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PROGRAM DEVELOPMENT AND EVALUATION OF A DIABETES SELF-MANAGEMENT EDUCATION AND SUPPORT TOOLKIT ON AN E-LEARNING PLATFORM FOR YOUNG ADULTS LIVING WITH TYPE 2 DIABETES

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PROGRAM DEVELOPMENT AND EVALUATION OF A DIABETES SELF-MANAGEMENT EDUCATION AND SUPPORT TOOLKIT ON AN E-LEARNING PLATFORM FOR YOUNG ADULTS LIVING WITH TYPE 2 DIABETES

A Scholarly Project Submitted to the Graduate School
in Partial Fulfillment of the Requirements
for the Degree of
Doctor of Nursing Practice

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PROGRAM DEVELOPMENT AND EVALUATION OF A DIABETES SELF-MANAGEMENT EDUCATION AND SUPPORT TOOLKIT ON AN E-LEARNING PLATFORM FOR YOUNG ADULTS LIVING WITH TYPE 2 DIABETES

An Abstract of the Scholarly Project by
Marlene Eicher, MSN, APRN, FNP-BC

The purpose of this project was to develop and evaluate the effectiveness of a diabetes education toolkit on an e-learning platform for improving individual self-management and medication knowledge to promote healthy lifestyle behaviors for young adults living with type 2 diabetes mellitus (T2DM).

A descriptive, quasi-experimental design with one-group pretest-posttest was used. Participants were recruited from an independently owned medical clinic. The participants were English-speaking young adults, between ages 18 to 39 with a diagnosis of prediabetes or T2DM. The intervention was a DSMES toolkit with twelve e-learning modules that participants completed over a three-month period. Data collected was age diagnosed, glycated hemoglobin (A1C), blood pressure, height, weight, current age, medication adherence, self-rated perception, and confidence of self-care.

A paired sample t-test was used to evaluate if participants increased their knowledge of diabetes self-management and decreased A1C over the three-month period. Participant outcomes were positive with post-DSMES mean of (5.4) for confidence in diabetes self-care knowledge and (5.0) for readiness for lifestyle change. A program evaluation was conducted to determine curriculum revisions for future replication. The participant comments were positive for impacting healthy behaviors, dietary changes, weight loss, stress management, and establishing physical and mental health routines.

Participants' A1C measurements at three months did not provide valuable data for

this study. Limitations of the study were small sample size and convenience sampling at independently owned small clinic, which may limit the generalizability of the results. However, the study results demonstrate a beneficial role for the DSMES toolkit in improving confidence in self-management knowledge and preparedness for healthy behavior modifications.

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CHAPTER I

Introduction

The Centers for Disease Control and Prevention (CDC) (2019) reports 1 in 10 people are living with diabetes, and 90% to 95% of these people are diagnosed with T2DM. In addition, obesity in childhood is increasing in number, and so are the rates of type 2 diabetes in youth. More than 75% of children with T2DM have a blood relative living with the chronic illness (CDC, 2019). Obesity is the result of imbalanced nutrition and consistent lack of physical activities. In the past, T2DM has been a chronic illness solely among the middle aged to older adult. In recent years, the worldwide prevalence of T2DM has significantly increased among adolescents, teens, and young adults (CDC, 2019). Often this population has a greater challenge because parents or guardians determine lifestyle, nutrition, and healthcare access (Eva et al., 2018).

The increasing number of young adults diagnosed with prediabetes or type 2 diabetes mellitus (T2DM) should prompt healthcare professionals to assess programs for diabetes education and support options in their community. Young adults living with T2DM develop similar microvascular and macrovascular complications as older adults if hyperglycemia is not controlled. Youth and young adults are at greater risk of diabetes-related complications due to early onset and duration of the chronic illness (Copeland et al., 2013; Rhodes et al., 2012). In some ethnic populations, 1 in 3 children younger than

18 years are diagnosed with T2DM (Copeland et al., 2013). Most diabetes education materials for younger patients targets type 1 diabetes mellitus, which was diagnosed rapidly with onset of symptoms in children and young adults. It is essential that family-centered diabetes self-care focuses on lifestyle changes and medication adherence based on learning methods. Copeland et al. (2013) explains DSMES programs preferred by younger people include internet-based, peer-enhanced activities, face-to-face, and telehealth interventions.

There are many well established methods for educating patients about self-management and measures for monitoring patient outcomes in clinical settings. Often, for young adults, the T2DM diagnosis occurs when admitted to the hospital in a hyperglycemic crisis (Pasquel & Umpierrez, 2014). The healthcare team usually includes medical and nursing staff, diabetes educators, and dieticians that provide education about diabetes self -management using rapid face-to-face sessions with booklets like those developed and published by American Diabetes Association (ADA), Merck, and Novo Nordisk. However, this approach may not be effective learning tools for educating young adults about their newly diagnosed chronic illness. Young adults, millennials and Generation Z use the internet, electronic devices, and interactive teaching strategies to support the learning process and obtain knowledge (Shatto & Erwin, 2017). Health care educators must match the learning style, and this is essential when working with young adults (ADA, 2021). Data shows one in four young adults are living with prediabetes or T2DM, and the lack of ongoing diabetes education and support can lead to chronic health complications (CDC, 2020).

At home, those with T2DM may search for health information, but the abundance

information about diabetes on the internet can be overwhelming and confusing and may not necessarily provide adequate support, which may mean that patients are not able to successfully manage blood glucose levels. According to Kansas Department of Health and Environment (KDHE) (2016) persons living with diabetes have medical expenses 2.3 times higher than same age healthy people with annual cost of $13,700 of which $7,900 is attributed to diabetes. However, studies have found that healthy lifestyle modifications can prevent or delay T2DM among adults with risk factors to develop the disease (KDHE, 2016). Access to ongoing education for diabetes self-care and support is essential for young adults living with prediabetes or T2DM for improving patient outcomes and reducing healthcare costs (Eva et al., 2018). Of these, effective patient self-management of diabetes and diabetes risks are among the most consequential because of the large and increasing proportion of the adult population at risk for or already suffering from T2DM and the high financial and personal cost of diabetes.

Description of the Clinical Problem

Diabetes education should effectively educate patients about necessary actions for glucose control and a lifestyle that reduces the diabetes risk, motivate patients to engage in effective self -management and to continue learning more about living well with diabetes and encourage and support patients who are experiencing challenges in living with diabetes (ADA, 2021). Educational materials like those provided by the diabetes educators are geared toward older adults in content, the types of visual images used, and the format in which information is presented. Young adults are in their busiest and productive years of life with college, working, raising families, and managing households, so clinic-based DSMES programs with face-to-face, small groups activities

are under-utilized and have limited effective for self-care behaviors. Young adults may receive limited ongoing diabetes education and may lack alternative approaches that focus on diabetes self-care. The lack of accessible DSMES programs impacts understanding for lifestyle modification, medication adherence, and preparedness for self-management (ADA, 2021). Life expectancy is reduced by 15 years for young adults living with T2DM, and complex, chronic health complications may develop by their 40s when diabetes is not well controlled. (Rhodes et al., 2012). Diabetes-related complications significantly increase healthcare costs and reduce quality of life for youth and young adults living with diabetes (CDC, 2017).

Significance to Nursing and Patients

Lifestyle and dietary choices established in childhood by parents and guardians' preferences, family cultural, and available resources affect health risks for developing cardiovascular diseases and T2DM in young adults that leads to premature death (Rhodes et al., 2012). Healthcare providers should assess for knowledge gaps when interacting with patients to address health concerns and issues. The key focus of *Healthy People 2030* goals is driven by US data for social determinants that effect individual's health outcomes (Office of Disease Prevention and Health Promotion (ODPHP), 2020). Priority is to provide access to health care and services for all with health problems and interventions to promote population health (Keating & DeBoor, 2018). The increasing number of young adults diagnosed with T2DM should prompt healthcare professionals to identify accessible DSMES programs.

Chronic illnesses management requires nurses, nurse educators, and health care providers to schedule adequate time with individual patients to understand their

challenges and provide access to lifestyle modifications to improve health outcomes. However, young adults, between 18 to 39 years of age are actively working or attending college, so the traditional diabetes self-management forum at an education center may not provide adequate self-care education to reinforce lifestyle changes, medication adherence, and glycemic control. Studies have shown that alternative approaches to diabetes self-care education can be effective for young adults. Diabetes self-care education is the key to managing T2DM, reduce microvascular and macrovascular complications, and improve life-long health outcomes (ADA, 2021). It is important that the recommendations are evidence-based practice and focus on clear and healthy outcomes and relevant behavior changes to meet the program outcomes.

Purpose

The purpose of this project was to develop and evaluate the effectiveness of a DMSES toolkit with 12 learning modules delivered on an e-learning platform to improve self-care knowledge and health outcomes for young adults, between ages 18 to 39 living with T2DM.

Theoretical Framework

Orem's Self Care Theory is applicable to education about diabetes self-management to support self-reliance in young adults living with T2DM. Orem's theory includes three integrated parts: self-care, self-care deficits, and nursing system (Current Nursing, 2012; Smith & Parker, 2015). The major assumptions are that people are individuals and should be responsible for self-care for themselves and their families. An individual's understanding of health and health complications is often learned through socio-cultural context. Nursing is an interaction between two or more people; the nurse,

the patient, and/or a family member. Nurses should understand and meet the individual and their family's self-care requirements for preventive care and illness management as universal. An individual's understanding of health and health complications is crucial for promoting self-care behaviors. The domain concepts integrated in the major assumptions are nursing, health, environment, human being, nursing client, nursing problem, nursing process, and nursing therapeutics (Current Nursing, 2012; Smith & Parker, 2015).

The first premise of self-care is that individuals initiate and practice healthy behaviors on their own to maintain life, health, and wellbeing (Current Nursing, 2012; Smith & Parker, 2015). The person's ability to participate in these behaviors is dependent on age, development, life experiences, resources, and sociocultural definition of health. The duration of time during which a person performs effective self-care is dependent on self-care basics such as mode of operation, activities, and validity of methods. Self-care requisites include three categories universal, developmental, and health deviation. Universal self-care requisites are the basic needs to promote and maintain human function as a human being. Food, water, air, rest, social interaction, and safety are examples. Developmental self-care requisites are needed for events throughout the stages of life from birth to death. Self-care requisites for health deviation are sought after when individuals experience acute illness, injury, and chronic illness. Individuals can access healthcare services to manage health deviation and often lead to modification of self-concepts to accept education, medical assistance, and living with conditions (Current Nursing, 2012; Smith & Parker, 2015).

The second premise is that self-care deficits defines nursing requirements for providing the tools for effective self-care (Current Nursing, 2012; Smith & Parker, 2015).

Orem describes five helping approaches are “acting for and doing for others, guiding others, supporting others, providing an environment prompting personal development in relation to meet future demands, and teaching another” (Current Nursing, 2012, para. 16). The third premise is that nursing systems take a holistic approach to assessment, diagnosis, planning, implementation, and evaluation when designing a health care plan focused on the individual client. The health care plan defines the role, relationship, and responsibility of the individual, family, and nurse for identifying and meeting self-care needs and compensatory systems. The design and elements consider technologies of communication, interpersonal coordination, therapeutic relationships, health promotion and health maintenance. Orem emphasizes that the technological components must be coordinated with interpersonal and social processes within nursing situations (Current Nursing, 2012). Nursing must consider self-care deficits to identify tools for effective diabetes management.

Diabetes education is often provided at time of diagnosis and learning how to manage a complex disease can be overwhelming. Some young adults are diagnosed with T2DM after being admitted to the hospital with diabetes ketoacidosis (DKA). Hospitalized patients interact with a hospitalist, endocrinology providers, diabetes educator, dietician, and social worker who bombard them with information about medications, diet, blood glucose monitoring, and lifestyle changes. New prescriptions to manage T2DM could include rapid acting insulin, basal insulin, and oral medications plus a glucometer, test strips, and alcohol pads along with lifestyle changes. In conjunction with other providers, nurses often provide initial education about diabetes self-management and support about with respect to medications, monitoring, and lifestyle

modifications.

Figure 1

DSMES Toolkit and Nursing Interventions

Note. Adapted from Dorthea Orem's Self-Care Deficit Theory Conceptual Model

Project Questions

The primary question for this project was how do diabetes education and support systems using an e-learning approach affect diabetes self-management in young adults living with type 2 diabetes mellitus? Specific research questions include:

1. Before accessing DSMES toolkit modules, what was the participants' glycated hemoglobin (A1C)?
2. Will participants that complete the 12 weekly DSMES toolkit modules have a change in glycated hemoglobin (A1C)?
3. What was the effect of DSMES toolkit modules on diabetes self-care knowledge for young adults?
4. Will participants report medication adherence as prescribed by a primary care provider for blood glucose control after completing the DSMES toolkit?
5. Did participants report readiness for lifestyle changes after participating in the DSMES toolkit program?
6. What were the young adult participants' perceptions of the DSMES toolkit modules?

Definition of Key Terms

The following definitions were relevant to this scholarly project and contributed background information associated the purpose of this study.

Diabetes self-management education and support: Education programs that emphasize diabetes self-care knowledge and skills to "assist a person in implementing and sustaining the behaviors needed to manage his or her condition on an ongoing basis, beyond or outside of formal self-management training" (CDC, 2018, para. 4).

E-Learning: "The use of computer and Internet technologies to deliver a broad array of solutions to enable learning and improve performance" (Food and Agriculture Organization, 2011, p. 3).

Glycated hemoglobin (A1C) test: "Reflects average glycemia over approximately 3 months" (ADA, 2021, p. S73).

Prediabetes: Individuals with prediabetes have elevated blood glucose and diagnosed with A1C results between 5.7% and 6.4%. "Prediabetes was associated with obesity (especially abdominal or visceral obesity), dyslipidemia with high triglycerides and/or low HDL cholesterol, and hypertension" (ADA, 2021, p.S20).

Self-Care: The World Health Organization (2021) "defines self-care as "the ability of individuals, families and communities to promote health, prevent disease, maintain health, and to cope with illness and disability with or without the support of a healthcare provider" (para. 1).

Type 2 diabetes mellitus: In T2DM cells are resistant to insulin and blood glucose elevates. The pancreas continues to increase insulin production to use the circulating glucose for cellular function. Eventually, the pancreas cannot produce enough insulin to use the blood glucose for cellular function, and blood glucose becomes chronically elevated, and cells are insulin resistance (CDC, 2019). A diagnosis of T2DM when A1C was at or greater than 6.5% (ADA, 2021).

Young adults: Persons between ages 18 to 39 years old (Public Health, n.d.).

Logic Model

The following illustration (Figure 2) is a logic model that describes the process that guided the program development and evaluation project. The beginning stages of

development required input from community partners at an independently owned primary and urgent clinic. Then input was obtained from experienced inpatient and outpatient diabetes educators and nursing staff for development of the DSMES toolkit modules for young adults living with T2DM. The input from community partners and experienced diabetes educators guided the development of the twelve DSMES modules and selection of the pretest and posttest with survey.

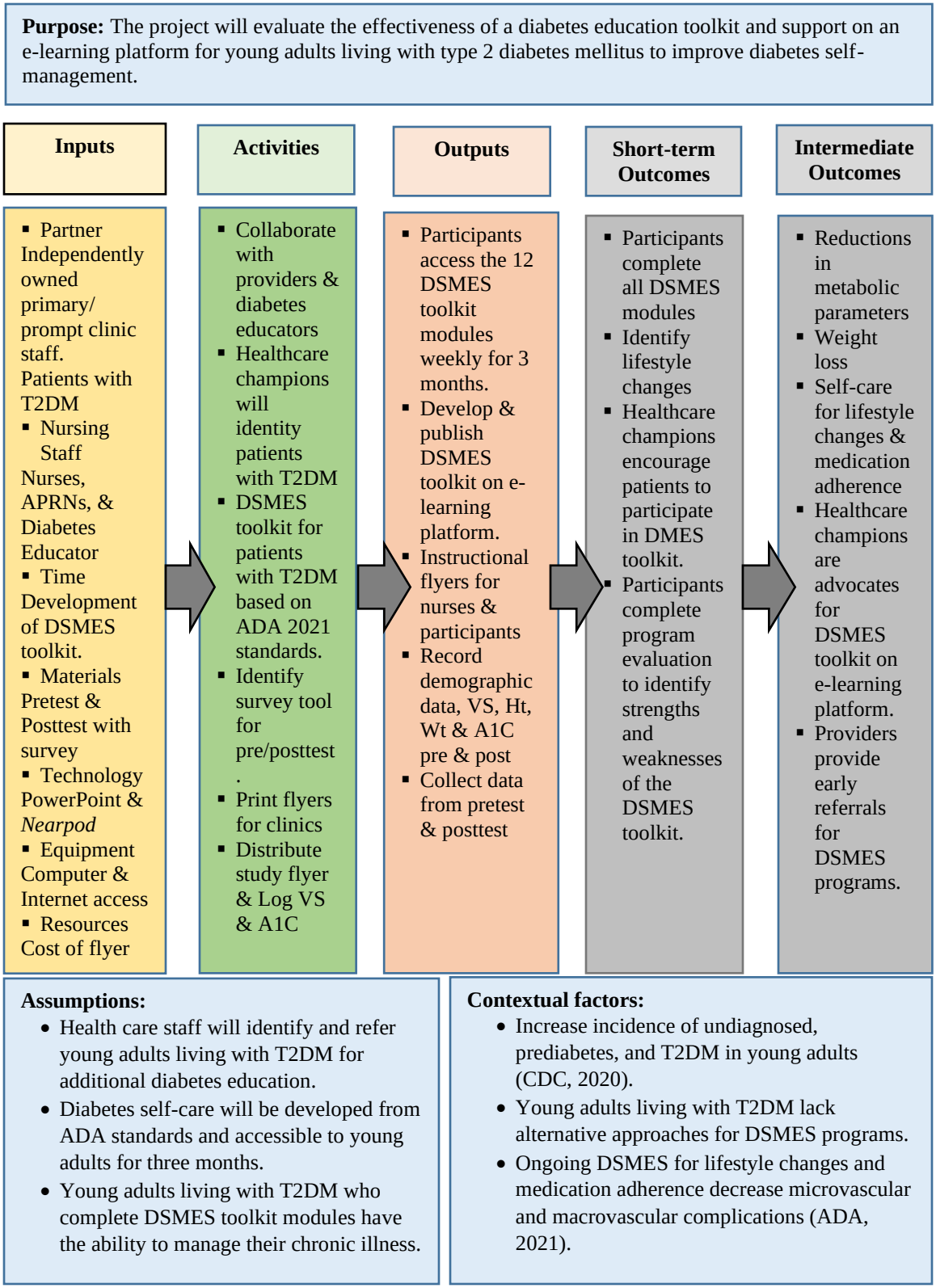
A retrospective chart review was completed at independently owned primary and urgent clinic to identify a convenience sample of participants who met inclusion criteria for this study. The logic model displays the community partners, collaborative team, development tools, and technology resources utilized for the DSMES toolkit development. In 2019 11.5% of adults were living with a diagnosis of diabetes in Shawnee County, Kansas compared to 10.5% statewide (Kansas Health Matters, 2019). In 2016 1.8% of adults between 18 and 34 years old and 5.3% between 35 and 44 years old were living with diabetes, while 3.2% of adults between 18 and 34 years old and 4.8% between 35 and 44 years old met the criteria for prediabetes (KDHE, 2016).

In this illustration (Figure 2), the short, intermediate, and long-term outcomes for the DSMES toolkit's effect on participants, partners, and health care providers are identified. The short-term outcomes for patients are active participation in and completion of the DSMES toolkit and initial goal setting for lifestyle changes while the short-term outcome for healthcare champions and healthcare providers is that they would encourage ongoing patient participation in the program. Intermediate outcomes are that the DSMES toolkit continue to affect weight loss, self-care, metabolic parameters, and medication adherence, healthcare champions support ongoing analysis of DSMES

programs on e-learning platforms, and health care staff continue to identify and refer patients at earlier stages in disease progression. The intended long-term outcomes are that patients engage in lifelong healthy behaviors, related to diabetes self-care, and maintain lowered A1C levels, healthy weight, normal blood pressure (BP), and normal cholesterol to reduce the risk of microvascular and macrovascular complications, healthcare champions continue to advocate for resources to support ongoing development of DSMES programs, and healthcare practitioners routinely match diabetes self-care programs to each patient's learning style.

Figure 2

Logic Model: Development of a DSMES Toolkit



Summary

Type 2 diabetes is increasing in the U.S. for young adults. Often young adults receive limited ongoing education for diabetes self-care to support lifestyle changes, medication adherence, and assessment for whether ADA recommendation for target goals have been met. There are many challenges for individuals to understand health care systems, health prevention, and acute and chronic disease management. Health care providers and nursing staff must understand the individual's financial resources, sociocultural influences, and developmental stage to provide an effective learning environment. Diabetes medications, medical supplies, and lifestyle changes are necessary to improve health outcomes and prevent diabetes-related complications. Assessment of self-care requisites to meet basic needs, preferred mode to learn, and perceived knowledge of diabetes management is an essential basis for identifying self-care deficits (Smith & Parker, 2015).

The ADA recommends intensive intervention programs to modify lifestyle and behaviors for nutritional intake, physical activity, and weight loss. Useful behavior management and mental health well-being are foundational to attain treatment goals for individuals with diabetes (ADA, 2021). For greatest effectiveness, it is essential that diabetes self-management education and support (DSMES) meets the individual's learning style for chronic illness management, while at the same time nurses and nurse practitioners should develop rapport with individuals and their families to design a health care plan that overcomes healthcare barriers and includes health promotion, and health maintenance.

CHAPTER II

Review of Literature

A review of literature of the latest peer-reviewed articles related to best practices for health education care of adolescents, and teens, and young adults living with type 2 diabetics was done. The purpose of this research was to examine approaches to DSMES programs as valid tools and to guide the development of a toolkit for diabetes self-management modules for an e-learning platform. Search of the databases included Google Scholar, ProQuest, MEDLINE, CINAHL, PubMed, and SAGE Premier using key words such as health education, nutrition, diabetes, self-management, adolescents, teenagers, young adults, type 2 diabetes mellitus, social media, and e-learning. Articles were selected based on publication date, historical knowledge, study findings, methodology, and focus, with an emphasis on the benefits of diabetes self-management education (DSMES) provided to teenagers and young adults, and barriers for self-care and self-management in this population.

Significance

There are various genetic and lifestyle factors which result in the gradual loss of β-cells mass and/or function that presents clinically as hyperglycemia (ADA, 2021). The common factor for onset of type 1 and type 2 diabetes is demise and dysfunction of β-cells that results in insulin secretory defects. Insulin resistance appears to be common

for T2DM and may be evident in children and adolescents prior to symptoms of hyperglycemia. Among children and adolescents, ages 10 to 19 years the incidence of T2DM has significantly increased which requires health care providers to complete regular risk-based screenings (ADA, 2021; CDC, 2020). For teens and young adults living with T2DM, the symptoms of hyperglycemia may not be evident for years and may result in increased insulin resistance and gradual loss of β-cell function altogether, which means the inability to regulate blood glucose levels without medications (ADA, 2021). The onset of T2DM often presents as subtle changes in blood glucose regulation; therefore, youth and young adults may not be diagnosed early enough to prevent long-term complications of this complex chronic illness.

Diabetes Impact on Health Outcomes

The leading mortality cause in the United State was heart disease, and consequently diabetes was the seventh leading cause of death in the United States (National Center for Health Statistics, 2021). Diabetes management and associated complication expenses are costly in multiple ways with a total expenditure of $327 billion for direct and indirect costs in 2017 (CDC, 2020). More importantly, microvascular and macrovascular complications can result in kidney disease, blindness, loss of limb, and heart disease that led to disability and death.

Chronic kidney disease occurs in 20-40% of people living with diabetes with approximately 32% having atherosclerotic cardiovascular events (ADA, 2021). Eye disorders including diabetes retinopathy, glaucoma, and cataracts occur earlier and more often in individuals with diabetes. Neuropathy affects multiple organs including peripheral vascular, tachycardia, hypoglycemia awareness orthostatic hypotension,

gastroparesis, constipation, diarrhea, sexual function, neurogenic bladder, and sudomotor dysfunction with either increased or decreased sweating (ADA, 2021). Lack of glycemic control leads to 50% with symptomatic peripheral neuropathy, and often presents at diagnosis of T2DM. Moderate to severe neuropathic pain was irreversible and affects quality of life, decreased mobility, depression, and social dysfunction (ADA, 2021). Ninety percent of diabetes patients are cared for in the primary care setting, and 50-80% of people diagnosed with diabetes lack the knowledge and skills for self-management (Celeste-Harris & Maryniuk, 2006).

Components of Self Care

Eva et al. (2019) performed a review focusing on T2DM education to identify self-care practices of adolescents between 12 and 19 years old. Self-care behaviors determine how patients with or at risk of diabetes manage their chronic illness successfully by themselves. Seven key diabetic self-care behaviors include healthy diet, physical activity, glucose monitoring, proper medication, excellent problem-solving attitudes, sound adapting abilities, and risk-reduction (Eva et al., 2019). In the treatment options for type 2 diabetes in adolescents and youth (TODAY) program, the education focused on "physiology and treatment, building skills of healthy eating habits, carbohydrate counting, portion sizes, reading food labels, glucose monitoring, and ketone testing, as well as problem solving, risk reduction, and living with diabetes" (Arslanian et al., 2018, p. 2652). Lifestyle modification programs that include self-care support and self-management show improvement of patient outcomes and reduction of long-term microvascular and macrovascular complications. Though studies have established the many benefits of DSMES, minimal individuals diagnosed with T2DM are active

participants in ongoing diabetes education. Diabetes practice guidelines provide national healthcare guidelines for diabetes education and healthcare management.

Standards of Medical Care in Diabetes

Clinical practice guidelines (CPG) developed by the American Diabetes Association (ADA) and American Association of Clinical Endocrinologists (AACE) provides critical information to assess for pre-diabetes and diabetes, laboratory tests to diagnose, planning ongoing chronic illness care, interventions including medications and self-care education, and follow-up evaluation (ADA, 2021; Garber et al., 2019). Both clinical guidelines discuss the importance of ongoing DSMES programs that encourage lifestyle changes and medication adherence to decrease microvascular and macrovascular complications. Diabetes management should include proactive care delivery, self-management support, decision support, clinical information systems, community resources, and quality-oriented health systems. The concept of tailoring treatment for social context that addresses social and financial barriers, referral to local resources, and self-management support (AACE, 2015).

The ADA guidelines were selected based on recommendations for evidence-based practice, self-management, and lifestyle modifications for young adults. Annually, the ADA publishes updated *Standards of Medical Care in Diabetes* based on the latest research. Randomized control trials (RCTs), cohort case studies, and/or case control studies supports most of the diabetes management recommendations. Lifestyle management is crucial for achieving these goals are diabetes self-management education and support (DSMES), medical nutrition therapy (MNT), routine physical activity, smoking cessation counseling when necessary, and psychosocial treatment (ADA, 2021).

The DSMES toolkit were developed using the ADA 2021 evidence-based practice guidelines, and content for the twelve modules focus was self-care knowledge, healthy behavior changes, medication adherence, and to maintain a lower A1c results.

Type 2 Diabetes Recommendations for Care

The twelve modules of the DSMES toolkit were developed using a curriculum approach as a key intervention to prevent acute and chronic diabetes related complications. The ADA (2021) clinical guidelines provide detailed elements of thorough diabetes medical assessment at initial, follow-up, and annual clinic visits. The patient-center decision cycle diagram guides communication, comprehensive assessments, and ongoing monitoring and management with an overall goal to prevent complications (ADA, 2021).

There should be an annual assessment of high-risk patients and testing to determine if parameters of A1C 5.7% to 6.4% for impaired glucose levels and early diagnose of prediabetes (ADA, 2021, p. S34). Lifestyle behavior programs should include weight loss of 7% for overweight or obese patients. Healthy behaviors include increase physical activity to moderate intensity for at least 150 minutes weekly and dietary counseling for weight loss and reduce dietary fat and calories to prevent T2DM development. Education about tobacco cessation, and hypertension and hyperlipidemia management to reduce or prevent cardiovascular risk are effective behaviors for diabetes self-care (ADA, 2021).

Target glycemic measurements are A1C less than 7% for many nonpregnant adults (ADA, 2021, p. S75). Self-monitoring of blood glucose (SMBG) was useful when making dietary changes, increasing physical activities, and adjusting medication to

identify hyperglycemic or hypoglycemic causes. The target range was 70 mg/dL to 179 mg/dL for SMBG (ADA, 2021).

Target blood pressure was less than 140/90 mmHg for all patients (ADA, 2021). Target blood pressure was less than 130/80 mmHg for individuals with a high 10-year atherosclerotic cardiovascular disease (ASCVD) risk score of greater than 15% and diagnosed with diabetes and hypertension (ADA, 2021).

Medical nutritional therapy promotes nutritious foods of appropriate proportion to balance nutrition intake with physical activity (ADA, 2021). A target weight loss goal of 5% for overweight and obese individuals supports healthy behaviors. Carbohydrates should be high in fiber, nonstarchy vegetables, and minimal processed foods. Dietary fat should be foods rich in monounsaturated and polyunsaturated fats as recommended in the Mediterranean-style diets "to improve glucose metabolism and lower cardiovascular disease risk" (ADA, 2021, p. S56). Limit sodium intake to less than 2300 mg/day. The emphasis was on water intake with limited sweetened and nonnutritive-sweetened beverages and moderate alcohol intake (ADA, 2021).

Regular screenings for microvascular complications included dilated eye exams, foot examination with monofilament and tuning fork, and spot urinary albumin-to-creatinine ratio (ADA, 2021). Screening for macrovascular complications include ongoing blood pressure monitoring, cardiac investigation prior to beginning intensive physical activity, and annual lipid panel, liver function test, and ASCVD risk analysis. Medications are for glycemic control, blood pressure control, reduction of lipids, and results of ASCVD risk factors. Consideration for care management includes

immunizations, mental health services, tobacco cessation, cognitive impairment, obstructive sleep study, and nonalcoholic fatty liver disease (ADA, 2021).

Prevention and delaying onset of diabetes type 2 complication was also the focus of the *Healthy People 2030* objectives (ODPHP, 2020). The ADA recommends diabetes self-management education "at diagnosis, annually or when not meeting target goals, physical or social situations complicate self-management, and when transition in life and care occur" (ADA, 2021, p. S54). Young adults are in several stages of transitions between 18 and 39 years, which are moving out of family home, college, jobs, relationships, marriage, and starting families.

Evaluation of Diabetes Self-Care Education Approaches

Diabetic educators usually provide standard education at individual or small group sessions with handouts, either in the hospital or clinical setting with limited ongoing diabetes education and support for young adults living with T2DM in many communities and few alternative approaches that focus on diabetes self-care for youth and young adults. Diabetes education does not target 18–39-year-olds even though this population is expected to live the longest with T2DM. There are many well-established methods for educating patients about self-management and measures for monitoring patient outcomes in various clinical settings.

Shared Medical Appointments

Hartzler et al. (2018) performed a prospective, quasi-experimental study to evaluate health outcomes of shared medical appointment (SMA) sessions in an urban family practice setting. "The purpose of the study was to evaluate the impact of a collaborative diabetes SMA on patient outcomes" (Hartzler et al., 2018, p. 363). The

study included multiple group sessions for one year, and the 120-minute sessions included “stress management, mindfulness strategies, sleep hygiene, readiness to make and commit to a health habit change, and relapse prevention” (Hartzler et al., 2018, p. 365). Initial A1C, lipid panel, and weight were collected at the first appointment, and data was collected at 6-month and 12-month periods. This study started with 59 participants; however, all data was collected from 40 participants. There was a statistical significance for improved A1C and LDL-C. Also, there was 100% adherence for medications treatments (Hartzler et al., 2018).

The many pamphlets, handouts, and face-to-face education session in the hospital setting to educate individuals about medication management, healthy lifestyle modification, and referral to endocrinology for ongoing management. Chronic illness management and diabetes self-management support must be available on the platforms where patients and their families obtain information, and the healthcare team can guide collaborative plan of care.

Online Spaced Education

One online approach was a randomized controlled trial study, and 456 participants were randomly assigned to two groups (Kerfoot et al., 2017). The study was performed at a Veterans Affairs in the eastern U.S. for one year using a “spaced education” approach. The participants received weekly emails with diabetes self-care information and two questions to evaluate knowledge. The target population was patients with inadequate control of blood glucose currently taking oral antihyperglycemic medication with or without insulin. The study method was a team-based online game that compared online diabetes self-management education (DSME) content with civic government education

booklet for the experimental group, and the control group received a traditional DSME booklet with online civic government content. The online DSME was taught over six months, and educational content was delivered twice weekly per email or mobile application (app) to veterans diagnosed with T2DM. The online or mobile app approach was flexible, and the participants could access the educational content at their convenience, and the researchers resent question modules through the study to enforce the participants' knowledge about diabetes self-management (Kerfoot et al., 2017).

The approach to learning was online education, termed as spaced education (SE). Kerfoot, al et. (2017) performed a randomized controlled trial (RCT) to investigate health outcomes of DSME delivered in an online team-based game and whether the participants' hemoglobin A1c (HbA1c) improved over 12 months. "Delivered via e-mail or mobile application (app), SE presents clinical case scenarios accompanied by multiple-choice questions" (Kerfoot et al., 2017, p. 1219). At each interval, "the patients completed two online questionnaires: an 8-item Diabetes Empowerment Scale (DES) Short Form and 20-item Problem Areas in Diabetes (PAID)" (Kerfoot et al., 2017, p.1220).

The main outcome measurements included changes in level of HbA1c at six months and 12 months. Secondary outcome measurements included PPR of oral antihyperglycemic medications, urine microalbumin, and both DES and PAID scores. The findings were that there was a reduction of HbA1c in both arms over the 12-month period; however, the DSME game arm was greater with a decrease of 6 to 10 mmol/mol versus 3 to 7 mmol/mol of the control group that received the booklet. Other findings were an increase in empowerment among DSME game patients, but there was not a significant relationship between empowerment and improved HbA1c (Kerfoot et al,

2017). In addition to the home HbA1c test at enrollment, home tests were completed at six months and 12 months. Other RCTs studies using SE method showed participants have improved knowledge and were able to retain the information for up to two years.

Gabarron et al. (2018) conducted a study to identify preferences and interests of diabetes social media users regarding a health promotion intervention. Social media followers of the Norwegian Diabetes Association were invited to participate and complete a survey provided via hyperlinks on three social media channels (Facebook, Twitter, and Instagram). Preferred type of health promotion was research and innovation about diabetes. Teens and young adults preferred the technology aspect. The age distribution of the participants was as follows 10 were less than 18 years old, 144 were between 18- to 44-year-olds, 96 were between 45 to 64 years old, and 34 were greater than 65 years old (Gabarron et al., 2018). Studies identify diabetes education as a key intervention to prevent acute and chronic diabetes related complications. A DSMES toolkit that provides diabetes education in a self-study, e-learning format would be beneficial for the young adult living with prediabetes or T2DM.

Assessment Tools for Evaluations of Diabetes Self-Care

The Adolescent Diabetes Needs Assessment Tool (ADNAT) was developed into an app to determine best practice standards and integrate recommendations for pediatric diabetes care was the second approach identified (Cooper et al., 2018). There were 89 participants recruited from three sites, and 85 completed the study. The overall purpose of this study was to develop and test a tool for future cohort studies ensure equality of access to ADNAT. The 20 ADNAT self-care questions tool can be adapted for a pre-test and post-test about physical activity, eating, monitoring blood glucose, medication

adherence, and descriptive questions about living with diabetes (Cooper et al., 2018).

The LMC Skills, Confidence & Preparedness Index (SCPI), an electronic tool was developed to meet International Society for Quality of Life Research (ISOQOL) standards to evaluate self-care patients with type 1 and type 2 as an effective measurement instrument and provide feedback to providers immediately (Aronson et al., 2018). The SCPI tool has 25-items that measures understanding, confidence and readiness to make behavior changes, and in addition compares relationship of score results to glycemic control. There were 529 participants diagnosed with either type 1 or type 2 recruited from an endocrinology specialty clinic with 200 diagnosed with type 1 and 329 diagnosed with type 2. The internal validity of the SCPI tool was Cronbach's alpha range of 0.81 to 0.95, indicating a strong internal constancy. The reliability for test-retest was $r = 0.84$ ($P < .001$) for the 61 patients diagnosed with type 1 and type 2 that completed the questionnaire a second time. Analysis of mean scores for Skills, Confidence, and Preparedness Index (SCPI) scales indicate construction validity and showed "high correlation with each of the Michigan Knowledge Test and the Diabetes Empowerment Scale" (Aronson et al., 2018, p. 131). Both the ADNAT and SCPI instruments were useful for developing diabetes self-care questions for this DNP scholarly project.

Summary

Certainly, there was an abundance of diabetes educational methods to educate all age groups about controlling their newly diagnosed chronic illness and preventing complications. Adolescents and teens living with T2DM have access to diabetes self-care education and parental support to manage their complex chronic illness. The challenge

was when young adults go to college and make independent lifestyle choices about alcohol, tobacco use, dietary intake, and medication adherence. Their choices lead to emergency room visits and hospitalization for hyperglycemia and DKA, because they do not take antihyperglycemic medications or manage co-morbidities such high blood pressure.

Multiple approaches were identified for accessible and ongoing diabetes self-management to support self-care for persons living with T2DM in the review of literature, which was the cornerstone to improving health outcomes. Accessible DSMES programs on an e-learning platform can be a cost-effective approach for ongoing chronic illness self-care education.

CHAPTER III

Methodology

The purpose of this project was to develop and evaluate modules in an e-learning DSMES toolkit that focuses on glycemic management, healthy lifestyle behaviors, and medication adherence over a period of three months using a self-care approach to increase self-rated health in young adults with prediabetes or T2DM. The goal of this project was to create a scalable approach to content design and delivery with the possibility for future expansion. The diabetes self-care education modules developed using evidence-based practice tools and delivered on an e-learning platform focused on disease prevention and health promotion to increase self-care knowledge and understanding of prediabetes and T2DM and associated chronic illnesses and complications.

Project Design

The design of this project was a program development and evaluation of a DSMES toolkit. A topic outline for the twelve modules was developed using an educational curriculum format with learning outcomes, medical disclaimer, evidence-based content, and evaluation questions. Module one was used for data collection that includes demographics, health history, and self-rated pretest with self-management, medication adherence, and readiness for change. PowerPoint slides were created for

modules two through eleven following the topic outline and integrating ADA guidelines, CDC recommendations, and diabetes education booklets. Topic outline was types of diabetes, meal planning, antihyperglycemic medications, physical activity recommendations, laboratory tests, interventions for abnormal blood glucose, provider visits, social habits, healthy behaviors, and long-term effects of poor blood glucose control. The modules were created using voice over PowerPoint with embedded questions published on the *Nearpod* secured learning management platform, and each module took approximately 20 to 30 minutes to complete. Module twelve was used for data collection of self-rated posttest with self-management, medication adherence, and readiness for change with program evaluation survey. Participants' responses for each module were downloaded using *Nearpod* report system.

Research Design

The research design was quasi-experimental, one-group with a pretest and posttest of young adults diagnosed with prediabetes or T2DM. Data collection consisted of a pretest prior to using the DSMES toolkit and a posttest survey after completing all modules. A1C and BMI results were also collected at the beginning and end of the intervention period. The pretest and posttest survey were adapted from the LMC Skills, Confidence and Preparedness Index (SCPI) using a 7-point Likert scale for participants to evaluate themselves. The participants were invited to participate in the e-learning modules with integrated questions using the adapted Adolescent Diabetes Needs Assessment Tool questionnaire (Cooper, et al., 2018). The questionnaires were utilized to assess the level of knowledge and perceived health management confidence of patients previously diagnosed with prediabetes or T2DM. The study results were utilized to

develop beneficial e-learning DSMES programs.

Data Analysis

A one-group, pretest-posttest design was one of the simplest of quasi-experimental designs with assessment (pretest) before the treatment and assessment (posttest) after the treatment (Millsap & Maydeu-Olivares, 2009). The treatment in this study was DSMES toolkit with twelve modules provided on an e-learning platform over a three-month period. Quantitative data were gathered for descriptive statistical analysis, and qualitative data were gathered for program evaluation.

Project Site

The practice site was an independently owned primary and urgent care clinic, Sunflower Primary Care and Sunflower Prompt Care, located in Northeast Kansas. Two physicians and one advanced registered nurse practitioner (APRN) provide primary care services. In the urgent care setting, there are four APRNs, one full-time and three part-time that provide healthcare services. Providers utilize the electronic health record (EHR) platform to review health history and document clinic visits. To identify potential participants, a retrospective EHR analysis of patients diagnosed with prediabetes, which was ICD-10 code R73.03, and T2DM, which was ICD-10 codes beginning with E11 that are between 18 and 39 years old. Data collected included most recent A1C, age, weight, height, and vital signs.

Target Population

Shawnee County, Kansas has a population of 176,875 with 25% of this population between 18 and 39 years of age with an estimated 6.7% of young adults diagnosed with prediabetes or T2DM (United States Census Bureau, 2019). This data was used to

calculate the estimated sample size for one study group diagnosed with prediabetes or T2DM as dichotomous variable. The statistical parameters were 25% of Shawnee County population is between 18 and 39 years old with an estimated 6.7% incidence of prediabetes or T2DM and using a power analysis of 80% and an alpha of 0.05. The estimated sample size for one study group for this population would be 33 participants (ClinCalc, n.d.).

Once approval was granted through Sunflower Primary Care/Sunflower Prompt Care and Pittsburg State University, patient data selection began on June 26, 2021. The researcher identified patients between 18 and 39 years old that were seen at the clinic within the last three years and determine if they had a diagnosis of prediabetes or T2DM, ICD-10 code R73.03 and codes beginning with E11. Convenience sampling of patients were utilized and determined by the number of participants identified during the EHR search. Also, health care staff would refer potential participants that met the inclusion criteria.

Recruitment

Individual patients that meet the criteria from the patient data search were contacted by telephone or a clinic visit to offer the DSMES toolkit. In addition, a project flyer was available at the front desk with information about the program and how to begin the study (see Appendix A). The consent forms were available with risks and benefits for patients to read. The participants were not selected based on social status, race, sex, gender, or culture.

Inclusion and Exclusion Criteria

Participants were included in the study if between 18 and 39 years of age with a

diagnosis of prediabetes or T2DM. Participants who are non-English speaking, pregnant, or mentally disabled were excluded from the study. Health care providers also referred young adult patients that met inclusion criteria to the clinic.

Protection of Human Subjects

Before this scholarly project was implemented, an application to Pittsburg State University Institutional Review Board (IRB) was submitted for approval. To preserve the identity of the participants, no patient identifiers were obtained in data collection to preserve the identity of the participants. The initial data collection documents obtained at the initial clinic visit with the participants' demographics, vital signs, height, weight, and A1C results were stored in a locked cabinet for three years. All digital files developed from this data included the participants' unique username as identification and saved as a password protected document. The participants created a unique username with ten characters and a random combination of letters and numbers that they entered each time accessing the DSMES e-learning modules. All data collection was conducted on *Nearpod*, a secure learning management system (LMS). In accordance with the both the researcher's affiliated university and place of employment, all criteria for data of human subjects were upheld for the entire process including data collection, analysis, and presentation. The post DNP scholarly project reports from the LMS platform were stored for data analysis as secure digital folder and password protected. Once the data has been fully analyzed it were kept in locked cabinet for three years.

Instruments

The specific instruments for the quantitative research of this project are listed below and include *A1CNow* diagnostic test, a demographic questionnaire, pretest and

posttest survey, project instructions, and the follow-up program evaluation to appraise the usefulness of the DSMES toolkit for further development.

1. Informed Consent – Informed consent was the process in which the researcher educates the volunteer participants in risk and benefits to participate in the DSMES toolkit. The participant can decide to participate without persuasion from the researcher or stakeholders. A statement was included to confirm that participation was not intended as a subsequent for provider health care services. An initial question prior to gathering demographic data was specifically ask about providing consent and understanding about the project and criteria to participate (see Appendix B).
2. *A1CNow* – The diagnostic test measures the individual's average blood glucose over a 90-day period. A small blood sample was obtained with a single fingerstick and the *A1CNow* results in five minutes (PTS Diagnostics, 2021). The test has 95% confidence of Bland Altman analysis with A1C variance of -0.6 to +0.5 % for accuracy with an average bias of -0.03% (PTS Diagnostics, 2021). The *A1CNow* has a Clinical Laboratory Improvement Amendments (CLIA) waiver, which means the test has "an insignificant risk of an erroneous results" (Centers for Medicare & Medicaid Services, n.d., p. 2).
3. Pretest – The LMC SCPI electronic tool has an overall Cronbach's alpha of 0.94 for internal validity for interclass correlation (Aronson et al., 2018, p. 130). The tool was scored using a Likert scale, which were adapted to a multiple-choice survey using 7-point Likert scale with 20 questions for

delivery on a LMS platform. The pretest was created to be clear and concise to reduce participant confusion and increase response rate (see Appendix C).

4. Posttest – The posttest included the same 20 multiple-choice questions as the pretest survey (see Appendix D).
5. Qualitative questionnaire – Three multiple-choice questions and two open-ended survey questions to provide feedback about the learning modules and to guide future development of the DSMES toolkit (see Appendix D).
6. Educational Resources – The educational resources included the most recent and reliable evidence-based practice clinical guidelines from the American Diabetes Association: Standards of Medical Care in Diabetes – 2021. The *Living Well with Diabetes* self-care workbook published by Merck (2015) was used to ensure terminology was clear and concise, and easy to read (StayWell, 2015). Amidor (2020) uses the *Create-Your-Plate* approach for meal planning, which was a simpler guide to balance nutrition and control blood sugars. Another booklet, *Meal Planning and Carb Counting* published by Novo Nordisk was used for types of healthy foods (Cornerstone4care, 2015). The diagrams and key concepts from the medical-surgical nursing textbook provides clear and concise knowledge for young adults in nursing programs (Hoffman & Sullivan, 2020). These educational resources were used for the program development. The DSMES toolkit were developed using an educational curriculum format with learning outcomes, content outline, and learner analysis, learning activities, assessment, and program evaluation for the twelve DSMES toolkit modules (see Appendix E).

7. Participant Instructions – Instructions to access the DSMES toolkit modules and contact information were provided. The one-page document included a table with titles of the twelve modules, close date, and session code field (Appendix G).

For the evaluation of the data collection, a paired sample t-test were implemented to compare the results of the pretest and posttest survey. The demographic data were presented comparing age, A1C, blood pressure, and BMI. The qualitative data were gathered to evaluate for strengths and challenges of the DSMES toolkit.

Procedure

The initial step for the procedure was to seek IRB approval through Pittsburg State University IRB approval that included a certificate for completion of the Collaborative Institutional Training Initiative (CITI) about human subject protection as well as assessment of the risks vs benefits to the participants. A letter of approval was obtained from the business owner at Sunflower Primary Care and Sunflower Primary Care. Once approval was obtained from Pittsburg State University, the report builder of EHR system at the clinical site was ran to identify potential participants for the study. A description of the study was provided with risks vs benefits and informed consent. Printed participant instructions were provided to access the learning modules from an electronic device such as computer, tablet, or smartphone. The participants accessed the LMS system using the session code provided on the flyer to access the first module. An electronic signature was obtained for informed consent on the LMS platform, and if they agree to participate in the study. The session code for the next module was provided on the final slide after the quiz. The twelve self-study modules were completed in order and

can be accessed one time.

Timeline

After IRB approval and mutual consent, participants were contacted in late June to volunteer for the study. The participants came to the clinic or met with investigator individual for an initial walk-in visit to obtain demographics, height, and weight to calculate BMI, blood pressure, and *A1CNow* results. The participants were provided the informed consent at the initial clinic visit. The fingerstick blood sample required for the *A1CNow* results was already performed at Sunflower Primary Care/Sunflower Prompt Care for other types of fingerstick tests. Data were collected on a one-page by clinical staff that will remain at the clinic (see Appendix F). The project will continue the e-learning platform pretest, DSMES toolkit modules based on CPG educational resources, posttest, and outcome evaluation from July through September 2021. In three months, the participants returned to the clinic for BMI calculation, blood pressure, and *A1CNow* results.

Budget

Resources for this scholarly project included seven years of APRN practice and fifteen years of nurse educator teaching experience at an undergraduate university, personal guidance from committee chair and committee members for development, implementation, and data analysis. Assistance with creating the informed consent, pretest/posttest survey including measurable responses to ensure validity and reliability were discussed with the committee prior to implementation. Office 365 was utilized to develop the informational flyer, data collection form, and DSMES toolkit modules as a voice over PowerPoint converted to videos. Technology was provided on the researcher's

personal LMS platform utilized for nursing education. The survey, including demographics, pretest and posttest were embedded within the DSMES modules. Fiscal cost for the e-learning platform was low for this research project since available technology was utilized for implementation. The cost of the *A1CNow* diagnostic test was an average of $11 to $13 per test.

Outcomes and Evaluation Plan

Common methods utilized for formative evaluation are audit and feedback, focus groups, interviews, observations, and surveys. Data collection tools with validity and reliability and laboratory results with sensitivity and specificity are excellent summative evaluation methods. Evaluation of the young adult learner is essential to determine the strengths and challenges of the DSMES toolkit. The ADA (2021) recommends "assess diabetes health care maintenance using reliable and relevant data metrics to improve processes of care and health outcomes, with attention to care costs" (p. S7). This DNP scholarly project purpose was to develop and evaluate the effectiveness of a diabetes education toolkit on an e-learning platform to improve their health outcomes for young adults living with prediabetes and T2DM.

Data collection from formative evaluation provides qualitative and quantitative data to evaluate the percentage of young adult learners that complete all twelve of the DSMES modules. Three survey questions evaluated the young adult learner's perception of the learning modules usefulness with strengths and challenges of the DSMES toolkit. Data collection from summative evaluation provide quantitative data to determine changes in A1C, blood pressure, self-care knowledge, medication adherence, and readiness for lifestyle changes.

Plan for Sustainability

There are opportunities to implement the DSMES toolkit modules on an e-learning platform in other settings such as indigent care and Indian Health clinics, and during medical missions. Nutrition education and DSME modules based on the National Health Education Standards, Kansas State Department of Education, and ADA standards could have a significant impact on health behaviors in adolescents, teenagers, and young adults in the educational setting.

Summary

The current focus was on population health that was defined as the health outcomes of a group of individuals, including the distribution of health outcomes within the group (ADA, 2021). Therefore, the increasing number of adolescents and young adults diagnosed with prediabetes or T2DM should prompt healthcare professionals to address the lack of ongoing diabetes education and support for young adults in many communities. Health education and DSME content based on CPG resources would benefit students, parents, educators, nurses, and health care practitioners in public health care settings.

CHAPTER IV

Evaluation of Results

The purpose of this DNP scholarly project was to develop a diabetes self-care education toolkit on an e-learning platform for young adults, between ages 18 to 39 living with prediabetes or T2DM. The twelve modules of the DSMES toolkit were developed using a curriculum approach to include outcomes with questions to assess learning for each module. The SPCI electronic tool was adapted for the 20 questions on the pretest and posttest surveys. A 7-point Likert scale was utilized to measure diabetes self-care knowledge, understanding of medications to control blood glucose, and readiness for lifestyle change. The data collected on the secured e-learning platform, *Nearpod* was analyzed using *IBM SPSS Statistics* to compare pretest and posttest findings.

Participants used the 7-point Likert scale to rate the DSMES toolkit for program evaluation. This data was analyzed using *IBM SPSS Statistics* as well. The project attempted to identify strengths and challenges of the educational modules by having participants complete a short evaluation with recommendations for future development. Data collection started after participants reviewed and signed the informed consent. The project questions evaluated include:

1. Before accessing DSMES toolkit modules, what was the participants' glycated hemoglobin (A1C)?

2. Will participants that complete the 12 weekly DSMES toolkit modules have a change in glycated hemoglobin (A1C)?
3. What was the effect of DSMES toolkit modules on diabetes self-care knowledge for young adults?
4. Will participants report medication adherence as prescribed by a primary care provider for blood glucose control after completing the DSMES toolkit?
5. Did participants report readiness for lifestyle changes after participating in the DSMES toolkit program?
6. What was the young adult participants' perceptions of the DSMES toolkit modules?

This chapter will discuss the participants that completed the DSMES educational program. It will provide an analysis of the data collected as it relates to the purpose of this project. Finally, it will discuss the findings of the project in detail.

Description of Sample

Once approval was obtained from Pittsburg State University IRB and Sunflower Primary Care, clinic staff were instructed on how to complete the data collection form that included instructions and session code to access the DSMES toolkit modules on the back. Study flyers were placed at the front desk and providers provided copies to patients met project criteria. Staff education began on June 15, 2021 and ran through June 21, 2021.

The sample size for a one study group of young adults living with prediabetes or T2DM was 33 calculated using an 80% power and an 0.5 alpha. The goal for this study was to identify and enroll 20 young adults that met the inclusion criteria. The criteria was

applied to all patients seen at the clinic site or referred to the investigator. Participants were accepted between 18 to 39 years old and diagnosed with prediabetes or T2DM. Patients that were non-English speaking, pregnant, or mentally disabled were excluded from the study. Additionally, those patients younger than 18 years of age, and older than 39 years of age were also excluded.

Data was collected at scheduled face-to-face visit with the investigator to review the informed consent form and then sign. Vital signs, height, weight, blood pressure, pulse, and *A1CNow* test were performed to gather pre-study data for comparison to post-study data in three months. Data collection began on June 26, 2021 and ran through July 7, 2021. A final face-to-face visit was scheduled on October 2, 2021 with the investigator to measure vital signs, height, weight, blood pressure, pulse, and *A1CNow* test after participants completed all twelve modules.

Twenty pretest and posttest survey questions were adapted from SPCI assessment tool. Participants' responses to pretest and posttest survey were assigned to related study question to measure diabetes self-care knowledge, understanding of medications, and readiness for lifestyle change. Appendix H table shows how the pretest and posttest survey questions were assigned to analyze the related study questions. Data analysis was performed by finding the summative mean to analysis the project questions. The participants were provided a Likert rating scale presenting a statement with a one to seven score between strongly disagree to strongly agree. The questions were identical for both pretest and posttest.

Participants Demographics

Four participants agreed to review informed consent and signed the form before

initial data collection. Three participants completed all twelve modules on *Nearpod* and schedule final face-to-face visit for assessments of vital signs, height, weight, blood pressure, pulse, and *A1CNow* test. Demographic data was divided into age, sex at birth, gender, race/ethnic group, level of education, type of diabetes, and other health problems. No analysis of participants'' demographic data was performed due to small sample size. The following table reviews frequency of participants' response to demographic data.

Table 2

Social Demographic Characteristics of Participants

Characteristics	Prediabetes	T2DM
	n	*n*
Age		
23-28	1	1
29-34	1	0
Sex at birth		
Female	2	0
Male	0	1
Race/Ethnic		
White	2	1
Level of Education		
High school	0	1
College	2	0

Note. N = 3. Participant gender, and other health problems did not differ by condition.

Description of Project Variables

The independent variable for this study was the diabetes self-care education provided in the DSMES toolkit modules. Each learning module was developed using current evidence-based practice recommendations for prediabetes and T2DM. The content was delivered on slides with audio recordings that focused on important knowledge for young adults to develop diabetes self-care and make lifestyle change to improve health outcomes. The twelve modules were available on *Nearpod*, a secure e-

learning platform to complete on electronic device with internet access. Two modules included pre- and post-test survey questions for statistical analysis and program evaluation.

The dependent variables for this study were the participants' A1C, diabetes self-care knowledge, medication adherence, and readiness for lifestyle modifications prior to and after the educational interventions. The goal was to determine if the dependent variables were affected by the DSMES toolkit education. The effect on the dependent variables was shown in comparison to the pretest and posttest surveys and data collection at initial and final clinic visits.

Analysis of Project Questions

The ADA identifies annual provider visits, diabetes self-care education, and community resources as crucial for lifestyle change, medication adherence, and achieving target A1C and blood pressure goals. Research has demonstrated LMC Skills, Confidence & Preparedness Index as an effective tool that measures understanding, confidence and readiness to make behavior changes. There were six project questions addressed in this project. Each question will be reviewed individually to ensure it is answered completely. The summative mean was identified as the most valuable factor in analyzing data.

Research Question One

Before accessing DSMES toolkit modules, what was the participants' A1C? This question was answered by performing a fingerstick to obtain blood for the *A1CNOW* diagnostic testing equipment at the initial clinic visit. The diagnostic test measures the participant's average blood glucose over the last 90-day period. One participant

compared recent Hgb A1C results on *MyChart* to *A1CNOW* to confirm accuracy of the equipment. The following table (Table 3) compares participants' initial and three-month *A1CNOW* results and the mean of each.

Research Question Two

Will participants that complete the 12 weekly DSMES toolkit modules have a change in A1C? This question was answered by performing a fingerstick to obtain blood for the *A1CNOW* diagnostic testing equipment after participants completed all 12 modules in the DSMES toolkit on *Nearpod*. A paired-sample t test was conducted to evaluate whether the participants A1C would change after completing the DSMES toolkit modules.

Table 3

Analysis of Pre-Study and Post-Study A1CNow Results

Participant	Pre-A1C	Post-A1C
1	5.3	5.6
2	5.3	7.1
3	5.6	5.6
Mean	5.4	6.1

Note. N = 3. The participant living with T2DM had a significant increase in A1C results.

Hemoglobin A1C increased for two participants and one participants A1C was unchanged. There were three factors that could affect Pre-A1C and Post-A1C results. One is the learning curve of using a new product in the Pre-A1C phase. Another factor is the participant with the significantly increased Pre-A1C of 5.3 and Post-A1C of 7.1 stopped taking T2DM medications during the study. The final factor is A1C measures average blood glucose control over the previous three months. A minimal change either increase or decrease in A1C would be expected after three months.

Research Question Three

What was the effect of DSMES toolkit modules on diabetes self-care knowledge for young adults? The participant response to questions regarding diabetes self-care knowledge on questions one to 13 on both the pretest and posttest. The participants were provided a Likert rating scale presenting a statement with a one to seven score between strongly disagree and strongly agree for identical questions on pretest and posttest surveys. Participants were asked to rate the current perception of confidence managing meal planning, physical activity, stress management, blood glucose monitoring, and healthcare visits. An overall summative average of participant perception of diabetes self-care knowledge after completing the pre and post DSMES toolkit on the LMS was compared (Table 4).

Table 4

Summative Average of Diabetes Self-Care Knowledge

	Mean	N	St. Deviation
Pre-Summative Average of Diabetes Self-Care Knowledge	3.7949	3	.57735
Post-Summative Average of Diabetes Self-Care Knowledge	5.3889	3	.67358

Note. For observed mean, 1 = strongly disagree, 2 = somewhat disagree, 3 = disagree, 4 = neither disagree or agree, 5 = agree, 6 = somewhat agree, 7 = strongly agree

Using the seven-point Likert scale from strongly disagree to strongly agree, participants summative average pretest and posttest were analyzed on questions one to 13 regarding confidence with diabetes self-care knowledge. Response evaluated from the following scores: Strongly disagree (0-1.49), Somewhat disagree (1.5-2.49), Disagree (2.50-3.49), Neither disagree or agree (3.50-4.49), Agree (4.50-5.49), Somewhat agree (5.50-6.49), and Strongly agree (6.50 and above). The pre-summative mean (3.8) indicates participants neither disagreed nor agreed of confidence with diabetes self-care

knowledge. The post-summative mean (5.4) shows participants had an increase of (1.6) points indicating perception of confidence in diabetes self-care knowledge.

Research Question Four

Will participants report medication adherence as prescribed by a primary care provider for blood glucose control after completing the DSMES toolkit? The participant response to questions regarding taking medication as prescribed and monitoring on questions 14 to 16 on both the pretest and posttest. The participants were provided a Likert rating scale presenting a statement with a one to seven score between strongly disagree and strongly agree for identical questions on pretest and posttest surveys. Participants were asked to rate the current perception of medication adherence and understanding of medications adjustments when ill. An overall summative average of participant confidence of glycemic control medications after completing the pre and post DSMES toolkit on the LMS was compared (Table 5).

Table 5

Summative Average of Medication Adherence

	Mean	N	St. Deviation
Pre-Summative Average of Medication Adherence	4.3333	3	.57735
Post-Summative Average of Medication Adherence	5.4444	3	.50918

Note. For observed mean, 1 = strongly disagree, 2 = somewhat disagree, 3 = disagree, 4 = neither disagree or agree, 5 = agree, 6 = somewhat agree, 7 = strongly agree

Using the seven-point Likert scale from strongly disagree to strongly agree, participants summative average pretest and posttest were analyzed on questions 14 to 16 regarding confidence with medication adherence. Response evaluated from the following scores: Strongly disagree (0-1.49), Somewhat disagree (1.5-2.49), Disagree (2.50-3.49), Neither disagree or agree (3.50-4.49), Agree (4.50-5.49), Somewhat agree (5.50-6.49),

and Strongly agree (6.50 and above). The pre-summative mean (4.3) indicates participants neither disagreed nor agreed of confidence with diabetes self-care knowledge. The post-summative mean (4.3) shows participants had an increase of (1.1) points indicating perception of confidence for medication adherence.

Research Question Five

Did participants report readiness for lifestyle changes after participating in the DSMES toolkit program? The participant response to questions regarding readiness for lifestyle change on questions 17 to 20 on both the pretest and posttest. The participants were provided a Likert rating scale presenting a statement with a one to seven score between strongly disagree and strongly agree for identical questions on pretest and posttest surveys. Participants were asked to rate the current plans for lifestyle changes in dietary intake, stress management, and physical activity. An overall summative average of participant preparedness for behaviors changes after completing the pre and post DSMES toolkit on the LMS was compared (Table 5).

Table 6

Summative Average of Readiness for Lifestyle Change

	Mean	N	St. Deviation
Pre-Summative Average of Readiness for Lifestyle Change	3.6667	3	.72169
Post-Summative Average of Readiness for Lifestyle Change	5.0000	3	.90139

Note. For observed mean, 1 = strongly disagree, 2 = somewhat disagree, 3 = disagree, 4 = neither disagree or agree, 5 = agree, 6 = somewhat agree, 7 = strongly agree

Using the seven-point Likert scale from strongly disagree to strongly agree, participants summative average pretest and posttest were analyzed on questions 14 to 16 regarding confidence of readiness for lifestyle change. Response evaluated from the following scores: Strongly disagree (0-1.49), Somewhat disagree (1.5-2.49), Disagree

(2.50-3.49), Neither disagree or agree (3.50-4.49), Agree (4.50-5.49), Somewhat agree (5.50-6.49), and Strongly agree (6.50 and above). The pre-summative mean (3.7) indicates participants neither disagreed nor agreed on preparedness for behavior changes. The post-summative mean (5.0) shows participants had an increase of (1.3) points indicating preparedness for lifestyle changes.

Research Question Six

What was the young adult participants' perceptions of the DSMES toolkit modules? This question was answered with five program evaluation questions on the posttest. Participants were asked to rate understanding of the DSMES toolkit content, ability to apply the learning modules to personal health and self-care, and whether the e-learning modules were an effective method for learning. The participants response to program evaluation questions are defined on the following tables. The participants were provided a Likert rating scale presenting a statement with a one to seven score between strongly disagree and strongly agree for three program evaluation questions (Table 7).

Table 7

Analysis of Program Evaluation

	Mean	N	St. Deviation
I understood the content of the modules.	6.3333	3	.57735
I could apply the modules to my personal health and self-care.	6.3333	3	.57735
The e-learning modules were an effective method of learning for me.	6.0000	3	1.00000

Note. For observed mean, 1 = strongly disagree, 2 = somewhat disagree, 3 = disagree, 4 = neither disagree or agree, 5 = agree, 6 = somewhat agree, 7 = strongly agree

Using the seven-point Likert scale from strongly disagree to strongly agree, participants were analyzed on questions regarding program evaluation. Response

evaluated from the following scores: Strongly disagree (0-1.49), Somewhat disagree (1.5-2.49), Disagree (2.50-3.49), Neither disagree or agree (3.50-4.49), Agree (4.50-5.49), Somewhat agree (5.50-6.49), and Strongly agree (6.50 and above). The mean (6.3) indicates participants somewhat agree understanding of the DSMES toolkit content. The means (6.3) indicates participants somewhat agree that learning modules can be applied to personal health and self-care. The mean (6.0) indicates participants somewhat agree DSMES toolkit was effective method for learning. The participants provided short answers on plan for applying DSMES toolkit content for self-care and additional content about diabetes self-care management (Table 8).

Table 8

Analysis of Program Evaluation Comments

Plans to use DSMES content for self-care	Additional information about self-care
Meet dietary goals.	How to monitor prediabetes.
Weight loss goals of 7% initially.	Should I check BG with prediabetes?
Slowly increase weight loss to sustain.	Often should a person monitor A1C with prediabetes?
Schedule provider for guide to goals.	More information about mental health and diabetes.
Implement self-care to reduce stress.	Modules would be helpful resources when first diagnosed with diabetes.
Daily physical and mental health routine.	Modules were fairly comprehensive and easily digestible.
Remove prediabetes status.	Would like more information about diet?
Check blood sugar on a daily basis.	
Exercise once or twice weekly.	
Reduce simple sugars and carbohydrates.	
Use meal planning and exercise to impact health in the future.	

Overall, participants somewhat agree the DSMES toolkit modules on *Nearpod* were effective learning method for planning diabetes self-care.

Summary

The purpose of this project was to develop and evaluate the effectiveness of a diabetes education self-management and support (DSMES) toolkit on an e-learning platform to improve their knowledge and health outcomes for young adults, between ages 18 to 39 living with prediabetes or T2DM. Results of the data analysis and comparison revealed the study did not have enough power to evaluate level of significance given the small sample size and time limitations. Although there was increase in mean between pretest and posttest for diabetes self-care knowledge, medication adherence, and readiness for lifestyle modifications. These findings support evidence that a larger sample size and data collection of height, weight, blood pressure, and A1C at initial visit and in six months would be recommended.

CHAPTER V

Discussion

The goal of this project was to develop and evaluate learning modules for a diabetes self-management education and support (DSMES) toolkit delivered on a secure e-learning platform over a period of three months between July 1 and September 20, 2021. The program was developed using current evidence-based practice resources that focused on glycemic management, healthy lifestyle behaviors, and medication adherence. The data collected indicates that young adults, between ages 18 and 39 living with prediabetes or T2DM would use and benefit from an accessible self-care approach using teaching strategies to managing their chronic illnesses.

Relationship of Outcomes to Research

Five research questions were examined in this project to examine the effect of the DSMES toolkit for young adults living with prediabetes or T2DM. The project analyzed pre-study and post-study A1C results using A1CNow test and the adapted LMC SCPI questions to compare pre-study and post-study self-care knowledge, medication adherence, and readiness for lifestyle change. The first question "before accessing DSMES toolkit modules, what was the participants' A1C?" The second question "will participants that complete the 12 weekly DSMES toolkit modules have a change in A1C?" These questions were answered by performing a fingerstick for an *A1CNow* rapid

test to assess the participants' A1C at the initial study visit and one week after completing the learning modules. The *A1CNow* equipment cost per test was $12.58 each, and the box contains 20 tests. The equipment is stored in a dedicated refrigerator for medications and laboratory equipment. At room temperature the kits are reliable when used within four months of opening the box. The fingerstick sample and *A1CNow* equipment requires specific steps to obtain an accurate and valid results. It is important that the equipment instructions are followed correctly. The fingerstick sample is obtained after the second drop of blood after wiping away the first drop to fill the sample collector correctly. *A1CNow* test measures the average blood glucose over the last 90-days, so expectation would be a minimal decrease in individual participant's A1C results for the three-month study. Recommendations is to obtain individual A1C results at initial visit and then at six months following completion of the DSMES modules. The *A1CNow* test appear to measure the average blood glucose over the last 90-days accurately when the test is performed correctly.

The third question "what was the effect of DSMES toolkit modules on diabetes self-care knowledge for young adults?" This question was answered by comparing pretest and posttest surveys evaluating questions one through 13. Participants were asked to rate self-care knowledge of diabetes on a seven-point Likert-type scale, "strongly disagree", "disagree", "somewhat disagree", "neither agree or disagree", "somewhat agree", "agree", or "strongly agree". Each category was coded using numerical data 1-7 starting at number one (strongly disagree) to number seven (strongly agree).

The summative mean of the data collected for perception of confidence in diabetes self-care knowledge revealed an increase in participant response by 1.6 points

and a standard deviation of 0.96. These findings indicate the participants perceived more understanding of diabetes self-care knowledge after completing the DSMES toolkit. The standard deviation was low indicating less variability.

The fourth question "will participants reports medication adherence as prescribed by a primary care provided for blood glucose control after completing the DSMES toolkit?" This question was answered by comparing pretest and posttest surveys evaluating questions 14 through 16. Participants were asked to rate taking medications practices and monitoring blood glucose while taking medications on a seven-point Likert-type scale, "strongly disagree", "disagree", "somewhat disagree", "neither agree or disagree", "somewhat agree", "agree", or "strongly agree". Each category was coded using numerical data 1-7 starting at number one (strongly disagree) to number seven (strongly agree).

One participant diagnosed with T2DM was taking oral and injectable long-acting medications. One participant diagnosed with prediabetes stopped oral medications during the study. One participant diagnosed with prediabetes was not offered any medication at time of diagnosis nor was diabetes self-care education provided. The summative mean of the data collected for perception of confidence in medication management revealed an increase in participant response by 1.1 points and a standard deviation of -6.8. These findings indicate the participants lacked practice medication adherence and blood glucose monitoring for necessary medications after completing the DSMES toolkit. The standard deviation was negative indicating no variability.

The fifth question "did participants report readiness for lifestyle changes after participating in the DSMES toolkit program?" This question was answered by comparing

pretest and posttest surveys evaluating questions 17 through 20. Participants were asked to rate readiness for lifestyle change on a seven-point Likert-type scale, “strongly disagree”, “disagree”, “somewhat disagree”, “neither agree or disagree”, “somewhat agree”, “agree”, or “strongly agree”. Each category was coded using numerical data 1-7 starting at number one (strongly disagree) to number seven (strongly agree).

The summative mean of the data collected for preparedness for behavior modifications revealed an increase in participant response by 1.3 points and a standard deviation of 1.80. These findings indicate the participants perceived preparedness for making behavior changes for self-care after completing the DSMES toolkit. The standard deviation was low indicating less variability.

The sixth question, “what was the young adult participants’ perceptions of the DSMES toolkit?” This question was answered by asking three program evaluation type questions often administered at completion of educational programs. Participants were asked to rate understanding of the DSMES toolkit content, ability to apply the learning modules to personal health and self-care, and whether the e-learning modules were an effective method for learning on a seven-point Likert-type scale, “strongly disagree”, “disagree”, “somewhat disagree”, “neither agree or disagree”, “somewhat agree”, “agree”, or “strongly agree”. Each category was coded using numerical data 1-7 starting at number one (strongly disagree) to number seven (strongly agree).

The mean of the data collected for program evaluation questions for the three program evaluation questions were (6.3, 6.3, and 6.0) respectively. Scores indicate the three participants rated somewhat agree as effective e-learning method for DSMES toolkit. Comments responses indicate all three participants plan to use the DSMES

information for self-care. One participant personally reported the investigator's audio recordings for the slides improved overtime. Themes for plans to change include setting dietary goals to limit simple sugars and carbohydrates, weight loss to sustain, stress management, establish physical and mental health routine, and use dietary plans and physical activity to impact health. Nurses and nurse practitioners should develop rapport with individuals and their families to design a health care plan that includes ongoing self-care education to overcome healthcare barriers with health promotion, and chronic illness management. health maintenance.

Observations

General observations noted during the project was young adults are at their busiest time of life so there were delays in completing the weekly modules. It was a challenge to identify young adults that met the inclusion criteria even though the flyers were placed on the registration desk June 7, 2021. One participant completed the initial visit and signed the consent form but did not access any modules DSMES toolkit on *Nearpod*. The three participants in the program would often go two or three weeks without completing a module. After six weeks into the study the remaining modules were opened with the close date as September 30, 2021 to allow time for participants to complete. The participant living with T2DM for eight years commented the education was a review of previous knowledge yet target A1C increased from 5.3% to 7.1% during the three month period. The participant reported poorly managing dietary intake during the three-month study.

There was a challenge of participants obtaining the next session code. The instruction form was updated with next session code and emailed to participants weekly

(Appendix G). The ten modules based on ADA clinical guidelines, CDC recommendations, medical-surgical textbook, and teaching booklets published by StayWell and Cornerstones4care were used to develop the voiceover slides. The goal was for each module to take 20 to 30 minutes to complete with two or three questions at the end of each module. The number of slides were 15 to 25 for the ten modules. The module with introduction and pretest questions was 41 slides, and the module with posttest and program evaluation questions was 32 slides. The program evaluation and participants feedback indicate the e-learning modules on *Nearpod* are an effective teaching strategy.

Evaluation of Theoretical Framework

The theoretical framework applied to this project was Orem's Self-Care Theory. This framework was applicable for diabetes self-management education to support self-reliance in young adults living with prediabetes and T2DM. The Self-Care Theory has three integrated premises within the framework. The first premise, self-care was the focus of this project when developing the DSMES toolkit on an e-learning platform. The assumption was young adults are in their busiest time of life and providing education about diabetes self-care should be easily accessible. The second premise, self-care deficits for this population was considered when establishing tools for effective diabetes management education. The third premise, nursing systems must use a holistic approach to assessment, diagnosis, plan, implement, and evaluate when designing a health care plan focused on the individual client (Current Nursing, 2012; Smith & Parker, 2015). The ADA (2021) recommends intensive intervention programs to modify lifestyle and behaviors for nutritional intake, physical activity, and weight loss. One participant reported the DSMES toolkit modules on *Nearpod* provided fairly comprehensive

information and easily understood.

Evaluation of Logic Model

The project results somewhat indicate the DSMES is beneficial for increasing diabetes self-care skills and readiness for lifestyle behavior change. The intent of the project was to evaluate the effectiveness of diabetes education toolkit and support on an e-learning platform for young adults living with T2DM to improve diabetes self-management. The assumption was health care staff would identify and refer young adults living with T2DM for additional diabetes education. There were referrals that met the inclusion criteria; however, the young adults were not interested in the program at this time. The assumption was diabetes self-care will be developed from ADA standards and would be accessible to young adults for three months.

The DSMES toolkit is available with twelve modules to provide educational concepts about types of diabetes, dietary intake goals, common antihyperglycemic medications, physical activity benefits, hyperglycemia and hypoglycemia management, healthy lifestyle benefits, negative social habits impact, positive health improvement impact, and outcomes of poor blood glucose control. The last assumption was young adults living with T2DM who complete DSMES toolkit modules have the ability to manage their chronic illness. In theory, the project demonstrates an expected relationship between the concepts of the logic module. Based on the program evaluation it was determined the DSMES toolkit has the potential of improving self-care knowledge, medications adherence, and readiness for healthy lifestyle modifications.

Limitations

There were several limitations for this DNP Scholarly Project. One limitation was

the small sample size and convenience sampling resulting in three participants. Another limitation of the study was the lack of ethnic diversity because all participants identified as race/ethnic group as white. The project plan was to identify potential participants at the project site using a retrospective EHR analysis of young adult patients diagnosed with prediabetes and T2DM within the last two years. The report revealed only six potential participants that met inclusion criteria. Another limitation was the study lacked clinic diversity as it was only performed using one clinic site and clinic staff employed at the clinic. This makes the study potentially lack generalizability since there was no additional clinics studied.

The method for distributing project flyers to announce the DSMES toolkit limited marketing for the program. Other approaches to notify healthcare providers will be considered for future dissemination. Finally, the time allotted for data collection would be considered a limiting factor. The *A1CNOW* measures the individual's average blood glucose over a 90-day period. The three participants completed the study between July 1 through September 30, 2021. Participants' A1C measurement at three months did not provide valuable data for this study.

Implications for Future Projects

The study approach to teaching strategies was online education, termed as spaced education (Kerfoot, al et., 2017). "The purpose of DSMES is to give people with diabetes the knowledge, skills, and confidence to accept responsibility for their self-management" (Powers et al., 2020, p. 1637). The program modules were developed from evidence-based practice guidelines and diabetes management booklets that the diabetes education team provides patient newly diagnosed with diabetes. The DSMES toolkit available on e-

learning platform provides a convenient, cost-effective way for all adults to access the learning modules from an electronic device such as computer, tablet, or smartphone.

Future project designs would be to offer the DSMES toolkit program to all adults that have an electronic device with internet access. Patients excluded would be non-English speaking, pregnant, mentally disabled, or younger than 18 years of age. To collaborate with a local diabetes educator team for vetting of each module for future use and provides an opportunity to market the product.

Findings indicate the small sample size and short time of three months reduces the power of the study. To improve the design for this project, the investigator would increase the interval between completion of DSMES toolkit and *A1CNow* test for data analysis at six months instead of three months. The participants would complete the adapted SPCI assessment survey at initial clinic visit, three months, and six months. This would help eliminate recall bias.

Implications for Practice, Health Policy, and Education

The results of this study indicate the DSMES toolkit is beneficial for individuals living with prediabetes and T2DM. Participant outcomes were positive with post-DSMES mean of (5.4) for confidence in diabetes self-care knowledge and (5.0) for readiness for lifestyle change. The participant comments were positive with plans for behavior change to include setting dietary goals to limit simple sugars and carbohydrates, weight loss to sustain, stress management, establish physical and mental health routine, and use dietary plans and physical activity to impact health. These results demonstrate that the DSMES toolkit is beneficial for improving confidence in self-management knowledge and preparedness for making healthy behavior modifications.

There are many well established methods for educating patients about self-management and measures for monitoring patient outcomes in clinical settings. The increasing number of young adults diagnosed with T2DM should prompt healthcare professionals to address the lack of ongoing diabetes education and support for adults in many communities. The traditional diabetes self-management forum at hospital bedside and then referral to group center may not be beneficial for long-term healthy behavior changes. This educational approach may lack adequate self-care education and ongoing support to reinforce lifestyle changes, medication adherence, and glycemic control. It essential that the DSMES toolkit programs meets the person's learning style for chronic illness management.

The recommendation is for health care stakeholders to respond with creative methods for cost-effective diabetes self-management education and support encompassing the social determinants of health (Powers et al., 2020). Nurses and nurse practitioners should develop rapport with individuals and their families to design an accessible, collaborative plan that overcomes healthcare barriers and includes health promotion, and health maintenance. There is the option of translating the DSMES toolkit for Spanish speaking communities. In addition, translating the toolkit for Swahili to provide diabetes self-care education during Kenyan medical missions. Program implementation of the DSMES toolkit on *Nearpod*, a secure e-learning platform would provide accessible evidence-based practice education to significantly impact health behaviors in adults in all communities.

Conclusion

The aim of this DNP scholarly project was to design, develop, and evaluate the

effectiveness of a toolkit on an e-learning platform to increase diabetes self-care knowledge, medication adherence, and support readiness for healthy behavior change to health outcomes for young adults, between ages 18 to 39 living with prediabetes or T2DM. The *Consensus Report* published by the American Diabetes Association made "a call to action for all health care systems and organizations is to engage needed resources and to effectively and efficiently manage and address this expensive epidemic affecting health outcomes" (Powers et al., 2020, p. 1637). This call to action in 2020 is supported by major health care organizations to reduce health care costs and improve health outcomes for individuals living with diabetes. There is a lack for ongoing evidence-based diabetes self-care education on secured e-learning platform.

The outcome of the study enhances the awareness for the necessity of evidence-based education that focuses on diabetes self-care knowledge, medications adherence, and preparedness for healthy lifestyle modifications. Accreditation of DSMES programs can help achieve the *Healthy People 2030* goal for increasing the number of people with diabetes who access education (ODPHP, 2020). Further studies with adults of all ages would need to be performed and data analysis completed before considering the accreditation and recognition process for DSMES toolkits program.

References

American Diabetes Association. (2021). Standards of medical care in diabetes—2021. *Diabetes Care, 44*(Suppl. 1), S1-S232.

Amidor, T. (2020). *The create-your-plate diabetes cookbook: A plate method approach to simple, complete meals*. American Diabetes Association.

Aronson, R., Brown, R. E., Jiandani, D., Walker, A., Orzech, N, & Mbuagbaw, L. (2018). Assessment of self-management in patients with diabetes using the novel LMC skills, confidence, and preparedness index (SCPI). *Diabetes Research and Clinical Practice, 137*, 128-136. https://doi.org/10.1016/j.diabres.2017.10.028

Arslanian, S., Bacha, F., Grey, M., Marcus, M. D., White, N. H., & Zeitler, P. (2018). Evaluation and management of youth-onset type 2 diabetes: A position statement by the American Diabetes Association. *Diabetes Care, 41*, 2648-2668. https://doi.org/10.2337/dci18-0052

Celeste-Harris, S., & Maryniuk, M. (2006). Educating medical office staff: Enhancing diabetes care in primary care offices. *Diabetes Spectrum, 19*(2), 84-89. https://spectrum.diabetesjournals.org/content/diaspect/19/2/84.full.pdf

Centers for Disease Control and Prevention. (2018). *Diabetes self-management education and support DSMES) toolkit. https://www.cdc.gov/diabetes/dsmes-toolkit/background/terminology.html*

Centers for Disease Control and Prevention. (2019). *Type 2 diabetes*. https://www.cdc.gov/diabetes/basics/type2.html

Centers for Disease Control and Prevention. (2020). *National diabetes statistics report-2020*. U.S. Department of Health and Human Services. https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf

Centers for Medicare and Medicaid Services. (n.d.). *How to obtain a CLIA certificate of waiver*. U.S. Department of Health and Human Services. Retrieved March 31, 2021 from https://www.cms.gov/regulations-and-guidance/legislation/clia/downloads/howobtaincertificateofwaiver.pdf

ClinCalc. (n.d.). Sample size calculator. Retrieve November 11, 2021, from https://clincalc.com/stats/samplesize.aspx

Cooper, H., Lancaster, G. A., Gichuru, P., & Peak, M. (2018). A mixed methods study to evaluate the feasibility of using adolescent diabetes needs assessment tool app in paediatric diabetes care in preparation for longitudinal cohort study. *Pilot and Feasibility Studies, 4*(13), 1-17. DOI 10.1186/s40814-017-0164-5

Copeland, K. C., Silverstein, J., Moore, K. R., Prazar, G. E., Raymer, T., Shiffman, R. N., Springer, S. C., Thaker, V. V., Anderson, M., Spann, S. J., & Flinn, S. K. (2013). Management of newly diagnosed type 2 diabetes mellitus (T2DM) in children and adolescents. *Pediatrics, 131*(2), 364-382. doi:10.1542/peds.2012-3494.

Cornerstones4care. (2015). *Meal planning and carb counting: Your guide to eating healthy with diabetes*. Novo Nordisk.

Current Nursing. (2012, February 4). *Dorothea Orem's self-care theory*. http://currentnursing.com/nursing_theory/self_care_deficit_theory.html

Eva, J. J., Kassab, Y. W., Neoh, C. F., Ming, L, C., Wong, Y. Y., Hameed, M. A., Hong, Y. H. & Sarker, M. R. (2018). Self-care and self-management among adolescent T2DM patients: A review. *Frontiers in Endocrinology, 9*(489), 1-7. doi: 10.3389/fendo.2018.00489

Food and Agriculture Organization. (2011). *E-learning methodologies: A guide for designing and developing e-learning courses.* http://www.fao.org/3/i2516e/i2516e.pdf

Gabarron, E., Dorronzoro, E., Bradway, M., Rivera-Romero, O., Wynn, R., & Arsand, E. (2018). Preferences and interest of diabetes social media users regarding a health-promotion intervention. *Patient Preference and Adherence, 12,* 2499-2506. doi: 10.2147/PPA.S184369

Garber, A. J., Abrahamson, M. J., Barzilay, J. I., Blonde, L., Bloomgarden, Z. T., Bush, M. A., Dagogo-Jack, S., DeFranzo, R. A., Einhorn, D., Fonseca, V. A., Garber, J. R., Garvey, W. T., Grunberger, G., Handelsman, Y., Hirsch, I. B., Jellinger, P. S., McGill, J. B., Mechanick, J. I., Rosenblit, P. D., & Umpierrez, G. E. (2019). Consensus statement by the American Association of Clinical Endocrinologist and American College of Endocrinology on the comprehensive type 2 diabetes management algorithm: 2019 executive summary. *Endocrine Practice, 25*(2), 69-100. https://doi.org/10.4158/CS-2018-0535

Hartzler, M. L., Shenk, M., Williams, J., Schoen, J., Dunn, T., & Anderson, D. (2018). Impact of collaborative shared medical appointments on diabetes outcomes in a family medicine clinic. *The Diabetes Educator, 44*(4), 361-372. doi: 10.1177/0145721718776597

Hoffman, J. J., & Sullivan, N. J. (2020). *Davis advantage for medical-surgical nursing: Making connections to practice* (2nd ed.). F.A. Davis.

Kansas Department of Health and Environment. (2016, May). *Kansas diabetes and prediabetes facts*. https://www.kdheks.gov/diabetes/download/Kansas_Diabetes_Facts.pdf

Kansas Health Matters. (2019). *Percent of adults with diagnosed diabetes. County: Shawnee*. https://www.kansashealthmatters.org/indicators/index/view?indicatorId=2270&localeId=1028

Keating, S. B., & DeBoor, S. S. (2018). *Curriculum development and evaluation in nursing education* (4th ed.). Springer Publishing Company, LLC.

Kerfoot, B. P., Gagnon, D. R., McMahon, G. T., Orlander, J. D., Kurgansky, K. E. & Conlin, P. R. (2017). A team-based online game improves blood glucose control in veterans with type 2 diabetes: A randomized controlled trial. *Diabetes Care, 40*(9), 1218-1225. doi: 10.2337/dc17-0310

Millsap, R. E., & Maydeu-Olivares, A. (Ed.). (2009). *The SAGE handbook of quantitative methods in psychology*. SAGE Publications Ltd.

National Center for Health Statistics (2021). *Death and mortality*. Centers for Disease Control and Prevention. https://www.cdc.gov/nchs/fastats/deaths.htm

Office of Disease Prevention and Health Promotion. (2020). *Healthy People 2030: Diabetes*. https://health.gov/healthypeople/objectives-and-data/browse-objectives/diabetes

Pasquel, F. J., & Umpierrez, G. E. (2014). Hyperosmolar hyperglycemic state: A historic review of the clinical presentation, diagnosis, and treatment. *Diabetes Care, 37*, 3124-3131. DOI: 10.2337/dc14-0984

Powers, M. A., Bardsley, J. K., Cypress, M., Funnell, M. M., Harms, D., Hess-Fischl, A., Hooks, B., Isaacs, D., Mandel, E. D., Maryniuk, M. D., Norton A., Rinker, J., Siminerio, L. M., & Uelmen, S. (2020). Diabetes self-management education and support in adults with type 2 diabetes: A consensus report of the American Diabetes Association, the Association of Diabetes Care & Education Specialists, the Academy of Nutrition and Dietetics, the American Academy of Family Physicians, the American Academy of PAs, the American Association of Nurse Practitioners, and the American Pharmacists Association. *Diabetes Care, 43*(7), 1636-1649. doi.org/10.2337/dci20-0023

PTS Diagnostics. (2021). *A1CNOW®+ lab quality results at the point of care.* https://ptsdiagnostics.com/a1cnow-plus-system/

Public Health. (n.d.). *Health guides: Young adults 18 to 39*. Retrieved March 31, 2021 from https://www.publichealth.org/public-awareness/preventive-care-schedule/young-adults/

Rhodes, E. T., Prosser, L. A., Hoerger, T. J., Lieu, T., Ludwig, D. S., & Laffel, L. M. (2012). Estimated morbidity and mortality in adolescent and young adults diagnosed with type 2 diabetes mellitus. *Diabetic Medicine, 29*(4), 453-463. doi: 10.1111/j.1464-5491.2011.03542.x.

Shatto, B., & Erwin, K. (2017). Teaching millennials and generation Z: Bridging the generational divide. *Creative Nursing, 23*(1), 24-28.

Smith, M. C., & Parker, M. E. (2015). *Nursing theories and nursing practice* (4th ed.). F. A. Davis Company.

StayWell (2015). *Living well with diabetes: A self-care workbook*. Merck. http://mydiabetescenter.org/documents/living-well-with-diabetes.pdf

United States Census Bureau. (2019). *Quickfacts: Shawnee county, Kansas*. https://www.census.gov/quickfacts/fact/table/topekacitykansas,shawneecountykansas/PST045219

World Health Organization. (2021). *Sexual and reproductive health: What do we mean by self-care?* https://www.who.int/reproductivehealth/self-care-interventions/definitions/en/

APPENDIX

Appendix A

Patient Information Flyer

Are you interested in a diabetes self-care education program on your computer or smartphone?
If you are over 18 years old, this program may be for you.

Education for young adults living with prediabetes or type 2 diabetes

We are looking for adults between 18 and 39 years who are diagnosed with prediabetes or type 2 diabetes to complete and evaluate a diabetes self-management education and support (DSMES) toolkit that you access on a computer or smartphone.

Many young adults diagnosed with prediabetes or type 2 diabetes may not receive ongoing education to manage their chronic illness.

Participants will be asked to participate in:

- 2 separate walk-in clinic visits for screenings
- Weekly DSMES learning module.
- 20-30 minutes for each module.
- 12 DSMES modules

Participants will receive:

- Blood pressure, BMI, and A1C screenings.
- Diabetes self-care education on a secure e-learning platform.
- Education based on best practice guidelines.

Location

- Walk-in clinic visits will be at **Sunflower Primary Care, 3405 NW Hunters Ridge Terrace, Topeka, KS .**
- DSMES modules will be completed using secure session codes on the Nearpod app or https://nearpod.com/student/

Are you eligible?

- Between 18 and 39 years old.
- Current diagnosis of prediabetes or type 2 diabetes.
- Not currently pregnant.

Study Close Date

- September 30, 2021

If you are unsure if you meet the requirements, call , email or visit the clinic on Fridays from 8 am to 6 pm.

- Investigator: Marlene Eicher, APRN-BC
- Office: 785-246-3733
- Email: lessonswithmarlene@gmail.com

IRB: AS21-047-2 | Date approved: 05/07/21
- Pittsburg State University, Pittsburg, KS
- Committee Chair: Dr. Ashleigh Heter
- Executive Director of Academic Affairs Support: Cynthia Johnson

Appendix B

CONSENT FORM

INVESTIGATOR NAME: Marlene Eicher, APRN-BC

STUDY TITLE: Program Development and Evaluation of a Diabetes Self-Management Education and Support Toolkit on an E-Learning Platform for Young Adults Living with Type 2 Diabetes.

PURPOSE OF THE STUDY: The purpose of this project is to develop and evaluate the effectiveness of a diabetes education self-management and support (DSMES) toolkit on e-learning platform to improve their knowledge and health outcomes.

I am being asked to participant in the study because I am a young adult between 18 to 39 and currently diagnosed with prediabetes or type 2 diabetes.

DESCRIPTION OF THE STUDY: As a participant in the study, I will have an initial walk-in clinic visit with the clinic staff to obtain blood pressure, height, weight, and a fingerstick for *A1CNow* diagnostic test. This procedure is similar to blood glucose test and will provide my average blood glucose management results for the last 90 days.

I will create a unique username with a combination of ten numbers and letters that I will use to access the twelve DSMES toolkit modules on *Nearpod* with either my computer or smartphone to complete the survey questions and diabetes learning modules with questions. Each module will take between 20 to 30 minutes, and I will complete the study learning modules as scheduled through September 30, 2021.

After I complete the modules, I will have a walk-in clinic visit with clinic staff to obtain blood pressure, height, weight, and a fingerstick for *A1CNow* diagnostic test by October 15th. There will be no cost to me related to study participation.

RISK AND DISCOMFORTS: As a participant in this study, there is a risk of loss of privacy. Your survey answers will be stored on a *Nearpod* a secure education system with your chosen unique username. Your username will be used to collect your blood pressure, height, weight, and A1C results. The clinic staff and investigator will provide a supportive learning environment at each visit to reduce discomfort, stress, and embarrassment.

BENEFITS: I will gain knowledge about diabetes self-care to include A1C results, healthy eating, blood sugar management, exercise, taking medications, and reduce diabetes related complication.

ALTERNATIVE PROCEDURES: The alternative would be to not participate.

CONFEDENTIALITY: All documents and information pertaining to this research study will be kept confidential in accordance with all applicable federal, state, and local laws and regulations. I understand that data generated by the study may be reviewed by

Pittsburg State University's Institutional Review Board, which is the committee responsible for ensuring my welfare and rights as a research participant, to assure proper conduct of the study and compliance with university regulations. If any presentations or publication result from this research, I will not be identified by name.

Data will be stored in a locked drawer in the clinic, as well as a secured file on the investigator's computer for three years. My privacy and confidentiality will be protected by password protection and not using any names.

My confidentiality will be also protected by having no study participants identified by name. This is an anonymous survey; research records cannot be destroyed following submission of the survey.

TERMINIATION OF PARTICIPATION: I may choose to withdraw from this study at any time and for any reason. If I choose to drop out of the study, I will close my internet browser. I cannot withdraw from the study once the survey has been submitted.

COMPENSATION: I will not receive payment for being in this study. Participation in this study is strictly voluntary. There will be no cost to me for participating in this research.

INJURY COMPENSATON: Neither Pittsburg State University nor any government or other agency funding this research project will provide special services, free care, or compensation for any injuries resulting from this research. I understand that treatment for such injuries will be at my expense and/or paid through my medical plan.

QUESTIONS: All my questions have been answered to my satisfaction and if I have further questions about this study, I may contact Marlene Eicher, APRN-BC on Fridays at Sunflower Primary Care/Sunflower Prompt Care, 785-246-3733, or email lessonswithmarlene@gmail.com

Dr. Ashleigh Heter, Committee Chair, Assistant Professor of Irene Ransom Bradley School of Nursing, McPherson Hall 116, 620-235-4439, aheter@pittstate.edu

Cynthia Johnson, Executive Director of Academic Affairs Support, Russ Hall 213, 620-235-4175, cynthia.johnson@pittstate.edu

VOLUNATARY PARTICIPATION: I understand that my decision to participate in this project is entirely voluntary. If I decide not to participate in this project, it will not affect the care, services, or benefits to which I are entitled.

If I decide to participate in this study, I may withdraw from participating any time without penalty or consequence.

By signing and selecting a unique username, I voluntarily give my consent to participate in this scholarly project.

_____ _____

Participants signature Username

Appendix C

Pretest Instruments

DIABETES MODULE SURVEY QUESTIONS

For the following items, please select the answer that best applies to you.

Pretest Part A - Demographics

1. Age (Check one)
   a. 18-22
   b. 23-28
   c. 29-34
   d. 35-39

2. Sex at birth (Check one)
   a. Male
   b. Female
   c. Intersex
   d. Prefer not to answer

3. Gender Identity (Check one)
   a. Male
   b. Female
   c. Lesbian
   d. Gay
   e. Bisexual
   f. Transgender
   g. Queer/Questioning
   h. Prefer not to answer

4. Which of the following best describes your race/ethnic group? (Choose all that Apply)
   a. White (Non-Hispanic white)
   b. Hispanic, Latino, or Spanish origin
   c. American Indian or Alaska Native
   d. Asian
   e. Black or African American
   f. Native Hawaiian or Other Pacific Islander
   g. Prefer not to answer

5. What is the highest grade you completed in school? (Check one)
   a. Grade school (K-8th grade)
   b. High school (9-12th grade)
   c. College
   d. Postgraduate

6. Are you currently employed? (Check one)
   a. Yes
   b. No
   c. Retired
   d. Disabled

7. Do you know what type of Diabetes you have? (Check one)
    a. Prediabetes
    b. Type 1
    c. Type 2
    d. Unknown

8. During the past year, have you participated in a diabetes education program about diabetes? (Check one)
    a. Yes
    b. No
    c. Unsure

9. At what age were you diagnosed with prediabetes or type 2 diabetes? ___(Enter age if known)

10. What types of medications are you taking for diabetes? (Check all that apply)
    a. Short-acting Insulin
    b. Long-acting insulin
    c. Oral pills
    d. Weekly noninsulin injection
    e. No medications

11. Are you taking medications for any other health problems? (Check all that apply)
    a. High blood pressure
    b. High cholesterol
    c. Hypothyroidism

Pretest Part B - Adapted from LMC Skills, Confidence and Preparedness Index (SCPI)

1. I am able to portion out and choose foods that have the best balance between carbohydrates, proteins, and vegetable to help keep my blood sugars within goal.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

2. I know how my diabetes insulin or medication works in my body and at which time of day I should check my blood sugars to make sure my dose is correct.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

3. I feel confident that I can plan balanced meals and snacks effectively to keep my fasting blood glucose between 80 to 130 mg/dL.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

4. If I miss a dose of my insulin or medication, I know how my body will react and the steps to take to get back on track.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

5. When I am planning to exercise, I know what changes I need to make to avoid a low blood sugar before, during, and after exercise.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

6. I am confident that I can implement stress management techniques into my lifestyle.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

7. I know when to check my blood sugar if I want to see how my body reacted to a meal.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

8. I intend to start planning and eating balanced meals and snacks starting next week.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

9. I know how to identify stress in my life and how it can impact my diabetes management and overall health.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

10. When I look at my blood sugars in my meter or in my logbook in a given week, I could explain to my doctor what my blood sugar pattern is.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

11. I plan to choose an activity and begin incorporating it into my schedule in the coming week.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

12. I am confident that the next time I am eating out of my home, I will be able to plan and select foods that best keep my blood sugars under control.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

13. I plan to start using my blood sugar levels to make changes to my diet and/or insulin starting next week.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

14. I am confident that I can choose a healthy activity for me and include it into my schedule.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

15. I plan to start making a list of stress management techniques that will work for me in the upcoming week.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

16. I am confident that I can commit to preventing and monitoring my diabetes complications such as see my eye doctor at least once a year and checking my feet on a daily basis.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

17. I am confident that I will use my blood sugar results to make changes to my diet and/or insulin to keep my blood sugars in goal.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

18. I know what the ABCs (A1C, Blood Pressure, and Cholesterol) of Diabetes are, what my goals are and how they impact my diabetes.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

19. The next time I am sick, I will make necessary changes to my medications, insulin and/or eating depending on my blood sugars.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

20. With my next exercise, I am going to make a plan to reduce the change of low blood sugar or reaction with a good response if I do have a low blood sugar.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

Appendix D

Posttest Instruments

DIABETES MODULE SURVEY QUESTIONS

For the following items, please select the answer that best applies to you.

Posttest Part C – Adapted from LMC Skills, Confidence and Preparedness Index (SCPI)

1. I am able to portion out and choose foods that have the best balance between carbohydrates, proteins, and vegetable to help keep my blood sugars within goal.
   a. Strongly disagree
   b. Disagree
   c. Somewhat disagree
   d. Neither agree or disagree
   e. Somewhat agree
   f. Agree
   g. Strongly agree

2. I know how my diabetes insulin or medication works in my body and at which time of day I should check my blood sugars to make sure my dose is correct.
   a. Strongly disagree
   b. Disagree
   c. Somewhat disagree
   d. Neither agree or disagree
   e. Somewhat agree
   f. Agree
   g. Strongly agree

3. I feel confident that I can plan balanced meals and snacks effectively to keep my fasting blood glucose between 80 to 130 mg/dL.
   a. Strongly disagree
   b. Disagree
   c. Somewhat disagree
   d. Neither agree or disagree
   e. Somewhat agree
   f. Agree
   g. Strongly agree

4. If I miss a dose of my insulin or medication, I know how my body will react and the steps to take to get back on track.
   a. Strongly disagree
   b. Disagree
   c. Somewhat disagree
   d. Neither agree or disagree
   e. Somewhat agree
   f. Agree
   g. Strongly agree

5. When I am planning to exercise, I know what changes I need to make to avoid a low blood sugar before, during, and after exercise.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

6. I am confident that I can implement stress management techniques into my lifestyle.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

7. I know when to check my blood sugar if I want to see how my body reacted to a meal.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

8. I intend to start planning and eating balanced meals and snacks starting next week.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

9. I know how to identify stress in my life and how it can impact my diabetes management and overall health.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

10. When I look at my blood sugars in my meter or in my logbook in a given week, I could explain to my doctor what my blood sugar pattern is.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

11. I plan to choose an activity and begin incorporating it into my schedule in the coming week.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

12. I am confident that the next time I am eating out of my home, I will be able to plan and select foods that best keep my blood sugars under control.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

13. I plan to start using my blood sugar levels to make changes to my diet and/or insulin starting next week.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

14. I am confident that I can choose a healthy activity for me and include it into my schedule.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

15. I plan to start making a list of stress management techniques that will work for me in the upcoming week.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

16. I am confident that I can commit to preventing and monitoring my diabetes complications such as see my eye doctor at least once a year and checking my feet on a daily basis.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

17. I am confident that I will use my blood sugar results to make changes to my diet and/or insulin to keep my blood sugars in goal.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

18. I know what the ABCs (A1C, Blood Pressure, and Cholesterol) of Diabetes are, what my goals are and how they impact my diabetes.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

19. The next time I am sick, I will make necessary changes to my medications, insulin and/or eating depending on my blood sugars.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

20. With my next exercise, I am going to make a plan to reduce the change of low blood sugar or reaction with a good response if I do have a low blood sugar.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat agree
    f. Agree
    g. Strongly agree

Posttest Part D - Program Evaluation Instrument

For the following items, please select the answer that best describes your evaluation of the e-learning DSMES toolkit modules for this project.

1. I understood the content of the modules.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat Agree
    f. Agree
    g. Strongly agree

2. I could apply the modules to my personal health and self-care.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat Agree
    f. Agree
    g. Strongly agree

3. The e-learning modules were an effective method of learning for me.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neither agree or disagree
    e. Somewhat Agree
    f. Agree
    g. Strongly agree

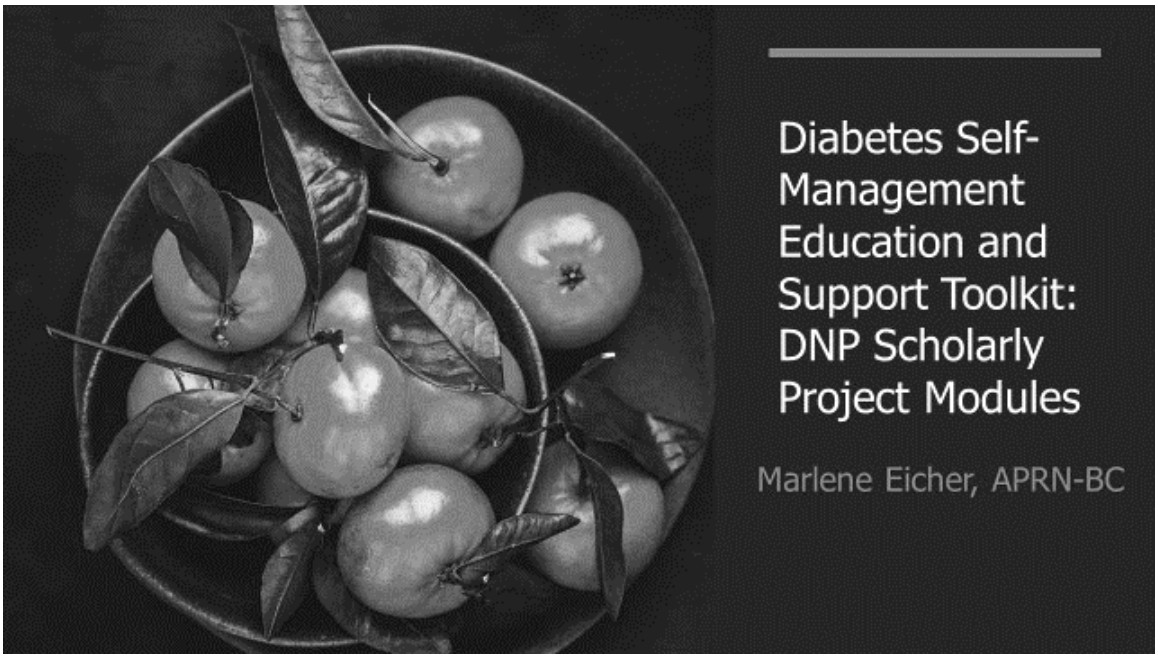
4. Explain in one paragraph how you plan to apply the DSMES toolkit modules for diabetes self-management.

5. Explain in one paragraph what additional information you would like to know about diabetes self-management.

Appendix E

DSMES E-Learning Toolkit PowerPoint Slides

Introduction slide - Welcome to the diabetes self-management education and support toolkit for my Doctor of Nursing Practice (DNP) Scholarly Project. There are twelve modules in the toolkit and each module will take between 20-30 minutes to complete. You will complete one module weekly over the next 12 weeks. I choose to focus this project on young adults between 18 and 39 years old, since young adults are in their busiest time of life with college, working, and family. The DSMES toolkit provides education to help you remember key information about diabetes self-care, because this complex disease can be challenging to manage.



Module 1 Outcomes – Introduction and pretest survey.

The participant will:

1. Learn about the DSMES toolkit.
2. Read the informed consent and digitally sign.
3. Complete the Pretest survey with 11 demographic questions and 20 questions about your personal diabetes self-care.

Module 2 Outcomes – Types of DM.

The participant will:

1. Understand the causes and differences between type 1, type 2, and prediabetes.

Module 3 Outcomes – Create-your-plate.

The participant will:

1. Understand the best foods to eat and drink.
2. Understand dietary intake that improves blood glucose control.
3. Understand dietary intake that effects blood glucose goals.

Module 4 Outcomes – Blood sugar lower medications.

The participant will:

1. Understand how common medications work to control blood glucose in the body.

Module 5 Outcomes – Benefits of physical activity.

The participant will:

1. Remember recommendations for physical activity.
2. Understand how physical activity improves blood glucose control.

Module 6 Outcomes – What blood glucose labs mean?

The participant will:

1. Understand what fingerstick blood glucose means?
2. Apply hemoglobin A1C to blood glucose control.
3. Recognize different types of tests to diagnose diabetes.

Module 7 Outcomes – When your blood glucose is too high or too low!

The participant will:

1. Understand treatments for low blood glucose.
2. Understand treatments for high blood glucose.

Module 8 Outcomes – Healthy lifestyle: Health care team.

The participant will:

1. Understand when to schedule doctor appointments.
2. Remember the names of common tests the doctor does in the office or orders for a lab draw.
3. Identify health care team members to support diabetes self-care.

Module 9 Outcomes – Lifestyle that has negative impact on health!

The participant will:

1. Identify how alcohol effects the body.
2. Understand how nicotine effects the body.
3. Understand how substance abuse has a negative impact on health.

Module 10 Outcomes – Healthy lifestyle: Improves health!

The participant will:

1. Understand healthy ways to relax and enjoy life.
2. Identify the benefits of healthy lifestyle choices.
3. Understand normal blood pressure for young adults living with diabetes.

Module 11 Outcomes – How does poor blood glucose control effect blood vessels?

The participant will:

1. Understand the effect of high blood glucose on eyes, kidneys, feet, heart, nervous system, emotional health, memory, and sexual function

Module 12 Outcomes – Wrap up: Posttest survey and DSMES toolkit evaluation.

The participant will:

1. Complete the posttest survey with 20 questions about diabetes self-care.
2. Complete an evaluation about the DSMES toolkit modules.

Appendix F

Data Collection Form

Patient Name: _____ Birthdate: _____

Username: _____
(Create username that is a combination of letters and numbers, at least 10 digits)

Diagnosis: ☐ Prediabetes ☐ Type 2 Diabetes

Medications used to treat: (include medication names)

☐ Oral_____ ☐ Insulin_____

Last clinic visit: _____

Initial Visit: Demographics/Vital Signs/*A1CNow Results*				
Date:	**Age:**	**Ht:** **Wt:**	**BP:** **P:**	***A1CNow:***
Follow-up Visit: Demographics/Vital Signs/*A1CNow Results*				
Date:	**Age:**	**Ht:** **Wt:**	**BP:** **P:**	***A1CNow:***

☐ Consent form reviewed and signed – Yes No

Clinic staff: Photocopy the data collection form and place the copy and signed consent form in the secured folder. The participant will receive the original data collection form along with a blank copy of the consent form. Staple the participant's data collection together with the signed consent form and place in the secured folder.

Data collection forms will be stored in a locked drawer at the clinic, as well as the data collected in a secured file on the investigator's computer for three years. The participant's privacy and confidentiality will be protected by password protection and not using any names for data analysis.

Contact Information

Investigator: Marlene Eicher, APRN-BC, **Email:** lessonswithmarlene@gmail.com

Clinic Site: Sunflower Primary Care, **Phone:** 785-246-3733

Appendix G

Participant Instructions

Module	Session Close Date	Session Code
Module 1: Introduction – Pretest Questions	July 19, 2021	5ACBT
Module 2: Types of diabetes	July 26, 2021	KYHCU
Module 3: The best foods to eat and drink.	August 9, 2021	R7J3B
Module 4: Taking blood glucose lower medications	August 16, 2021	LEPV3
Module 5: Benefits of physical activity	August 23, 2021	FCJXB
Module 6: What blood glucose labs mean	August 30, 2021	LEPV3
Module 7: When you blood glucose is too high or too low!	September 6, 2021	AFT8Q
Module 8: Healthy lifestyle – Health care team	September 13, 2021	EXABG
Module 9: Lifestyle that has negative impact on health!	September 20, 2021	ZFE2H
Module 10: Healthy lifestyle – Improves health!	September 27, 2021	6UY9W
Module 11: How poor blood glucose control effects blood vessels.	September 30 2021	U683V
Module 12: Wrap-up – Posttest Questions & DSMES Program Evaluation	September 30 2021	SVA8M

Instructions

You will complete the modules following the schedule on the table. To ensure confidentiality, **only enter** your unique 10-digit username on *Nearpod*. Each module will take 20-30 minutes on your computer or smartphone. It is best to complete each module in one continuous 20 to 30-minute session. Each ***Session Code*** is active until the close date.

Website and Smartphone Information

Website: https://nearpod.com/student/
Google Play or Apple Store App: *Nearpod*

- Enter unique **Session Code** to complete each DSMES Toolkit weekly module, and then enter your chosen unique 10-digit username.

Contact Information

Investigator: Marlene Eicher, APRN-BC, **Email**: lessonswithmarlene@gmail.com
Clinic Site: Sunflower Primary Care, **Phone**: 785-246-3733

Appendix H

Pretest/Posttest Survey Questions for Data Analysis

	Pretest/ Posttest	Adapted from LMC Skills, Confidence & Preparedness Index (SCPI) Tool
1.	B1/C1	I am able to portion out and choose foods that have the best balance between carbohydrates, proteins, and vegetable to help keep my blood sugars within goal.
2.	B3/C3	I feel confident that I can plan balanced meals and snacks effectively to keep my fasting blood glucose between 80 to 130 mg/dL.
3.	B5/C5	When I am planning to exercise, I know what changes I need to make to avoid a low blood sugar before, during, and after exercise
4.	B6/C6	I am confident that I can implement stress management techniques into my lifestyle.
5.	B7/C7	I know when to check my blood sugar if I want to see how my body reacted to a meal.
6.	B9/C9	I know how to identify stress in my life and how it can impact my diabetes management and overall health.
7.	B10/C10	When I look at my blood sugars in my meter or in my logbook in a given week, I could explain to my doctor what my blood sugar pattern is
8.	B12/C12	I am confident that the next time I am eating out of my home, I will be able to plan and select foods that best keep my blood sugars under control.
9.	B14/C14	I am confident that I can choose a healthy activity for me and include it into my schedule.
10.	B16/C16	I am confident that I can commit to preventing and monitoring my diabetes complications such as see my eye doctor at least once a year and checking my feet on a daily basis.
11.	B17/C17	I am confident that I will use my blood sugar results to make changes to my diet and/or insulin to keep my blood sugars in goal.
12.	B18/C18	I know what the ABCs (A1C, Blood Pressure, and Cholesterol) of Diabetes are, what my goals are and how they impact my diabetes.
13.	B20/C20	With my next exercise, I am going to make a plan to reduce the change of low blood sugar or reaction with a good response if I do have a low blood sugar.
14.	B2/C2	I know how my diabetes insulin or medication works in my body and at which time of day I should check my blood sugars to make sure my dose is correct.
15.	B4/C4	If I miss a dose of my insulin or medication, I know how my body will react and the steps to take to get back on track.
16.	B19/C19	The next time I am sick, I will make necessary changes to my medications, insulin and/or eating depending on my blood sugars.
17.	B8/C8	I intend to start planning and eating balanced meals and snacks starting next week.
18.	B11/C11	I plan to choose an activity and begin incorporating it into my schedule in the coming week.
19.	B13/C13	I plan to start using my blood sugar levels to make changes to my diet and/or insulin starting next week.
20.	B15/C15	I plan to start making a list of stress management techniques that will work for me in the upcoming week.

Note. Seven-point Likert scale: Strongly disagree, disagree, somewhat disagree, neither agree or disagree, somewhat agree, agree, or strongly agree.