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Efficacy of Diabetes Self-Management Education Administered via Telehealth for Adults with Uncontrolled Diabetes

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EFFICACY OF DIABETES SELF-MANAGEMENT EDUCATION ADMINISTERED VIA TELEHEALTH FOR ADULTS WITH UNCONTROLLED DIABETES

by

TANNER FREE

EVIDENCE-BASED PRACTICE PROJECT REPORT

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DEDICATION

This project is dedicated to my grandparents; Doctor Helen and Alfred Free who developed the first home test of glucose in urine. This advancement lead to diabetic patients being able to monitor their glucose level from home. In addition, I would like to dedicate this project to Sheila, a former nurse practitioner at the project site that died because of Covid-19 during the intervention.

ACKNOWLEDGMENTS

I would like to thank Dr. Theresa Kessler Ph.D. RN, ACNS – BC, CNE for her continuous support and encouragement throughout the entire EBP project process.

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ABSTRACT

Patient's with a diagnosis of diabetes require significant lifestyle modification and education. The need for patient education has led to the development of diabetes self-management education (DSME) classes. Unfortunately, utilization of DSME classes is only 5% among Medicare beneficiaries and 6.8% among privately insured patients (Centers for Disease Control [CDC], 2018). The purpose of this evidence-based practice (EBP) project was to implement DSME via telehealth and assist with goal formation to help patients with uncontrolled diabetes achieve glycemic control by increasing access to crucial education. The intervention consisted of bi-weekly calls for a period of 3 months. Participant data were collected, and the diabetes self-management questionnaire (DSMQ) was administered. During these calls, participants were reminded of and encouraged to follow patient education points from their last office visit. In addition, the DSMQ results helped create individualized education and goal setting based on the area of greatest deficiencies. Subsequent calls assessed goal progress, provided additional education, and helped set new goals based on progression towards achievement. The primary outcome of interest for this study was glycated hemoglobin (HbA1c), this was collected pre-intervention and compared to post-intervention results. Secondary outcomes included DSMQ, blood pressure, LDL cholesterol, activity in minutes, and BMI. This sample contained 24 adult patients that had either type I ($n = 2$) or type II diabetes ($n = 22$). Statistical analysis was conducted utilizing a paired *t* test. A significant decrease from pre-intervention HbA1c to post-intervention was found ($M = 1.51176$), ($t(17) = 3.043$, $p < .008$), demonstrating the average participant experienced a 1.5% reduction in post-intervention HbA1c levels. Conclusions from this project supported previous studies indicating that DSME administered via telehealth resulted in statistically significant reductions in HbA1c.

CHAPTER 1

INTRODUCTION

Background

Diabetes Mellitus is a chronic disease that is characterized by elevated levels of blood glucose. Normally, the body secretes insulin from the pancreas in response to elevated levels of blood glucose. In patients with diabetes, the pancreas is unable to secrete enough insulin to keep up with demand. There are three types of diabetes: type I diabetes, type II diabetes, and gestational diabetes (Inzucchi & Lupsa, 2019). According to Inzucchi and Lupsa, type II diabetes is the most prevalent type of diabetes, accounting for over 90% of diabetes in adults. The various classifications of diabetes have a different pathophysiology resulting in hyperglycemia. The pathophysiology leading to hyperglycemia in type I diabetes is the destruction of beta cells that are found in the pancreas. These cells are responsible for the secretion of insulin (Inzucchi & Lupsa). The destruction of these cells prevents the body from secreting insulin, and this results in the patient being completely dependent on insulin from an external source. This physiological process is also why this type of diabetes is called insulin dependent diabetes. Oral diabetes medications are ineffective in the treatment of this type of diabetes (Inzucchi & Lupsa). The pathophysiology of hyperglycemia in type II diabetes is caused by decreased insulin secretion as well as the body becoming resistant to insulin (Inzucchi & Lupsa). Basically, the body is creating less insulin and requires more insulin to achieve glycemic control. Gestational diabetes is different than type I or II since it typically resolves spontaneously following delivery. Since gestational diabetes is not characterized by chronic elevations in blood glucose, it be excluded from this project.

Chronically, elevated levels of blood glucose cause damage to all the blood vessels in the body leading to arteriosclerosis. Due to chronically elevated glucose levels, diabetes mellitus can cause major complications to virtually all systems of the body. Diabetes is the leading cause of blindness among working-age adults (Centers for Disease Control [CDC], 2019). People with diabetes are twice as likely to develop heart disease or stroke than non-diabetic patients (CDC). A third of people diagnosed with diabetes are also diagnosed with chronic kidney disease. Diabetes can cause lower extremity amputation secondary to peripheral neuropathy (CDC). These are just some of the common complications linked to the long-term effects of diabetes.

The risks of developing complications attributed to diabetes can be decreased by maintaining glycemic control. If the patient's blood sugar is well-controlled, then the severity and risk are decreased (CDC, 2019). If the patient's blood sugar is not well-controlled, then there is a higher risk of diabetes related complications and more rapid progression of comorbidities (CDC, 2019). Glycemic control is often measured using glycated hemoglobin (HbA1c); a diagnostic that measures the mean blood glucose level over the previous 8-12 weeks (McCulloch, 2018). The goal for most adult patients with diabetes set by the American Diabetes Association (ADA) (2020) is 7%. It is estimated that approximately half of all people with diabetes do not achieve an HbA1c of less than 7% (Chrvala, Sherr, & Lipman, 2016). These statistics represent 5% of the entire United States (US) population living above the ADA HbA1c recommendation, which puts them at a greater risk of developing severe complications (ADA, 2020; CDC, 2020; Chrvala, Sherr, & Lipman, 2016). Type I and Type II diabetes are going to be the focus of this evidence-based practice project because the aim is to decrease the risks of long-term complications.

Data from the Literature Supporting Need for the Project

In 2014, it was estimated that there were 422 million people worldwide living with diabetes mellitus a number that was up from 108 million in 1980 (World Health Organization [WHO], 2020). Of these 422 million individuals, it is estimated that 1.6 million died from diabetes related complications (WHO, 2020). The CDC (2020) estimates a diabetes prevalence rate of 10.5% in the US population. The burden of diabetes in the US is tremendous; the Incidence of diabetes in 2015 was 1.4 million in adults age 18-79. The prevalence of diabetes in the US is 34.2 million (CDC, 2018). The estimated costs associated with diabetes care is 327 billion annually, and patients with diabetes cost the healthcare system 2.3 times more than patients without diabetes (CDC). In Indiana, 10.5% of adults were diagnosed with diabetes in 2015 (CDC, 2018). These statistics show the magnitude of the problem globally and nationally and the necessity for interventions to help patients with diabetes achieve lower HbA1c levels.

Fortunately, complications resulting from diabetes can be minimized if the patient is able to control blood glucose levels. Some of the mainstays of diabetes treatment are lifestyle modifications. These modifications require extensive patient education regarding diet, exercise, and monitoring blood glucose levels (CDC, 2018). It has been shown that patients with diabetes benefit from diabetes self-management education. Despite these benefits, utilization of diabetes self-management is only 5% among Medicare beneficiaries and 6.8% among privately insured patients in the US (CDC). These statistics indicate an underutilization of diabetes self-management education and demonstrates a need for innovative and evidence-based diabetes self-management programs designed to improve access to diabetes education services.

Data from the Clinical Agency Supporting Need for the Project

During the spring of 2020, a clinical site in northcentral Indiana announced a need for a diabetes self-management education program. This project site is one location of a larger health center in the region. In 2018, 91.82% of the patients at the project site lived at or below 200% of the federal poverty guideline (Health Resource Services Administration [HRSA], 2018). The percentage of uninsured patients at this health care system in 2018 was 18.93%. This project site accepts patients without insurance and charges sliding scale fees based on the patient's income (HRSA). As a federally qualified health center, it is required to undergo an operational site visit (OSV) from the Health Resources & Services Administration (HRSA, 2018). A recent OSV conducted by HRSA showed a large portion of this facility's population of patients with diabetes was not meeting recommended standards. The findings from the most recent report were that 341 patients with diabetes were poorly controlled; this number represents 29.78% of the project site’s population of patients with diabetes. HRSA defines poorly controlled diabetes as a Hemoglobin HbA1c > 9%. An HbA1c of > 9% is more lenient than the ADA (2020) recommendation of 7%.

In response to the findings from the OSV, the qualified health center was required to identify three performance improvement actions and report them to HRSA (2018). A diabetes education committee was assembled to create evidenced-based interventions. The diabetes committee was comprised of key stakeholders from the facility including providers, administrators, nurses, a DNP student, information technology professionals, and social workers. The diabetes intervention committee was responsible for identifying interventions that were shown to be beneficial in the specific patient population and led the committee to diabetes self-management education. Further research was conducted, and it was determined that telehealth education modality would be beneficial in this patient population.

Purpose of the Evidence-Based Practice Project

The purpose of this evidence-based practice (EBP) project was to implement diabetes self-management education administered via telehealth. Administering patient education would help patients with uncontrolled diabetes achieve glycemic control. The evidence-based practice intervention was designed to increase access to diabetes self-management education for this patient population.

PICOT Question

The specific PICOT question for this EBP project was in (P) adult patients with uncontrolled type I or type II diabetes who have a HbA1c level of $\geq$ 9% (I) does the addition of individualized diabetes self-management education administered via telehealth (O) produce greater decreases in HbA1c levels and improvements in diabetes self-management scores (C) compared to pre-intervention HbA1c levels and diabetes self-management scores (T) over a 12-week period?

Significance of the EBP Project

The significance of this project was immense because the diagnosis of type I or II diabetes mellitus requires extensive education on self-management. Simple modifications to physical activity and diet can have a significant impact on HbA1c levels and result in better outcomes for patients with diabetes (CDC, 2019). The only problem is that these modifications require a significant amount of dedication. The target population for this EBP project was considered the medically underserved. The goal of this EBP project was to reduce health disparities in diabetes care for the targeted patient population. The intervention was designed to account for barriers that were unique to the specific patient population. It was shown that administering diabetes self-management education via telehealth can eliminate some of these barriers. Educating patients on diabetes self-management can improve health outcomes because patients will be better equipped to manage diabetes (CDC).

CHAPTER 2

EBP MODEL AND REVIEW OF LITERATURE

Evidence-based Practice Model

The evidence-based practice model utilized for this EBP project was the John Hopkins Nursing Evidence-Based Practice (JHNEBP) model (Johns Hopkins Medicine, 2017). The JHNEBP was one of many different EBP models that were considered for this EBP project. The JHNEBP model was selected after a thorough review of six different evidence-based practice models. This chapter describes the appraisal level and quality of evidence used to develop the best practice recommendations in order to guide the practice change.

Overview of EBP Model

The JHNEBP practice model was created when the administration at John Hopkins hospital identified the need to translate research into practice. Leadership wanted to build a nursing practice that was based on evidence. In order to achieve the goal of transitioning research into practice, the leadership team created a systematic approach (Melnyk, & Fineout-Overholt, 2019). The use of the JHNEBP model for EBP ensures that the process of transitioning research into practice is successful and based on research. The JHNEBP model is relatively simple consisting of three phases, Practice, Evidence, and Translation (PET). Each one of these phases has several steps that must be satisfied in order to move to the next phase (Johns Hopkins Medicine, 2017).

Practice Question

The JHNEBP model is initiated with a simple question, a member of the hospital staff wonders if a task is best practice (Melnyk, & Fineout-Overholt, 2019). Upon identifying a situation where best practice is questioned, the individual then shares the question and the first step of practice question is initiated. There are five sub-steps that must be met to continue to the next step. The first step is the development of an interprofessional team. The second step is for the team to identify and refine the EBP question. The third step is to define the scope of the question and to identify key stakeholders. Finally, in the fourth and fifth steps, the team leader is appointed, and meetings are scheduled (Melnyk, & Fineout-Overholt, 2019).

Evidence

Once all the steps of the practice question are satisfied, the evidence phase begins. The evidence phase is where evidence supporting best practice is identified, synthesized, leveled, and graded, based on the practice question (Melnyk, & Fineout-Overholt, 2019). Step six involves conducting an internal and external search for evidence. Step seven is to appraise the level and quality of evidence using the JHNEBP appraisal tools. Step eight is to summarize the individual evidence. Step nine is to synthesize the overall strength and quality of evidence (Melnyk, & Fineout-Overholt, 2019). The team then uses the evidence to determine step ten. For example, if there are numerous amounts of high-level evidence, then a practice change is recommended. Conversely, if there is little evidence supporting the practice change, then further research must be conducted to identify best practice. If the evidence supports a practice change, then the translation phase is started. The translation phase is where the team identifies strategies to turn the evidence into practice (Melnyk, & Fineout-Overholt, 2019).

Translation

Once an appropriate amount of evidence to support a change in practice is collected, the translation phase begins (Melnyk, & Fineout-Overholt, 2019). Step eleven involves determining the appropriateness of the proposed practice change. Steps twelve and thirteen involve creating an action plan and securing the resources to implement the action plan. Step fourteen is implementing the action plan. Step fifteen and sixteen are evaluating and reporting the outcomes to the stakeholders. Step seventeen and eighteen are identifying next steps and disseminating findings (Melnyk, & Fineout-Overholt, 2019).

Application of EBP Model to DNP Project

Practice Question

Upon learning that the federally qualified health system had an inappropriately high percentage of patients with diabetes that were not well controlled, an inquiry about best practice recommendations was identified. Following this inquiry, a diabetes team was formed that met Tuesdays during lunch. The interprofessional team consisted of two providers, the DNP student, two members of administration, two members of information technology, and two medical assistants. The leader of the interprofessional team was identified. The EBP question was narrowed down to non-pharmacological interventions to lower HbA1c levels in adult patients with diabetes and an HbA1c of greater than 9%.

Evidence

An internal and external search for evidence was then conducted. A review of literature was conducted, and high level and quality evidence was located. The evidence was in support of diabetes self-management education as the best intervention for the targeted population. The findings of the literature review were shared during the weekly meetings. Upon learning that the intervention was going to focus on education, a systematic review was conducted to locate the best diabetes self-management education modality. Preference was given to evidence that had patient demographics similar to the project site. The evidence was synthesized and it was determined that the diabetes self-management education modality would utilize telehealth. An added benefit to telehealth is that patients don't have to visit the project cite. By not requiring patients to visit the project site, the transmission of Covid-19 or the virus that was responsible for the global pandemic of 2020 was decreased.

Translation

Upon presenting the evidence in one of the weekly meetings, it was determined that best practice involved telehealth. Potential patients that met inclusion criteria were then identified by viewing the diabetes HbA1c registry.

Strengths and Limitations of EBP Model for DNP Project

One advantage of using the JHNEBP model is that it is applicable to virtually any specialty in nursing**.** One of the finest qualities of the JHNEBP model is that it creates a systematic approach for the process of transitioning EBP into practice. Another reason that the JHNEBP model was chosen is the model has tools for leveling and grading evidence. Consistency is critical when leveling and grading evidence, the tool ensures that everyone involved in the search for evidence is following the same criteria for leveling and grading. One weakness that is present with JHNEBP model is the total number of steps that are involved in the process. A long and drawn out process could be problematic if an intervention is a priority for the organization and must be completed within a specified time.

Literature Search

Sources Examined for Relevant Evidence

A comprehensive search of Joanna Briggs Institute (JBI), Cochrane Library, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline, Turning Research into Practice (TRIP), and practice guidelines was conducted (see Table 2.1). Search strategies were directed to the databases. To eliminate duplicate results a CINAHL search limiter was used that excluded Medline records. The strategy for each search was analyzed and refined by a research librarian to optimize the results. Inclusion and exclusion criteria were set at the beginning of each search and varied slightly with each search. The key inclusion criteria were published within the past 5 years, English language, and scholarly peer reviewed. Sources were excluded if they received a quality rating of a C because a C indicates that there were significant flaws within the study. Since the goal of the EBP project was to identify best practice, sources that received an evidence level of V were also excluded.

The keywords used for the JBI search included the key terms “diabetes mellitus” AND “glycated hemoglobin” OR HbA1c AND interven*. The only limiter used in the JBI search was within the past 5 years. The search generated 44 results. The titles of these results were screened for relevancy to the practice question by the DNP student. If the title was determined to be relevant, then the abstract was screened. Ultimately, the JBI search produced three results that involved interventions to reduce HbA1c in patients with diabetes. The abstracts of these relevant results were assessed, and one article was selected for use (Pamaiahgari, 2018).

The keywords used for the Cochrane Library search included the key terms “diabetes mellitus” AND “glycated hemoglobin” OR a1c AND interven*. The only limiter used in the Cochrane search was within the past 5 years. The search generated 28 results. The titles of these results were screened for relevancy to the practice question. Ultimately, the Cochrane search produced one result which involved interventions to reduce HbA1c in patients with diabetes. The abstract was assessed, and the source was not selected for use.

The keywords used for the CINAHL search included the key terms (MM "Diabetes Mellitus") AND "glycemic control" OR “glycated Hemoglobin” AND interven* OR strateg* OR "best practice*". The limiters used in the CINAHL search were: Scholarly (Peer Reviewed) Journals, dates 2015-2020, English language, research article, and exclude Medline records. The CINAHL search generated 157 results. The titles of these results were screened for relevancy to the practice question by the DNP student. If the title was determined to be relevant, then the abstracts were screened (see Figure 2.1). Ultimately, the CINAHL search produced 14 results that involved interventions to reduce HbA1c in diabetic patients. The abstracts of these relevant results were assessed, and one source were selected for use (Yang, Jiang, & Li, 2019).

The keywords used for the Medline search included the key terms (MM Diabetes Mellitus) AND "glycemic control" OR “glycated Hemoglobin” OR HbA1c AND interven* OR strateg* OR "best practice*". The limiters used in the Medline search were: Scholarly (Peer Reviewed) Journals, dates 2015-2020, and English language. The Medline search generated 374 results. The titles of these results were screened for relevancy to the practice question by the DNP student. If the title was determined to be relevant, then the abstracts were screened. Ultimately, the Medline search produced 17 results that involved interventions to reduce HbA1c in diabetic patients. The abstracts of these relevant results were assessed, and two sources were selected for use (Wu et al., 2018; Heitkemper, Mamykina, Travers, & Smaldone, 2017).

The keywords used for the Turning Research into Practice (TRIP) search included the key terms title: (Diabetes mellitus) (title: interven* OR strateg* OR "best practice*") (title: "glycemic control" OR “glycated Hemoglobin” OR HbA1c). The limiter used in the TRIP search was: since 2015. The TRIP search generated 12 results. The titles of these results were screened for relevancy to the practice question by the DNP student. If the title was determined to be relevant, then the abstracts were screened. Ultimately, the TRIP search produced one result that involved interventions to reduce HbA1c in diabetic patients. The abstract of the relevant result was assessed, and the article was not selected for use.

Finally, the reference list of each selected piece of evidence was searched, the search resulted in one additional piece of evidence (Chamany et al., 2015).

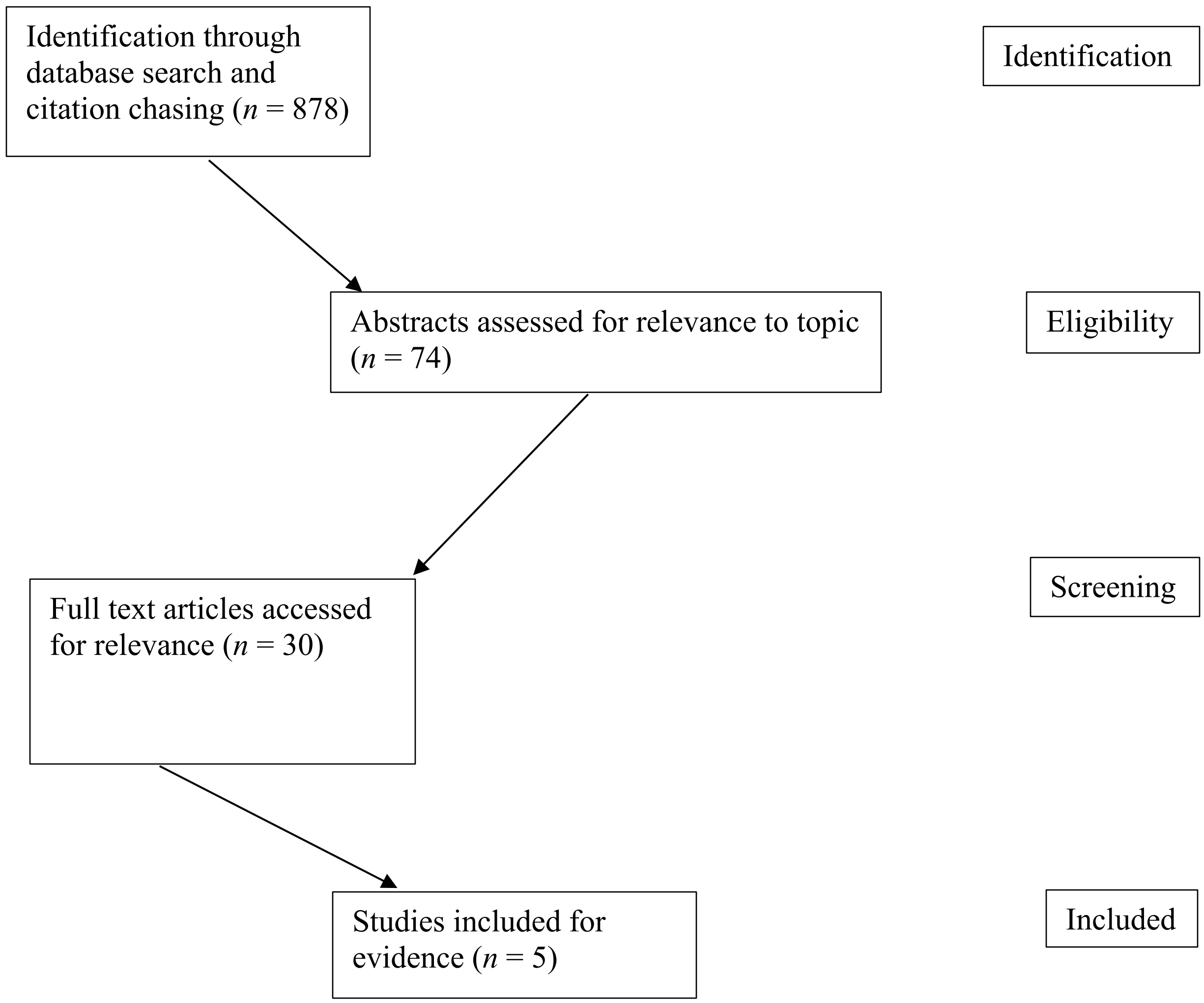
Table 2.1

Literature Search Results

Database	Keyword(s)	Limiters	Results	Relevance/ Saved
JBI	“diabetes mellitus” AND “glycated hemoglobin” OR a1c AND interven* (MM mobile applications)	English, Peer Reviewed	44	1
Cochrane	"diabetes mellitus" AND “glycated hemoglobin” OR a1c AND interven*	Past 5 years	28	0
CINAHL	(MM "Diabetes Mellitus") AND "glycemic control" OR “glycated Hemoglobin” AND interven* OR strateg* OR "best practice*"	Scholarly (Peer Reviewed) Journals, 2015-2020, English language, research article, exclude medline records	157	2
Medline	(MM "Diabetes Mellitus") AND "glycemic control" OR “glycated Hemoglobin” OR HbA1c AND interven* OR strateg* OR "best practice*"	English language, 2015-2020, Scholarly (Peer Reviewed) Journals	374	2
TRIP	(title:Diabetes mellitus)(title:interven* OR strateg* OR "best practice*")(title:"glycemic control" OR “glycated Hemoglobin” OR hba1c) from:2015	Since 2015	12	0
Pieces of Evidence selected that were “Citation Chased”		Since 2015, research article	262	1
Total			878	5

Figure 2.1

Prisma flow diagram



Levels of Evidence

The tool utilized to level the evidence of the selected studies was the Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) levels of evidence (Dang & Dearholt, 2017). The JHNEBP is a five-level rating system, with Level I being the highest level of evidence and level V being the lowest level of evidence (Dang, & Dearholt, 2017). Level I consists of experimental designs including randomized controlled trial (RCT) and systematic reviews of RCT. Level II is quasi-experimental study designs and systematic reviews of RCT and quasi-experimental study designs. Level III is non-experimental study designs and systematic reviews of non-experimental designs. Level IV is based on expert opinion, clinical practice guidelines, and position statements. Finally, level V is based on non-research evidence which includes literature reviews, case reports, and quality improvement projects (Dang, & Dearholt, 2017).

The sources of evidence selected from the literature review consisted of several different levels. Evidence that was selected was summarized and placed into a table (see Table 2.2). There were a total of two sources of evidence that were level I, two were level II, and one was level IV.

Appraisal of Relevant Evidence

The quality of the selected evidence was then appraised using the Johns Hopkins Nursing Evidence-Based Practice appraisal tool. The JHNEBP appraisal tool is an algorithm for assigning a grade to the evidence based on answers to various questions (Dang & Dearholt, 2017). The algorithm ensures that the appraiser was using the correct form based on answers to questions about the study’s characteristics (Dang, & Dearholt, 2017). The forms that were used for the EBP project were the research evidence appraisal tool and the non-research evidence appraisal tool. The research evidence appraisal tool was used for appraisal of five of the selected pieces of evidence, and the form contains eleven questions. These eleven questions are regarding: variable of interest identified, search reproducible, multiple databases searched, inclusion and exclusion criteria identified, flow diagram present, study details presented, methods of appraising evidence, conclusions based on evidence, results interpreted, conclusion answer the review question, and were limitations addressed (Dang, & Dearholt, 2017).

A quality rating of A to C is assigned to a study based on the answers to the appraisal questions. The grade of A, high quality, is reserved for studies that have consistent and generalizable results, make a definitive conclusion, and are based on the evidence (Dang & Dearholt, 2017). Grade B is good quality; the main difference with a B rating is that the results are less definitive or generalizable (Dang & Dearholt, 2017). Grade C is low quality and is reserved for studies that have major flaws or contain little evidence (Dang & Dearholt, 2017). All the studies that were selected for use as evidence in the EBP project achieved either an A or a B quality level (The following review of evidence is organized by level and quality).

Level I Evidence

Chamany et al., (2015). The authors utilized a multiple experimental group RCT study design with a sample of 941 adult patients with diabetes (type I or type II). The aim of the study was to determine if the addition of diabetes self-management education (DSME) administered via telehealth improved diabetes control. There were two intervention groups and two control groups, and patients were assigned to the initial group based on their pre-intervention HbA1c (7-9% and > 9%). Following categorization based on pre-intervention HbA1c, the subjects were randomly placed in either the experimental or control group. The intervention group received DSME materials in the mail and received four or eight phone calls spaced out evenly throughout the 12-month intervention period. The > 9% group received eight calls, and the 7-9% group received 4 calls. These calls covered diabetes self-management support, medication adherence, diet adherence, and physical activity adherence. Both control groups received the DSME material in the mail but no telephone calls.

The primary measured outcome was change in HbA1c after the 12-month intervention period. Secondary outcomes included diabetes medications and dosages, medication adherence, diabetes self-care activities, a depression scale, and a well-being scale. These outcomes were all measured pre-intervention and compared post-intervention. Significant findings were both groups that had a pre-intervention HbA1c of > 9% experienced a reduction in HbA1c. The experimental (> 9%) group experienced a mean decrease of 2.1%; the control (> 9%) group experienced mean decreases of 1.3%. The experimental group (7-9%) failed to achieve statistical significance, and the control group (7-9%) experienced a post-intervention mean increase of 0.2%. Significant secondary outcomes included, reported self-care activities (days/week) diet (+ 0.8 days/week), exercise (+ 0.6days/week), PHQ-8 score, and well-being score (0.7). Non-significant findings included decrease in Body Mass Index (BMI, less intense diabetes medication regimen, behavioral changes, and decrease in TV watching.

This study received a quality rating of A which indicates that it was a high-quality study. All the required criteria were included. One stated limitation of this study was that the sample consisted of predominantly patients that were low-income. This sample was preferred at this project site because the population was better represented by this sample than the overall population of patients with diabetes.

Heitkemper, E. M., Mamykina, L., Travers, J., & Smaldone, A. (2017). The aim of this systematic review was to assess the efficacy of DSME utilizing health information technology (HIT) in the medically underserved patient population. Thirteen RCT were included. The main inclusion criteria included a medically underserved sample, age $\geq$ 19, diabetes (type II or mixture of type I and type II), intervention involved DSME, DSME intervention utilized health information technology, pre-intervention and post-intervention HbA1c, community health center, and RCT study design. There were a variety of different HIT interventions that were included in this systematic review, tele-health *(n* = 3), computer software (*n* = 2), internet (*n* = 4), and automated calls (*n* = 4). The intervention content included education regarding medication, healthy eating, being active, monitoring, healthy coping, reducing risk, and problem-solving. This education was administered via the HIT modality of the respective study.

A significant finding was that studies that utilized telehealth reported the largest average reduction in post-intervention HbA1c. of 1.26%. Five studies in the review had a baseline HbA1c of $\geq$ 9%; the average reduction was 1.34% post-intervention. The subgroup that had a pre-intervention HbA1c < 9% had an average HbA1c decrease of 0.475%. These results showed that the patients with a pre-intervention HgA1C $\geq$ 9% benefited the most from telehealth.

This study achieved a quality level of B because the researchers failed to include a method for appraising level of evidence and methods for addressing limitations. The results from this study were more generalizable to this EBP project site because the inclusion criteria of medically underserved patient sample.

Level II Evidence

Yang, S., Jiang, Q., & Li, H. (2019). The aim of the systematic review with meta-analysis was to examine the role of telenursing in the management of diabetes. The role and definition of telenursing varied significantly in the included studies. The role of telenursing ranged from providing follow-up to DSME education (n = 7) to leading DSME (n = 10). The definition of telenursing included voice calls, video calls, instant messaging, and emails conducted by only a nurse versus a variety of trained personnel. Content of the telenursing intervention also included a variety of DSME topics: diet, exercise, diabetic medication, foot care, blood glucose monitoring, and stress management. Inclusion criteria for the selected pieces of evidence included telenursing as an intervention, HbA1c recorded pre- and post-intervention, and RCT (n = 12) or quasi-experimental study designs with randomization (n = 5).

The primary outcome of all included studies was the difference in HbA1c post-intervention. The pooled study data indicated that telenursing resulted in a statistically significant HbA1c reduction of 0.68% (95% CI 0.33–1.03, p = 0.0001). Nonsignificant findings included a decrease in body mass index (BMI), fasting blood glucose, and total cholesterol. Subgroup analysis of pre-intervention HbA1c could not be performed because the pre-intervention data from individual studies was not reported.

This study received a quality rating of A which indicates that it was a high-quality study. All the required criteria were included in the study. The only criterion that was omitted was a method for appraising level of evidence. The results of the systematic review with meta-analysis were more generalizable to the general diabetic population because it did not specifically include low-income patients. Since the results were consistent with studies that were designed to focus on the medically underserved, the results could be generalized to the project site.

Wu et al., (2018). The aim of this systematic review with meta-analysis was to assess clinical outcomes of telehealth compared to standard care. This systematic review consisted of 19 RCT. The main inclusion criteria included RCT study design, telehealth intervention, and an adult sample with diabetes (type I, type II, or type I and type II). The telehealth delivery method varied between studies. Telehealth delivery methods included mobile phone (n = 2), mobile phone and internet (n = 3), telephone (n = 2), internet (n = 1), telephone and internet (n = 9). Content for the telehealth intervention included DSME that was administered via each respective study's mode of communication. The primary outcome measured was change in HbA1c level from pre-intervention to post-intervention. Secondary outcomes included systolic blood pressure, diastolic blood pressure, BMI, and total cholesterol.

The pooled data for HbA1c showed that telehealth resulted in a statistically significant reduction of HgA1c (-0.22%; 95% *CI*, -0.28 to -0.15; $p < .001$). Pooled data of the secondary outcomes showed statistically significant reductions in systolic blood pressure (-1.92; 95% *CI*, -2.49 to -1.34; $p < 0.001$) and diastolic blood pressure (-1.31; 95% *CI,* -2.39 to -0.23; $p < 0.001$). Non-significant secondary outcomes included BMI and total cholesterol. The results from this study showed that telehealth could be beneficial in patients with diabetes. The authors performed a subgroup analysis of studies that reported a baseline HbA1c of $\geq$ 9%. Findings of the subgroup analysis showed that studies featuring a pre-intervention HbA1c of $\geq$ 9% reported an average HbA1c reduction of 1.22%. The subgroup that featured an HbA1c of < 9% only reported an average reduction of 0.35%. These results demonstrated that patients with a pre-intervention HbA1c of $\geq$ 9% experienced greater results from the telehealth intervention.

This study achieved a quality level of B because the researchers failed to include a method for appraising level of evidence and methods for addressing limitations.

Level IV Evidence

Pamaiahgari, P. (2018). This evidence summary included the best available evidence for the use of e-health in the management of diabetes. The authors defined e-health as the use of technology for diabetes management. Technologies included computer, mobile phone, telemonitoring, telephone support, and electronic result sharing. The specific population identified was patients that lived in a remote or rural setting. The evidence included expert opinion, 39 RCT, and 55 other study designs. The findings of the evidence summary were that telephone follow-up management options should be offered to patients with diabetes that are at risk of receiving sub-optimal care (Grade A). Also, mobile/phone-based interventions have a larger effect on HbA1c that internet-based interventions for patients with type II diabetes (Level I). This recommendation received a rating of A indicating that benefits clearly outweigh risks of intervention.

Despite the large number of studies included in this evidence summery, the evidence level was IV because it contains data form quantitative study designs as well as expert opinion. The quality rating for this evidence summary was a B. One component that this evidence summary failed to address was the risk for bias.

Table 2.2

Evidence Table

Citation (APA)	Purpose	Design	Sample	Measurement/ Outcomes	Results/Findings	Level/ Quality
Chamany, S., Walker, E. A., Schechter, C. B., Gonzalez, J. S., Davis, N. J., Ortega, F. M., Carrasco, J., Basch, C. E., & Silver, L. D. (2015). Telephone intervention to improve diabetes control: a randomized trial in the New York City a1c registry. *American Journal of Preventive Medicine*, 49(6), 832–841. https://doi-org.ezproxy.valpo.edu/10.1016/j.a	Determine the effect of diabetes self-management education (DSME) administered via telehealth on HbA1c levels.	Multiple experimental groups randomized controlled trial (RCT). Participants were organized based on their pre-intervention HbA1c level then randomized to experimental or control groups.	This study sample consisted of 941 adult patients with diabetes (type I or type II).	The primary outcome was the effect of telehealth on post-intervention HbA1c levels. Secondary outcomes included post-intervention BMI, medication, behavioral scales, self-care measurements, TV hours/day, health questionnaire, and wellbeing score.	Primary outcome resulted in a statistically significant reduction in HbA1c of 2.1% ($p < 0.05$) for the pre-intervention HbA1c of > 9% group, compared to the control group that experienced a mean reduction of 1.3% ($p < 0.003$). Primary outcome result was failure to achieve a statistically significant reduction in HbA1c ($p < 0.214$) for the pre-intervention HbA1c of (7-9%). Statistically significant secondary outcomes included self-reported improvements in activity level, exercise, and health questionnaire ($p < 0.005$), Wellbeing and behavior scale ($p<0.01$). Secondary outcomes that failed to achieve statistical significance	L-I Q-A

mepre.2015.04.016					included BMI, medication changes, TV hours/day, and health questionnaire results.	
Heitkemper, E. M., Mamykina, L., Travers, J., & Smaldone, A. (2017). Do health information technology self-management interventions improve glycemic control in medically underserved adults with diabetes? A systematic review and meta-analysis. *Journal of the American Medical Informatics Association*, 24(5), 1024–1035. https://doi-org.ezproxy.valpo.edu/10.1093/jamia/ocx025.	Determine the effect of DSME utilizing health information technology (HIT) on HbA1c in a medically underserved patient population.	Systematic review with metanalysis of RCTs.	The study sample consisted of 13 RCTs, comprised of 3257 adult patients with type I or II diabetes. Education modalities included: tele-health (*n* = 3), computer software (*n* = 2), internet (*n* = 4), and automated calls (*n* = 4).	The primary outcome was the effect HIT had on post-intervention HbA1c levels.	Primary outcome resulted in statistically significant reduction of HbA1c, pooled telehealth data show -0.37% (p = 0.02) at six months, and -0.21% at 12 months (p < 0.09) for the telehealth intervention. Primary outcome resulted in a statistically significant reduction of HbA1c, pooled internet data show -0.50% (p < 0.001) at 6 months, and -0.87% (p < 0.001) at 12 months for internet interventions. Primary outcome results utilizing Internet interventions only achieved statistical significance 50% of the time. The two internet intervention studies that were significant did not replace in-person education sessions and only used internet to supplement.	L-I Q-B
Pamaiahgari, P. (2018). Diabetes management: using ehealth in a rural or remote	Determine indications for the use of e-health for diabetes	Systematic review of evidence to determine best practice recommendations.	The evidence review included expert opinion, 39 RCTs, and 55	The primary objective of this evidence summary was to search evidence	Primary outcome results were that mobile/phone-based interventions have a larger effect on HbA1c that internet-based	L-IV Q-B

setting. Retrieved from http://ovidsp.dc2. ovid.com.ezproxy .valpo.edu/sp-4.04.0a/ovidweb. cgi	management in rural settings.		other study designs.	to find best practice recommendations for the use of e-health.	interventions for type II diabetic patients (Level I). Telehealth interventions result in reductions in HbA1c and reduces hospitalizations (Level I). Mobile interventions should be offered to individuals that are at risk of receiving sub-standard care (Grade A).	
Wu, C., Wu, Z., Yang, L., Zhu, W., Zhang, M., Zhu, M., Chen, X., & Pan, X., (2018). Evaluation of the clinical outcomes of telehealth for managing diabetes: a prisma-compliant meta-analysis. *Medicine,* 97(43), 1–9. https://doi org.ezproxy.valpo .edu/10.1097/MD. 0000000000012962	Determine the effect telehealth had on clinical outcomes compared to standard care.	Systematic review with metanalysis of RCTs.	Study sample included 19 RCTs and 6294 adults with type I or type II diabetes. The role of telenursing ranged from providing follow-up to DSME education (*n* = 7) to leading DSME (*n* = 10). The definition of telenursing included voice calls, video calls, instant messaging, and emails.	The primary outcome was the effect DSME administered via telehealth had on post-intervention HbA1c. Secondary outcomes included post-intervention blood pressure, BMI, cholesterol, and quality of life.	The primary outcome resulted in a statistically significant reduction in HbA1c -0.22% (95% CI, -0.28 to -0.15; p < 0.001) over the control for DSME administered via telehealth. Greater effects of telehealth experienced in the ≥ 9% pre-intervention HbA1c. Subgroup analysis of pre-intervention HbA1c ≥ 9% showed an average reduction of -1.22%. The pre-intervention HbA1c of < 9% only resulted in an average reduction of -0.35%. Statistically significant secondary outcomes were reduction in systolic blood pressure (-1.92; 95% CI, -2.49 to -1.34; *p* < 0.001) and diastolic blood pressure and (-1.31; 95% CI, -2.39 to -0.23; *p* <	L-II Q-B

					0.001). Pooled data from telehealth group. Secondary outcomes that failed to achieve statistical significance results were reported for BMI, total cholesterol, and quality of life.	
Yang, S., Jiang, Q., & Li, H. (2019). The role of telenursing in the management of diabetes: a systematic review and meta-analysis. *Public Health Nursing* (Boston, Mass.), 36(4), 575–586. https://doi-org.ezproxy.valpo.edu/10.1111/phn.12603	Determine the effect telenursing had on managing patients with diabetes.	Systematic review with meta-analysis of RCTs and quasi-experimental study designs.	The study sample consisted of 11 RCTs, and 6 quasi-experimental designs.	The primary outcome was the effect telenursing had on post-intervention HbA1c levels. Secondary outcomes included post-intervention BMI, fasting blood glucose, and Cholesterol.	The primary outcome resulted in a statistically significant reduction in HbA1c of -0.68% ($p < 0.0001$). of all included studies. Studies that included only type II diabetes experienced a statistically significant HbA1c reduction of 0.43% ($p = 0.04$) ($n = 9$). Studies that included type I & type II diabetes experienced a statistically significant HbA1c reduction of 1.23% ($p = 0.004$) ($n = 5$). The study that included only type I diabetes failed to achieve statistically significant HbA1c reduction of 0.31% ($p = 0.14$) ($n =1$). Secondary outcomes that failed to achieve statistical significance included change in body mass	L-II Q-B

					index (BMI), fasting blood glucose, and total cholesterol.	

Construction of Evidence-based Practice

Synthesis of Critically Appraised Literature

An evidence synthesis of the included studies shows that the utilization of information technology has the potential to lower HbA1c levels in patients with diabetes. Following a comprehensive review of literature, DSME was consistently shown to reduce post-intervention HbA1c levels. The content included in DSME remained consistent in the body of evidence. Topics included medication, healthy eating, being active, monitoring blood glucose, healthy coping, reducing risk, foot care, and problem-solving (Chamany et al., 2015; Heitkemper et al., 2017; Pamaiahgari, 2018; Wu et al., 2018; Yang, Jiang, & Li, 2019). The body of evidence consisted of a variety of education modalities including telehealth, computer software, internet, telenursing, mobile phones, or a combination of these interventions. Upon reviewing all the selected pieces of evidence that were included in the EBP project, several overreaching themes were identified as best practice: measured outcomes were consistent, telehealth was shown to be the most beneficial education modality, the education modality was shown to be most beneficial when the pre-intervention HbA1c was $\geq$ 9%.

Measured Outcomes

The primary outcome of interest in all the included studies was HbA1C levels; all studies compared pre-intervention to post-intervention (Chamany et al., 2015; Heitkemper et al., 2017; Pamaiahgari, 2018; Wu et al., 2018; Yang, Jiang, & Li, 2019). The measurement of HbA1c is considered the gold standard in measuring glycemic control because it measures the average blood glucose over the previous 8-12 weeks (McCulloch, 2018). Consistency among included pieces of evidence indicated that HbA1c measurement was considered best practice. Significant secondary measured outcomes included a decrease in systolic blood pressure and diastolic blood pressure, self-care, and increase in activity. Non-significant findings included a decrease in fasting blood sugar, less intense diabetes medication regimen, behavioral changes, and decrease in TV watching (Chamany et al., 2015; Heitkemper et al., 2017; Pamaiahgari, 2018; Wu et al., 2018; Yang, Jiang, & Li, 2019).

Diabetes Self-Management Education Modality

Information technology is transforming the way patients with diabetes receive care. The included evidence showed that there were a variety of information technology methods available, and one modality was shown to be superior to the others. In two systematic reviews with meta-analysis (Heitkemper et al., 2017; Wu et al., 2018), education modalities included mobile phone, mobile phone and internet, telephone, internet, telephone and internet, and computer software. Results demonstrated that telehealth resulted in the largest average reduction in post-intervention HbA1c levels (Heitkemper et al., 2017; Wu et al., 2018). Heitkemper et al. (2017) reported average reduction of 1.34% in the group that had a baseline HgA1c of $\geq$ 9%. Wu et al. (2018) reported an average HbA1c reduction of 1.22% in a group with the same characteristic. These results align with the best practice recommendation that interventions utilizing telehealth result in a greater effect on glycemic control than internet interventions (Pamaiahgari, 2018).

Results from the evidence synthesis showed that DSME administered via telehealth consistently reduces post-intervention HbA1c levels. Findings from the evidence synthesis also showed telehealth to be beneficial in the medically underserved patient population (Chamany et al. 2015; Heitkemper et al. (2017). Heitkemper et al. (2017) noted a statistically significant reduction of HbA1c, of -0.37% ($p = 0.02$) at six months, and -0.21% at 12 months ($p < 0.09$). Furthermore, Heitkemper et al. (2017) reported that telehealth DSME performed similarly to in-person DSME in the medically underserved population. These findings support the need to use telehealth as the intervention for the EBP project, because the project site has similar characteristics.

Pre-intervention HbA1c

Pre-intervention HbA1c levels were an important factor in determining statistical significance. A baseline HbA1c of ≥ 9% was shown to be associated with statistically significant results. Heitkemper et al. (2017) included five studies that had a baseline HbA1c of ≥ 9%, the average decrease in HbA1c was 1.34%. Conversely, the eight studies that were included in this systematic review that had a baseline HbA1c < 9% had an average HbA1c decrease of 0.475%. These findings show that the patient population with a pre-intervention HbA1c of ≥ 9% experienced a significantly greater benefit as a result of telehealth. These results were consistent across studies that reported pre-intervention HbA1c levels. Chamany et al. (2015) noted that the intervention group with an HbA1c of 7-9% had an average baseline HbA1c of 7.9%, and post-intervention HbA1c of 7.9%. These results indicate that telehealth was not beneficial in the pre-intervention HbA1c of 7-9% group. Conversely, the subgroup that had a HbA1c > 9% had a pre-intervention HbA1c of 11.3% and a post-intervention HbA1c of 9.2%. The result shows that the > 9% subgroup experienced a significant benefit as a result of telehealth. Wu et al. (2018) also reported similar findings in the studies with individuals who had a baseline HbA1c of ≥ 9%. The average decrease in HbA1c levels was 1.22%. Conversely, the average change in HbA1c levels was not statistically significant at -0.35% when the HbA1c was < 9% pre-intervention. The results from this evidence synthesis show that DSME administered via telehealth results in statistically significant reductions in HbA1c when the pre-intervention level was ≥ 9%.

Best Practice Model Recommendation

The body of evidence shows that the addition of DSME administered via telehealth to standard care resulted in statistically significant reductions in HbA1c levels. These reductions were shown consistently throughout the body of evidence (Chamany et al., 2015; Heitkemper, et al., 2017; Pamaiahgari, 2018; Wu et al., 2018; Yang, Jiang, & Li, 2019). When compared to other DSME modalities like internet and mobile phone applications, DSME utilizing telehealth consistently showed the greatest average reduction in HbA1c (Heitkemper et al., 2017; Wu et al., 2018). Furthermore, telehealth has been shown to be beneficial in the medically underserved population (Chamany et al., 2015; Heitkemper et al., 2017). This finding was significant because most of the patient population at the EBP project site fall below the federal poverty line.

The primary outcome to measure the impact of a telehealth intervention should include a pre-intervention and post-intervention HbA1c measurement (Chamany et al., 2015; Heitkemper et al., 2017; Pamaiahgari, 2018; Wu et al., 2018; Yang, Jiang, & Li, 2019). The measurement of HbA1c levels is considered the gold standard in glycemic control because it measures the average blood glucose over the previous 8-12 weeks (McCulloch, 2018). Findings from sub-group analysis indicated that participants with a pre-intervention HbA1c ≥ 9% experience the greatest benefits from the addition of DSME administered via telehealth (Chamany et al., 2015; Heitkemper et al., 2017; Wu et al., 2018). It was discovered that the project site had an excessive number of patients with diabetes that were considered poorly controlled, and the HbA1c that HSRA uses to define poorly controlled is > 9%. A pre-intervention HbA1c of > 9% was consistently shown to result in statistically significant reductions in HbA1c. While some of the population at this clinical site had patients with elevated HbA1c levels that were below 9%, this EBP project focused on those whose reading was >9% to address the HRSA concerns.

Following an extensive review of literature, best practice recommendations were constructed. These recommendations were created after the identification of consistent and generalizable results from multiple pieces of high level and good quality evidence. Best practice DSME measures pre- and post-intervention HbA1c levels as a primary outcome, should be administered via telehealth, and conducted on a sample with a pre-intervention HbaA1c of ≥ 9%. The presence of these characteristics were shown to result in statistically significant results across all included studies.

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

This EBP practice project was designed to determine the effect of diabetes self-management education and goal setting administered via telehealth has on HbA1c. The best practice recommendations identified in the previous chapter were used in the development. The planned intervention consisted of diabetes self-management education and goal setting administered via telehealth. An added benefit of performing DSME via telehealth was that patients were not required to visit the office. An important project detail is that this project took place during the Covid-19 pandemic of 2020. Utilizing telehealth as the education modality ensured that patients with uncontrolled diabetes received DSME without increasing their risk of Covid-19 infection. The purpose of this intervention was to improve diabetes self-management behaviors among poorly controlled patients with diabetes.

Participants and Setting

The project health system was a federally qualified health center in Northern, Indiana. The health system was comprised of three primary care locations. Services that are offered at these locations include adult and geriatric care, behavior health, dental, pediatric, pharmacy, and women's health. Providers at this health system include five pediatricians, six primary care providers, two behavioral health providers, two dentists, and one pharmacist. Providers practicing at the project site include a pediatrician and two primary care providers. After an inspection from HRSA, it was determined that the percentage of adults with uncontrolled diabetes (defined as an HbA1c > 9%) was too high. To remain in compliance, an action plan was created to decrease the number of patients with uncontrolled diabetes. Inclusion criteria for this project included adults (18 or older), a diabetes diagnosis (type I or type II), most recent HbA1c $\geq$ 9%, access to a telephone, medication compliance (has not gone > 1 year without medications), and was seen by a provider during calendar year 2020. Exclusion criteria for this project included pregnancy and dementia.

Pre-Intervention Group Characteristics

The project site primarily serves a low-income patient population of 11,595 at all locations. A total of 90.98% of patients were at or below 200% of the federal poverty line. The federal poverty line is determined by calculating the income of poverty by factoring in family size, income, and cost of living (HRSA, 2020). Approximately 18.79% of the patient population was uninsured in 2019. Approximately 30.21% of the project site diabetic population would be defined as poorly controlled, that accounts for approximately 313 patients or 2.69% of the project site population.

Intervention

Eligible participants were identified by performing chart reviews at the project site as well as recommendations by the project site facilitator. Recruitment of eligible participants included contact either by telephone or during a scheduled office visit. During the recruitment process, participants were asked if they would like to participate in this EBP project and verbal consent to participate was obtained, either by phone or in person (see Appendix A).

Following the acquisition of verbal consent, the participants were asked for an email address, the best phone number to reach them, and a specific time/day that was best to reach them (see Appendix A). These would allow education material to be sent and best time/day maximized the odds of the patient receiving education. Demographic data (see Appendix B) were also collected from the patient chart including age, gender, marital status, work status, household income, highest level of education completed, insurance status, and race. The most recent HbA1c level, blood pressure, and Low-Density Lipoprotein LDL cholesterol were also collected from the chart, provided these results were within the previous three months. Finally, the participants were asked to complete the diabetes self-management questionnaire (DSMQ) (see Appendix C).

Every 2-weeks during the intervention, participants were called by the DNP student. These calls were administered based on the time that the participant reported as most convenient for them. In the event of a missed call, a subsequent attempt was made to contact them. If the participant missed this call as well, the call was documented as unsuccessful. The number of unsuccessful calls was tracked throughout the intervention. Notes were taken during the call to record patient education topics and mutually agreed upon goals. These notes allowed the DNP student the ability to review the data for subsequent calls (see Appendix B). Following the conclusion of data analysis, these notes were destroyed.

During calls, participants were reminded of and encouraged to follow patient education points from their last office visit. In addition, an assessment of diet, exercise, medication adherence, and monitoring blood sugar adherence was performed. Diabetes self-management education was administered based on individualized area of weakness utilizing the results from the pre-intervention DSMQ. In addition, the findings of this assessment aided in the creation of individualized participant goals. The participant goals were created by combining areas that the DNP student identified as needing most improvement and participant preferences. Once the participant goals were mutually agreed upon by the participant and the DNP student, the goal was recorded for reassessment during subsequent calls. The curriculum was created by following joint recommendations provided by the American Diabetes Association, American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics in the diabetes self-management education support algorithm: action steps (see Appendix D) (Powers et al., 2015).

Comparison

All participant outcome data were collected pre-intervention and compared to post-intervention data. The post-intervention data were collected following the intervention period of three months, or during their next follow-up scheduled appointment. The standard follow-up appointment time at the project site for uncontrolled diabetes was three months. If participants adhered to the recommended follow-up schedule, post-intervention data collection provided enough time for a change in outcomes, such as HbA1c levels, DSMQ, blood pressure, LDL cholesterol, and BMI values. A data collection finishing point was identified. If the participant had not been seen by that date, then their post-intervention results were excluded. By collecting all patient data through February, participants had a month following the intervention to be seen by the provider.

Outcomes

The primary outcome for the EBP project was the difference between pre-intervention and post-intervention HbA1c levels. Pre-intervention HbA1c was collected by reviewing patient charts and provided HbA1c was assessed. Secondary outcomes included comparison of DSMQ, systolic blood pressure (SBP), diastolic blood pressure (DBP), LDL cholesterol, activity in minutes (ACT), and BMI values pre- and post-intervention.

In addition to the quantitative data above, qualitative data were collected following the last intervention for a limited sample of participants. The purpose of qualitative data collection was to support statistically significant quantitative data. The quantitative results were supported by providing subjective responses regarding the intervention. Qualitative data were collected by asking the participant “If they thought this intervention assisted them in reaching their HbA1c goals”. If the patient reported that they thought it helped them reach their HbA1c goal, the patient was asked to explain how they thought it helped them reach their HbA1c goals. Patient responses were transcribed verbatim on the data collection sheet. Similar responses were then grouped together to identify patterns in patient responses.

Time

This intervention began October 2020 and ended January 2021. Participants were scheduled for follow-up appointment in January/February, and post-intervention results were collected through February 2021.

Protection of Human Subjects

To protect human subjects, research ethics training was completed prior to the start of this project. Approval for the EBP project was obtained from the project site chief medical officer. In addition, the Valparaiso institutional review board approved this project. Consent to participate was received prior to participation. A multistep process was used to protect personal health information.

The process to protect personal health information began by not recording the patient name, and instead, a coded medical record number was used. A formula was created to code and decode the medical record number. Only the DNP student and the project site facilitator knew the formula to convert the code number to the medical record number. Following the acquisition of verbal consent, the only number that was recorded for data collection purposes was the coded medical record number. The required participant information was then accessed by logging into the secure electronic medical records. The participant was identified by decoding the medical record number (see Appendix E).

CHAPTER 4

FINDINGS

The EBP project was designed to determine the effect individualized DSME and goal setting had on adults with uncontrolled type I or type II diabetes. Following the review of evidence, it was determined that DSME and goal setting would have a greater effect on patients with HbA1c level of $\geq$ 9%. This effect was measured by calculating the HbA1c pre-intervention and comparing it to the post-intervention measurement. Secondary outcomes that were measured included BMI, DSMQ, SBP, DBP, LDL, and ACT. These secondary outcomes were also measured pre-intervention and compared to post intervention results. In addition, statistical analysis was performed to determine significance of results.

Qualitative data collection began by asking the participant “If they thought this intervention assisted them in reaching their HbA1c goals”. If the participant reported that they thought it helped them reach their HbA1c goal, the patient was asked to explain how they thought it helped them reach their HbA1c goals. Patient responses were transcribed verbatim on the data collection sheet. Similar responses were then grouped together to identify patterns in participant responses.

Participants

There were 24 participants that agreed to participate in the project and 7 participants (29%) were lost to attrition. Some participants (n = 4) finished the intervention and did not have a follow up appointment soon enough to be included in the data analysis, and some participants did not participate in the required number of calls (n = 3). The final group of participants was 17; the demographic data for the number of participants that finished was compared to the original sample (see table 4.1). Several differences were noted between those that were recruited and those that finished. Gender, employment status, and marital status were different for those who finished the project. The original sample was 58.3% female, but the participants who finished were only 47.1% female. Employment status experienced a similar shift, 37.5% of the original sample were employed and 52.9% of the participants that finished were employed. Finally, marital status also experienced a similar shift, only 29.2% of the original sample were married and 41.2% of participants that finished were married. All demographic data except for age (see Appendix F) and highest education (see Appendix H) were normally distributed.

Table 4.1
Participant Demographic Data

Demographic	Recruited	Finished
n =	24	17
Age: mean, *SD*, range	49.5; 14; 48	47.8; 13.5, 45
Income: mean, *SD*, range	21693; 17866; 84472	25193;20101; 84492
Gender (%): Female/Male	58.3/41.7	47.1/52.9
Education level: mean, *SD*, Range	11.87, 1.82, 7	11.59, 1.67, 7
Race (%): African American/Hispanic/White	16.7/33.3/50	17.6/41.2/41.2
Employment status (%): yes/no	37.5/62.5	52.9/47.1
Insurance status (%): yes/no	70.8/29.2	70.6/29.4
Marital status (%): married/single/partner	29.2/62.5/8.3	41.2/47.1/11.8

Changes in Outcomes

The primary outcome of interest for this project was a change in HbA1c after a 3-month intervention period. The outcome was measured pre-intervention and compared to post-intervention results. Secondary outcomes included changes in BMI, DSMQ, SBP, DBP, LDL, and ACT; these data were measured using the same statistical analyses. In addition, qualitative data were collected to determine participants perceptions of the intervention for aiding them in reaching their HbA1c goals.

Statistical Testing and Significance

To determine if the results were statistically significant, a *t* test was utilized for statistical analysis. The *t* test compares the means of interval or ratio data at two different points in time; for this project, data were paired pre-intervention and post-intervention (Cronk, 2018). Assumptions for the paired sample *t* test include interval or ratio measurement and the data are normally distributed (Cronk, 2018).

Primary Outcome

Effects on Post-Intervention HbA1c

Pre-intervention HbA1c and post-intervention HbA1c were analyzed for normalcy of distribution and found to be normally distributed (see Appendix I). Upon determining that the outcomes were normally distributed, a paired sample *t* test was performed to determine statistical significance. A paired-samples *t* test was calculated to compare the mean pre-intervention HbA1c to the mean post-intervention HbA1c. The mean pre-intervention HbA1c was 11.275 (SD = 1.44) and the mean of the post-intervention HbA1c was 9.694 (SD = 1.985). A significant decrease from pre-intervention HbA1c to post-intervention was found $t(17) = 3.043$, $p < .008$). Clinical significance was that 76.47% of participants experienced a reduction of post-intervention HbA1c.

Qualitative Analysis

Qualitative data were collected to determine participant perception of the intervention. Qualitative data were collected by asking the participant “If they thought this intervention assisted them in reaching their HbA1c goals”. If the patient reported that they thought it helped them reach their HbA1c goal, the patient was asked to explain how they thought it helped them reach their HbA1c goal. Patient responses were transcribed verbatim on the data collection sheet. Similar responses were then grouped together, and three patterns of patient responses were discovered. There were 10 participants (83.3%) that indicated the calls helped them control their diabetes. Participants (n = 8, 75%) responded that the calls helped them with diabetes management. Specific aspects of the disease management varied based on education focus. Two (16.6%) participants responded that the calls motivated them and two (16.6%) participants indicated that they were indifferent about the calls. One participant stated: “the calls keep me motivated and informed on what I need to for my diabetes care” and another stated “I would not have gotten my A1c down without these recommendations”.

Secondary Outcomes

Secondary outcomes included pre- and post-intervention BMI, DSMQ, SBP, DBP, LDL, and ACT.

Pre-intervention BMI and post-intervention BMI were analyzed for normalcy of distribution and found to be normally distributed. Upon determining that the outcomes were normally distributed, a paired sample *t* test was performed to determine statistical significance. A paired-samples *t* test was calculated to compare the mean pre-intervention BMI to the mean post-intervention BMI. Pre-intervention BMI was 36.54 (SD = 7.98) and the mean of the post-intervention BMI was 36.89 (SD = 8.27). No significant decrease from pre-intervention BMI to post-intervention BMI was found ($t(17) = -0.856$, $p > 0.404$).

Pre-intervention DSMQ and post-intervention DSMQ were analyzed for normalcy of distribution and found to be abnormally distributed. Pre-intervention DSMQ results had a positive skewed distribution and post-intervention DSMQ results had a negative skewed distribution. Despite this, a paired sample *t* test was performed to determine statistical significance. A paired-samples *t* test was calculated to compare the mean pre-intervention DSMQ to the mean post-intervention DSMQ. Pre-intervention DSMQ was 54.56 (*SD* = 17.68) and the mean of the post-intervention DSMQ was 68.59 (*SD* = 16.74). A significant increase from pre-intervention DSMQ to post-intervention DSMQ was found ($t(14) = -3.74$, $p < 0.002$).

Pre-intervention SBP and post-intervention SBP were analyzed for normalcy of distribution and found to be normally distributed with high uniformity. Upon determining that the outcomes were normally distributed, a paired sample *t* test was performed to determine statistical significance. A paired-samples *t* test was calculated to compare the mean pre-intervention SBP to the mean post-intervention SBP. Pre-intervention SBP was 128.12 (*SD* = 19.49) and the mean of the post-intervention SBP was 123.18 (*SD* = 17.52). No significant decrease from pre-intervention SBP to post-intervention SBP was found ($t(17) = 1.115$, $p > 0.281$).

Pre-intervention DBP and post-intervention DBP were analyzed for normalcy of distribution and found to be normally distributed. Upon determining that the outcomes were normally distributed, a paired sample *t* test was performed to determine statistical significance. A paired-samples *t* test was calculated to compare the mean pre-intervention DBP to the mean post-intervention DBP. Pre-intervention DBP was 81.06 (*SD* = 12.49) and the mean of the post-intervention DBP was 73.64 (*SD* = 9.6). A significant decrease from pre-intervention DBP to post-intervention DBP was found ($t(17) = 2.85$, $p < 0.012$).

Pre-intervention LDL and post-intervention LDL were analyzed for normalcy of distribution and found to be abnormally distributed. Upon determining that the outcomes had low uniformity and a positive skew. Despite this, a paired sample *t* test was performed to determine statistical significance. A paired-samples *t* test was calculated to compare the mean pre-intervention LDL to the mean post-intervention LDL. Pre-intervention LDL was 65.59 (*SD* = 52.22) and the mean of the post-intervention LDL was 62.74 (*SD* = 62.74). No significant decrease from pre-intervention LDL to post-intervention LDL was found ($t(17) = 0.256$, $p > 0.801$).

Pre-intervention ACT and post-intervention ACT were analyzed for normalcy of distribution and found to be abnormally distributed. Both were found to have a positively skewed distribution and high uniformity. Despite this a paired sample *t* test was performed to determine statistical significance. A paired-samples *t* test was calculated to compare the mean pre-intervention ACT to the mean post-intervention ACT. Pre-intervention ACT was 45.35 (*SD* = 35.97) and the mean of the post-intervention DBP was 69.64 (*SD* = 54.75). A significant Increase from pre-intervention ACT to post-intervention ACT was found ($t(14) = -2.55$, $p < 0.024$).

CHAPTER 5

DISCUSSION

The EBP question was narrowed down to non-pharmacological interventions to lower HbA1c levels in adult patients with diabetes and an HbA1c of greater than 9%. Upon learning that the federally qualified health system had an inappropriately high percentage of patients with diabetes that were not well controlled, an inquiry about best practice recommendations was identified. Following this inquiry, an interprofessional team that consisted of two providers, the DNP student, two members of administration, two members of information technology, and two medical assistants was formed. An extensive review of literature was performed, and best practice recommendations were identified. Studies performed at facilities with similar patient demographics to the agency were identified. Best practice recommendations involved DSME and goal setting via telehealth. The goal of this project was to reduce post-intervention HbA1c levels by providing participants DSME via telehealth. This chapter will analyze the results and explore the experiences with implementing this type of project. In addition, this chapter will examine the EBP framework, strengths and weaknesses, and recommendations for future studies.

Explanation of Findings

The specific PICOT question for this EBP project was in (P) adult patients with uncontrolled type I or type II diabetes who have a HbA1c level of > 9% (I) does the addition of individualized diabetes self-management education administered via telehealth (O) produce greater decreases in HbA1c levels and improvements in diabetes self-management scores (C) compared to pre-intervention HbA1c levels and diabetes self-management scores (T) over a 12-week period? The findings following the implementation of this EBP project will answer this question thoroughly.

Post-intervention HbA1c

A significant decrease from pre-intervention HbA1c to post-intervention was found (*M* = -1.51176), (*t*(17) = 3.043, $p < .008$), demonstrating the average participant experienced a 1.5% reduction in post-intervention HbA1c levels. Furthermore, a clinically significant finding was that 76.47% of participants experienced a reduction of post-intervention HbA1c levels. As this was the primary outcome for previous studies, a direct comparison of the results was possible. Heitkemper et al. (2017) reported an average reduction of 1.34%; Wu et al. (2018) reported an average reduction of 1.22%; and Chamany et al., (2015) reported average reduction of 2.1%. The average reduction of the mean post-intervention HbA1c levels across all evidence included in this project that utilized similar inclusion criteria was 1.55% which was very similar to the results of this study showing a mean reduction of 1.51%.

The results from this project could be attributed to participants knowing they were being assessed and adapting their behaviors just during the Intervention period. These participants knew that they were being tested with HbA1c assessment after the intervention period of 3 months. Therefore, they could have modified their behavior during the intervention period to show better results. A longer period from intervention to follow-up would help show that the results were sustained long-term. The duration of this study was only 3 months, results from previous studies showed these results continue for studies with longer durations. Chamany et al. (2015) had a 12-month duration for all participants. Heitkemper et al. (2017) had 9-12-month duration for studies that had a pre-intervention HbA1c ≥9%. Wu et al. (2018) had 6-12-month duration for studies that had a pre-intervention HbA1c ≥9%. These results help show the long-term benefits that are a result of DSME administered to this population over for studies with longer durations. Future studies would benefit analyzing the HbA1c immediately post-intervention and a second time post intervention. The second HbA1c level assessment would help show the long-term post-intervention effects on HbA1c rather than the just the immediate post-intervention effects.

In addition to the quantitative data above, qualitative data further supports the use DSME administered via telehealth. Participants (n = 8, 75%) responded that the calls helped them with diabetes management. Specific aspects of the disease management varied based on education focus. Two (16.6%) participants responded that the calls motivated them and two (16.6%) participants indicated that they were indifferent about the calls. The qualitative data also showed that participants benefited from the intervention.

Significant Secondary outcomes

A significant increase from pre-intervention DSMQ to post-intervention DSMQ was found ($t(14) = -3.74$, $p < 0.002$). These results should be accepted with caution due to the abnormal distribution and participant reactivity being a threat to external validity of the findings. In addition, this outcome is susceptible to response bias. However, the pre-intervention DSMQ score guided the education intervention and was tailored to participant knowledge deficiencies. The DSMQ assessed many self-management areas including diet, exercise, medication compliance, self-monitoring glucose levels, and adherence to office visits.

A significant decrease from pre-intervention DBP to post-intervention DBP was found ($t(17) = 2.85$, $p < 0.012$). There are numerous extraneous variables that affect blood pressure daily. This statistically significant result should be accepted with caution because there was no account for extraneous variables affecting blood pressure in this project design. In addition, 64.7% of participants already had a diastolic blood pressure reading that was controlled pre-intervention. We et al. (2018) also noticed a statistically significant reduction in diastolic blood pressure. Since over half of the participants were controlled pre-intervention, a decrease may not make a clinical difference; however, it could be argued that a decrease in blood pressure is a positive outcome. Future studies should focus on participants with an elevated diastolic blood pressure.

A significant increase from pre-intervention ACT to post-intervention ACT was found ($t(14) = -2.55$, $p < 0.024$). Again, these results should be accepted with caution due to the positively skewed and small distribution of data. Participant reactivity could be a threat to external validity of the findings. In addition, this outcome is highly susceptible to response bias.

Non-Significant Secondary outcomes

No significant decrease from pre-intervention BMI to post-intervention BMI was found ($t(17) = -0.856$, $p > 0.404$). This finding is in alignment with the findings of previous studies (Chamany et al., 2015; Wu et al., 2018; Yang, Jiang, & Li, 2019). This outcome, however, was to be expected since the participants were only followed for 3 months, not allowing enough time for a significant change in BMI.

No significant decrease from pre-intervention SBP to post-intervention SBP was found ($t(17) = 1.115$, $p > 0.281$). There are numerous extraneous variables that affect blood pressure that participants see daily. Again, 52.9% of participants already had a systolic blood pressure reading that was controlled pre-intervention. Since over half of the participants were controlled pre-intervention, a statistically significant decrease was not expected; however, participants still experienced some improvement in SBP. Future studies should examine participants that have an elevated systolic blood pressure. Only one source of evidence reported a statistically significant reduction in systolic blood pressure (Wu et al., 2018). Wu et al., (2018) explained that since participants for these studies were recruited based on HbA1c, blood pressure was not sure to be under control or not. Therefore, the pooled data could have contained participants that did not have hypertension or were controlled.

No significant decrease from pre-intervention LDL to post-intervention LDL was found ($t(17) = 0.256$, $p > 0.801$). This outcome lacked consistent findings among the participants and was positively skewed. There was a threat to construct validity regarding the collection of this outcome. If the LDL value was too low, the device was unable to calculate the values and read not applicable “NA”. Therefore, a true range of values for LDL was not able to be calculated. Other studies accounted for the measurement error by measuring total cholesterol instead of

LDL cholesterol, though this secondary outcome in both studies failed to reach statistical significance (Yang et al., 2019; Wu et al., 2018).

Strengths and Limitations of the DNP Project

Strengths

A comprehensive review of literature was conducted, and database specific search strategies were optimized with the assistance of a research librarian. Finding high quality and high-level evidence was a strength of this project. The robust amount of high level and high-quality data that supports DSME being administered via telehealth in similar populations to the project site helped generalize the planned intervention to the project site. The review of evidence showed that the primary outcome was measured the same way, allowing for a direct comparison between studies.

The project design successfully integrated participant needs, project site need, and best practice recommendations. In response to the findings from the OSV, the federally qualified health center was required to identify three performance improvement actions and report them to HRSA (2018). HRSA (2020) defines poorly controlled diabetes as a Hemoglobin HbA1c > 9%. Each piece of evidence that was included showed that telehealth resulted in a >1% reduction in HbA1c for participants that have a pre-intervention HbA1c $\geq$ 9% (Chamany et al., 2015; Heitkemper et al., 2017; Wu et al., 2018), and findings demonstrated significant improvement following the interventions. Incorporating these data into the project design ensured that the project focused interventions on the population with the greatest need. The project was helpful to the project site by focusing on the population the HRSA identified as needing improvement.

The measurement of HbA1c is considered the gold standard in measuring glycemic control because it measures the average blood glucose over the previous 8-12 weeks (McCulloch, 2018). The primary outcome of interest in all the included studies was HbA1C levels; all studies compared pre-intervention to post-intervention measurements (Chamany et al., 2015; Heitkemper et al., 2017; Pamaiahgari, 2018; Wu et al., 2018; Yang, Jiang, & Li, 2019). Incorporating these readings into the project design ensured transferability between evidence in the literature and this project.

Administering a validated instrument that assessed diabetes self-care behaviors including medication adherence, diet, exercise, monitoring blood glucose, and adherence to appointments allowed the DNP student to objectively identify knowledge deficiencies. By identifying knowledge deficiencies, the DNP student was able to create an individualized lesson plan focusing on the areas identified as greatest need. In addition, individualized goals were created to help participants improve on the weakest self-care areas.

Finally, this project accounted for population specific factors that influence adherence to appointments. The EBP practice project brought DSME to the participant at the time that was the most convenient for them. Requesting participants name the time that was most convenient to contact them ensured greater continuity. Additionally, by administering DSME via telehealth, participants received DSME without increasing the risk of Covid-19 infection.

Limitations

There were several aspects of this EBP project that may have impacted the results. There were only 86 patients who met all inclusion and exclusion criteria. Also, the use of a non-probability sampling method for participants could have excluded additional patients that would have benefited from the intervention. In addition, the project site primarily serves a low-income patient population; therefore, the results may not be generalizable to the entire population of patients with diabetes. Though this could also be looked at as a strength as DSME administered via telehealth showed to be effective at lowering HbA1c in this population.

Even though HbA1c is considered the gold standard in the measurement of diabetes control, HbA1c levels can be affected by a variety of extraneous variables. One of the main extraneous variables that was not accounted for in this project was changes in pharmacologic therapy. Changes in pharmacologic therapy could have contributed to the changes in HbA1c levels, though medication adherence was assessed. It is difficult to say whether the change was from the assessment of medication adherence or the medication itself.

The main concern with the collection of the secondary outcomes (SBP and DBP) was that the majority of the participants were normal pre-intervention; therefore, a significant reduction post-intervention was not anticipated. However, most participants still had improvements in blood pressure.

Implications for the Future

Practice

The results from this study show that DSME and goal setting administered via telehealth can be utilized to improve glycemic control for those with an HbA1c of $\geq$9%. It was an effective method of reducing HbA1c levels. These results were similar to previous studies that utilized this intervention (Chamany et al., 2015; Heitkemper et al., 2017; Wu et al., 2018). The findings from this project support the expansion and continuation of DSME administered via telehealth. In addition to the quantitative data above, qualitative data from participants also supports DSME administrated via telehealth.

EBP Model

The use of the JHNEBP practice model was crucial in the development, evidence, and translation of this EBP practice project. The practice question phase began with an inquiry into best practice, a diabetes team was formed. A multidisciplinary team was formed and the EBP question was narrowed down to non-pharmacological interventions to lower HbA1c levels in adult patients with diabetes and an HbA1c of greater than 9%. Initially, the intervention was going to consist of group diabetes education classes. The Covid-19 pandemic of 2020 forced the team to adjust the proposed intervention. The evidence phase began with a review of literature and high-level high-quality evidence was located. This evidence showed that DSME administered via telehealth was best practice for participants with an HbA1c $\geq$9%. Upon presenting this information in a weekly meeting, the intervention shifted from in person group meetings to individualized telehealth meetings. The translation phase began with gathering education material to give to participants. The translation phase is also where the idea to administer the DSMQ to allow the DNP student to provide individualized participant education began.

One of the main issues was the creation of an action plan related to physical activity of the participants. Winter is not the opportune time to do outdoor activities, and participants were discouraged form leaving their houses to reduce the spread of Covid-19. An intervention to increase physical activity that could be done from home was necessary. Free online exercise videos that were endorsed by both the American Heart Association and the American Diabetes Association (Acosta, 2018) were recommended to participants to increase physical activity without leaving home. These videos provided participants with the means to exercise from home, they also provided a variety of walking videos that could be completed in the safety of their home.

Research

By nature, a project that participants are aware of the measurement are highly susceptible to reactivity. Reactivity is a threat to external validity that explains the phenomenon of participants changing behaviors for the duration of the study and shortly after reverting to old behaviors. This causes researchers to question the change in the primary outcome. One way that future studies can show that reactivity did not factor into the change of HbA1c is to follow the participants over a longer period of time once the intervention is complete. If the HbA1c reduces or stays the same, then reactivity can be ruled out. On the other hand, if the HbA1c reverts to pre-intervention levels, it could be assumed that reactivity could have caused the reduction in HbA1c.

Education

Since the project was successful in reducing HbA1c levels in participants with uncontrolled diabetes, the project site desired to continue the intervention. The project site selected a nurse that is currently working for them to receive education on the project design. This education ensures that the project continues beyond the intervention period. In addition, printed material was given to the project site to give to patients newly diagnosed with diabetes mellitus. Materials are available in English and Spanish to account for the project sites large population of Spanish speaking individuals. All providers at similar clinical sites need education on best strategies to achieve improvements in HbA1c levels. This education can be given during the monthly provider meeting. Nurses and medical assistants should receive education from the nurse that has already received the education from the DNP student.

Conclusion

In conclusion, the results of this EBP practice project showed that DSME and goal setting administered via telehealth significantly improved HbA1c levels for participants in this EBP project. Persons with a diagnosis of type I or II diabetes mellitus require extensive education on self-management. This education requires more time than is typically available in a 20-minute office visit. Simple modifications to physical activity, diet, and medication adherence can have a significant impact on HbA1c levels and result in better outcomes for patients with diabetes (CDC, 2019).

In 34 years, the estimated number of people worldwide living with diabetes mellitus increased from 108 million to 422 million (WHO, 2020). These numbers show a 390.7% increase a period of 34 years which indicates the demand for simple, effective, and efficient DSME interventions. The goal of this EBP project was to reduce health disparities in diabetes care for the targeted patient population. The intervention was designed to account for barriers that were unique to the specific patient population. The quantitative results of this project show that this goal was achieved successfully. Furthermore, quantitative results were supported by qualitative results from participants explaining that they benefited from this intervention.

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BIOGRAPHICAL MATERIAL

Tanner Free graduated from Ivy Tech Community College with an associate of science in nursing in May of 2014. Upon graduation, he began his career as an intraoperative registered nurse at an outpatient surgery center in Northern Indiana. In 2015 he transitioned to the cardiovascular operating room and cared for patients with a variety of complex cardiovascular conditions. Tanner continued to expand on his knowledge of intraoperative nursing by becoming a member of the trauma surgery team. In this role he learned to provide care for patients with a variety of complex traumatic injuries. He obtained his Bachelor of Science in nursing in 2018 from Indiana University. Tanner has obtained the certified nurse operating room (CNOR) specialty certification. He has also completed the trauma nursing core course (TNCC). Tanner will be a member of the 2021 Valparaiso Doctor of Nursing Practice graduating class and intends to work in the family practice setting upon graduation.

ACRONYM LIST

ADA: American Diabetes Association

CDC: Centers for Disease Control

CINAHL: Cumulative Index to Nursing and Allied Health Literature

DBP: Diastolic Blood Pressure

DNP: Doctorate Nursing Practice

DSME: Diabetes Self-Management Education

DSMQ: Diabetes Self-Management Questionnaire

EBP: Evidence Based Practice

HbA1c: Glycated Hemoglobin

HRSA: Health Resources Services Administration

JBI: Joanna Briggs Institute

JHNEBP: John Hopkins Nursing Evidence-Based Practice

OSV: Operational Site Visit

PICOT: Population Intervention Comparison Outcome Time

RCT: Randomize Control Trial

TRIP: Turning Research into Practice

US: United States

WHO: World Health Organization

Appendix A

Consent Script

Code #

Consent Script

Introduction

Hi, my name is Tanner Free, and I am a graduate Nursing student at Valparaiso University. I am working with Dr ______ and _____Health Center on a project related to diabetes. We are following best practice principles to improve diabetes care. We are starting diabetes self-management education given via telehealth to see if it helps to decrease HbA1c levels in patients with diabetes.

The duration of this project is going to be 3 months. During these 3 months, you will receive a call from me every two weeks. During this call, I will be giving education regarding diabetes management, asking about taking medication and following diet and exercise recommendations. We will also work on supporting diabetes management goals based on your responses. Each phone call should last about 15 minutes.

The only requirement from you is your time and access to a telephone.

There are no risks associated with participation in this project. A benefit to participation is free diabetes self-management education and potentially better diabetes control.

Your responses to my questions will be kept confidential and your names will not be attached to the information. I will eventually tally your data with others who are participating and share what I learn with other providers.

If you have any questions or concerns regarding the project please contact me via email:.

Would you be interested in participating in this project? Your decision will not impact the care that you already receive at Heart City.

YES NO

If yes, what is a good email address to send you documents and what

Is this the best phone number to contact you?

What day/time is best to contact you?

Appendix B

Data Collection

Code Number:

Demographic data

Gender: Age: Marital status: Work Status: Household Income:

Education: Healthcare Coverage: Wt: Race:

Pre-intervention Characteristics

-DSMQ= -HbA1c= -Blood Pressure= -LDL Cholesterol= -Activity min/day=

Intervention

Call #1-

Call #2-

Call #3-

Call #4-

Call #5-

Call #6-

Post-intervention results

-DSMQ= -HbA1c= -Blood Pressure= -LDL Cholesterol= -Activity min/day=

-BMI=

Appendix C

Diabetes Self-management Questionnaire

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

12. I tend to forget to take or skip my diabetes medication (e. g. insulin, tablets). ☐ *Diabetes medication/insulin is not required as a part of my treatment.*	☐3	☐2	☐1	☐0
13. Sometimes I have real 'food binges' (not triggered by hypoglycaemia).	☐3	☐2	☐1	☐0
14. Regarding my diabetes care, I should see my medical practitioner(s) more often.	☐3	☐2	☐1	☐0
15. I tend to skip planned physical activity.	☐3	☐2	☐1	☐0
16. My diabetes self-care is poor.	☐3	☐2	☐1	☐0

(Schmitt et al., 2013)

Appendix D

Diabetes Self-management Education and Support Algorithm: Action Steps

Diabetes Self-management Education and Support Algorithm: Action Steps

Four critical times to assess, provide, and adjust diabetes self-management education and support

At diagnosis	***Annual*** assessment of education, nutrition, and emotional needs	When new ***complicating factors*** influence self-management	When ***transitions*** in care occur
Primary care provider/endocrinologist/clinical care team: areas of focus and action steps			
❑ Answer questions and provide emotional support regarding diagnosis ❑ Provide overview of treatment and treatment goals ❑ Teach survival skills to address immediate requirements (safe use of medication, hypoglycemia treatment if needed, introduction of eating guidelines) ❑ Identify and discuss resources for education and ongoing support ❑ Make referral for DSME/S and MNT	❑ Assess all areas of self-management ❑ Review problem-solving skills ❑ Identify strengths and challenges of living with diabetes	❑ Identify presence of factors that affect diabetes self-management and attain treatment and behavioral goals ❑ Discuss effect of complications and successes with treatment and self-management	❑ Develop diabetes transition plan ❑ Communicate transition plan to new health care team members ❑ Establish DSME/S regular follow-up care
Diabetes education: areas of focus and action steps			
Assess cultural influences, health beliefs, current knowledge, physical limitations, family support, financial status, medical history, literacy, numeracy to determine content to provide and how: ❑ Medications—choices, action, titration, side effects ❑ Monitoring blood glucose—when to test, interpreting and using glucose pattern management for feedback ❑ Physical activity—safety, short-term vs. long-term goals/recommendations ❑ Preventing, detecting, and treating acute and chronic complications ❑ Nutrition—food plan, planning meals, purchasing food, preparing meals, portioning food ❑ Risk reduction—smoking cessation, foot care ❑ Developing personal strategies to address psychosocial issues and concerns ❑ Developing personal strategies to promote health and behavior change	❑ Review and reinforce treatment goals and self-management needs ❑ Emphasize preventing complications and promoting quality of life ❑ Discuss how to adapt diabetes treatment and self-management to new life situations and competing demands ❑ Support efforts to sustain initial behavior changes and cope with the ongoing burden of diabetes	❑ Provide support for the provision of self-care skills in an effort to delay progression of the disease and prevent new complications ❑ Provide/refer for emotional support for diabetes-related distress and depression ❑ Develop and support personal strategies for behavior change and healthy coping ❑ Develop personal strategies to accommodate sensory or physical limitation(s), adapting to new self-management demands, and promote health and behavior change	❑ Identify needed adaptions in diabetes self-management ❑ Provide support for independent self-management skills and self-efficacy ❑ Identify level of significant other involvement and facilitate education and support ❑ Assist with facing challenges affecting usual level of activity, ability to function, health beliefs, and feelings of well-being ❑ Maximize quality of life and emotional support for the patient (and family members) ❑ Provide education for others now involved in care ❑ Establish communication and follow-up plans with the provider, family, and others

(Powers el al., 2020)

Appendix E

Medical Record Code/Decode Formulas

The following formula was utilized to convert the medical record number into a code number.

Code formula

- C= Code Number
- MR=Medical record number
- C= MR+7

The following formula was utilized to convert the code number into the medical record number.

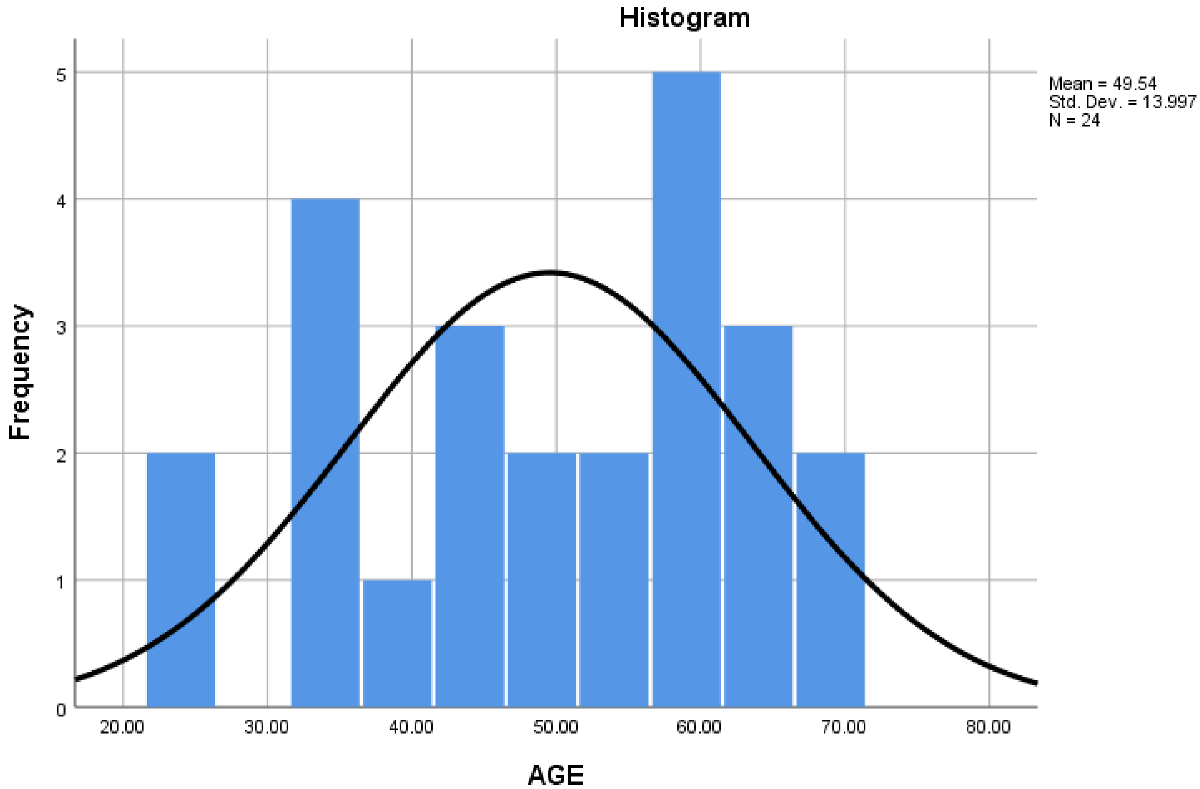
Decode Formula

- MR=Medical record number
- C= Code Number
- MR= C-7

Appendix F

Participant Age Distribution

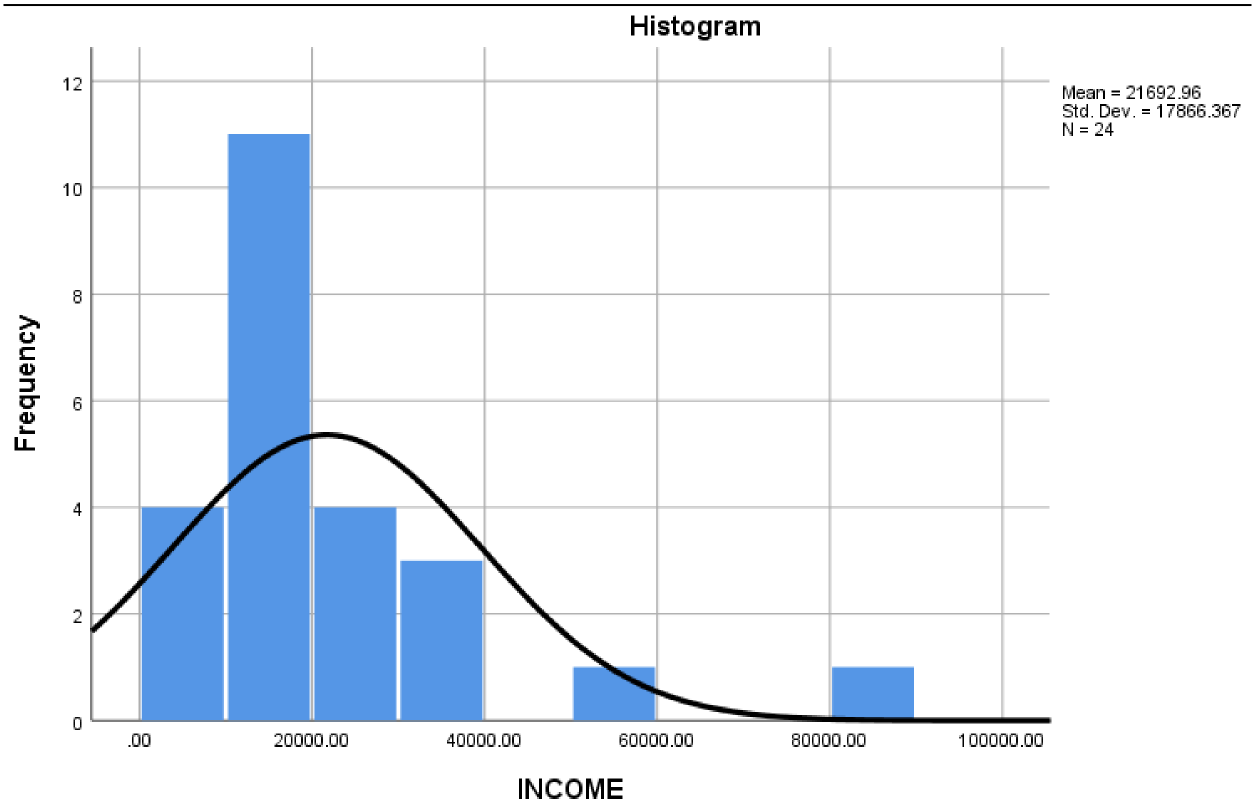
Statistics	
INCOME	
N	24
Mean	21692.9583
Std. Error of Mean	3646.95686
Median	15000.0000a
Mode	15000.00
Std. Deviation	17866.36686
Variance	319207064.824
Skewness	2.168
Std. Error of Skewness	.472
Kurtosis	5.972
Std. Error of Kurtosis	.918
Range	84472.00
Minimum	.00
Maximum	84472.00



Appendix G

Participant Income Distribution

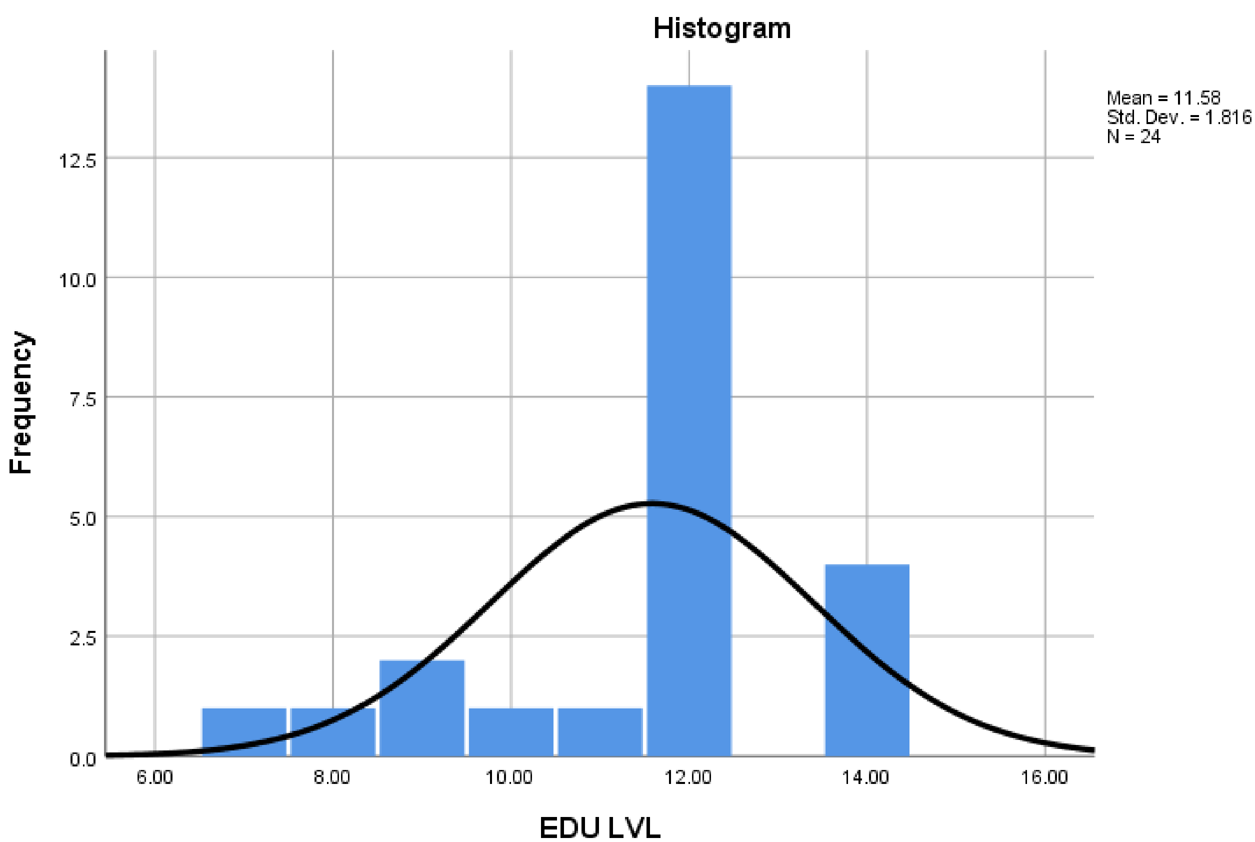
Statistics	
INCOME	
N	24
Mean	21692.9583
Std. Error of Mean	3646.95686
Median	15000.0000a
Mode	15000.00
Std. Deviation	17866.36686
Variance	319207064.824
Skewness	2.168
Std. Error of Skewness	.472
Kurtosis	5.972
Std. Error of Kurtosis	.918
Range	84472.00
Minimum	.00
Maximum	84472.00



Appendix H

Participant Education Distribution

Statistics	
EDU LVL	
N	24
Mean	11.5833
Std. Error of Mean	.37065
Median	11.8667a
Mode	12.00
Std. Deviation	1.81579
Variance	3.297
Skewness	-.978
Std. Error of Skewness	.472
Kurtosis	.920
Std. Error of Kurtosis	.918
Range	7.00
Minimum	7.00
Maximum	14.00



Appendix I

Pre/Post-Intervention HbA1c Distribution