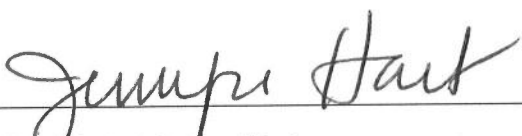# Implementation of a Diabetes Education Initiative in a Privately-Owned Family Practice

By

Howard William Ward III

APPROVED BY:

Jennifer Hart   8/31/22

Dr. Jennifer Hart, Advisor/Chair   Date

(signature)   8/30/22
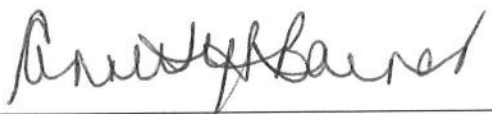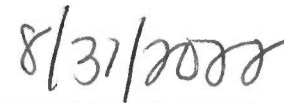
Dr. Charles Hofmann, Committee Member   Date

Annette Barnes   8/31/2022

Dr. Annette Barnes, Graduate Program Chair   Date

Implementation of a Diabetes Education Initiative
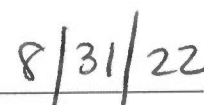
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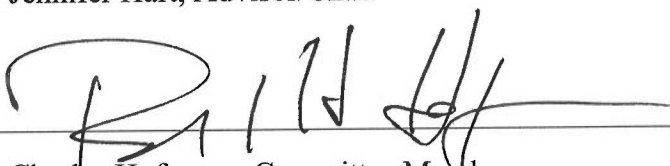
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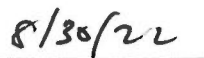DNP Project submitted to the School of Nursing

of Salisbury University in partial fulfillment of the requirements

for the degree of

Doctor of Nursing Practice

May 2022

IMPLEMENTATION OF DIABETES EDUCATION INITIATIVE

Dedication

This project is dedicated to my parents, Donna and Charles Laird; my grandparents, Ellen and Howard Ward Sr; and father, Howard Ward Jr., who were my biggest supporters throughout this entire process.

Acknowledgments

I would like to acknowledge several people who assisted me in the completion of this project and my doctorate degree. Special thanks to Dr. Jennifer Hart, my DNP committee chair, who guided me throughout this entire process of proposal development and project implementation. Much thanks to Dr. Charles Hofmann, who was on my DNP committee and served as an extraordinary clinical mentor. To Dr. Annette Barnes, my Graduate Program Chair that also assisted in the completion of this project. Finally, I would like to thank my parents, Donna and Charles Laird, who continued to motivate and support me with love and encouragement throughout all aspects of my life.

Abstract

Of the 34 million Americans living with diabetes mellitus (DM), approximately 95% have type-2 diabetes mellitus (T2DM), which is characterized by insulin resistance and gradual loss of insulin production (Centers for Disease Control and Prevention [CDC], 2019). Inefficient use of insulin causes excess glucose to build up in the bloodstream placing individuals at high risk for target organ damage (CDC, 2019). In rural and underserved areas of the country, the prevalence of T2DM among Americans continues to grow at an alarming rate (CDC, 2019). This office-based quality improvement project utilized a pre-test post-test design to assess patient self-care knowledge of T2DM before and after a standardized education session. The purpose of the education was to reinforcepatient understanding of DM, as well as promote healthy lifestyle modifications to effectively manage the disease in patients residing in a rural, underserved area. This project aimed to answer the following question: "In adults 18 years of age and over recently diagnosed with T2DM, does early implementation of standardized disease-specific education increase patient Revised Diabetes Knowledge Test (RDKT) scores andcompliance with T2DM management over standard care?" Participants were recruited from a privately-owned family practice located in a rural, underserved area, and those patients with a recent or new diagnosis of T2DM were eligible to participate. Descriptiveand inferential statistics were used for quantitative data analysis. A one-sample t-test showed statistical significance in the difference in pre-test and post-test scores before andafter the education, t (4.922), $p < .05$. Findings from this DNP project have potential to contribute to the lack of data and improve clinical practice in other rural, underserved areas.

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Implementation of a Diabetes Education Initiative

in a Privately-Owned Family Practice

Project Overview

Of the 34 million Americans living with diabetes mellitus (DM), approximately 95% have type 2 diabetes mellitus (T2DM), which is characterized by insulin resistance and a gradual loss of insulin production (Centers for Disease Control and Prevention [CDC], 2019). Inefficient use of insulin can cause excess glucose to build up in the bloodstream placing individuals at high risk for target organ damage (CDC, 2019). Once target organ damage occurs, malfunction of other organs can lead to other health complications such as heart disease, chronic kidney disease, and diabetic retinopathy (CDC, 2021).

Type 2 diabetes mellitus is an endocrine disorder that often occurs in adults 45 years of age and older, however, it has been increasing more in children, teens, and young adults (CDC, 2019). Development of T2DM is caused from a "progressive loss ofβ-cell insulin secretion frequently on the background of insulin resistance" (American Diabetes Association [ADA], 2020, p. 11). As the human body becomes insulin resistant,insulin secretion from the pancreas becomes impaired thus causing blood sugar to rise (CDC, 2019). Although management of T2DM requires the support of a healthcare provider, the most important factor in managing this disease is patient self-management (CDC, 2019). Disease-specific education is vital to effective self-management; therefore,assessing patients' baseline knowledge of T2DM can allow healthcare providers to identify and improve upon the knowledge gaps that currently exist.

Risk factors associated with T2DM have been identified and categorized into twogroups: non-modifiable risk factors, those risks a person cannot change, and modifiable risk factors, those risks a person can change. Non-modifiable risk factors include a person's family history, race or ethnic background, age, and history of gestational diabetes (AHA, 2015). Modifiable risk factors include overweight/obesity, physical inactivity, hypertension, smoking tobacco, and abnormal cholesterol levels (AHA, 2015).Although some risk factors are beyond a person's control, there are healthy lifestyle modifications that can reduce the risk or delay development of T2DM (AHA, 2015). Themost beneficial lifestyle modification that reduces risk of T2DM include diet and exercise. Engaging in at least 150 minutes of moderate-intensity aerobic physical activityper week and reducing body weight by up to 7% can decrease the risk of T2DM by 50% (AHA, 2015). Furthermore, identifying modifiable and non-modifiable risk factors can help gauge overall risk for T2DM and promote earlier identification of the disease.

Provider management that includes education and support to adults with T2DM is a critical component to prevent future health complications, such as target organ damage. Enrolling individuals in a diabetes self-management education and support (DSMES) program has been shown to produce positive health outcomes; therefore, at risk populations should be highly considered (ADA, 2020; Zhou, 2020). Populations at risk are frequently located in rural and underserved areas. These populations rely heavily on receiving healthcare from providers of primary care offices, and they need to be properly educated on T2DM by these providers to achieve effective self-management.

Problem Statement

The prevalence of T2DM among Americans continues to grow especially in rural and underserved areas of the country. This is attributed to unhealthy behaviors that contribute to the development of T2DM. Specifically, 44% of the current population is obese, 20% report tobacco use, and 35% are physically inactive (County Health Rankings, 2020). As these statistical measures decline, development of T2DM will continue to surge and wreak havoc on this population. Early detection with targeted management and education of patients with T2DM will help reduce the development of health complications such as target organ damage. Other potential benefits that can be associated with early detection, targeted management, and education include a reduction in healthcare costs and T2DM related hospital admissions, as these individuals are highly susceptible to experiencing kidney failure, heart failure, lower-limb amputations, and blindness (Siegel, 2020). Although this can be accomplished by implementing evidence-based health promotion and pharmacological management, standardized education and support post-diagnosis from a healthcare provider is a preventative healthcare measure that is needed in a rural primary care office located in Maryland.

Purpose of Project

This Doctor of Nursing Practice (DNP) project was an office-based quality improvement project that utilized a pre-test, post-test design. The purpose of this DNP project was to assist primary care providers to utilize the Revised Diabetes Knowledge Test (RDKT) to identify knowledge gaps and improve self-management of patients with T2DM residing in a rural, underserved area.

Following administration of the RDKT, participants received standardized education regarding T2DM and proper self-management. This DNP project also aimed to

bridge knowledge gaps and assist with the adoption of healthy lifestyle modifications in diabeticpatients to prevent future health complications associated with this chronic illness. A long-term goal of this project is to decrease target organ damage that results from poordiabetes self-care.

Clinical Question

This project aimed to answer the following question: In adults 18 years of age andover recently diagnosed with T2DM, does early implementation of standardized disease-specific education increase patient RDKT scores and compliance with T2DM management over standard care?

Succinct Synthesis and Analysis of Supporting Literature

Literature Search

Johns Hopkins Bayview Medical Center's Harrison Medical Library was used to identify potential research articles. A comprehensive review of literature was conducted using the following databases: CINAHL, and MEDLINE. The search was conducted from September 2020 – April 2021. Search terms included: "type 2 diabetes," "self-care OR self-management," and "primary care." CINAHL and MEDLINE databases were searched simultaneously, therefore duplicate research articles were automatically identified and removed. Articles describing quantitative and qualitative research were generated from the use of the search terms. Date of publication of 2016 to 2021, inclusion of full-text articles and articles that studied "all adults," narrowed the search to 32 eligible reports. Twenty-two of these reports were excluded, and the remaining research articles were inputted and further analyzed using a table of evidence. The comprehensive review of literature resulted in a total of 10 research articles. A PRISM

diagram overviewing the selection process was developed (Appendix A). A Table of

Evidence was also developed to provide a summary of the 10 research articles utilized for

the DNP project (Appendix B).

Level and Quality of the Evidence

Research articles were graded on level (i.e., strength of research) and quality

using the Johns Hopkins Nursing Evidence-Based Practice Model (JHNEBP) (Dearholt

& Dang, 2017). Of the 10 research articles that met inclusion criteria for this project,

three research articles were level I, four research articles were level II, and three research

articles were level III. Of the level I or highest strength research articles, two were rated

as B or good quality and one rated as C or low quality. The four level II research articles

were comprised of three rated as B or good quality articles, and one rated as C or a low

quality article. All the level III research articles were rated as B or good quality. Overall,

the evidence utilized for development of the project's intervention and outcomes was of

good quality.

Synthesis/Review of Literature

Type 2 diabetes mellitus continues to be a chronic disease that is managed by

healthcare providers in the primary care setting. A comprehensive literature review was

conducted to understand how to improve T2DM patient knowledge and self-care in the

primary care setting. Several major themes emerged from reviewing the literature: the

beneficial impact of a multidisciplinary approach, lack of provider support in patients

with T2DM, and improvement in patient outcomes with T2DM management programs

that include education as a key component of self-care.

Beneficial Impact of a Multidisciplinary Approach

Establishing a multidisciplinary approach to treat and manage chronic illnesses has been known to improve patient outcomes and literature supports that the medical management of T2DM in the primary care setting could benefit from a team approach. In a study by Gucciardi et al. (2020), mean A1C levels improved significantly among participants who received education from a diabetes team that was comprised of a nurse and a dietitian. Similarly, Flode et al.'s (2017) study implemented a T2DM program developed by a diabetes nurse, a physician, a foot care therapist, a physiotherapist, and a nutrition specialist. The researchers utilized a multidisciplinary approach which demonstrated a significant improvement in participants' diabetes knowledge compared to usual care. In contrast, du Pon et al. (2019) implemented an interdisciplinary self-management training program to T2DM patients and found no significant differences on self-reported outcomes such as knowledge, diabetes self-care behavior, and health-related quality of life. However, the lack of effects in primary outcomes may be explained by the already high scores at baseline which indicated that the patients included in the study had generally well managed T2DM, so there was limited room for improvement (du Pon et al., 2019).

T2DM Patients Lacking Provider Support

Newly diagnosed T2DM patients should receive self-care recommendations from healthcare providers. However, the research suggests that healthcare providers who manage T2DM in the primary care setting fail to provide adequate educational and management support to T2DM patients. In a qualitative study by Kjellsdotter et al. (2020), it was found that a provider-patient support gap existed due to providers'

uniformed approach to disease management, creating a lack of responsiveness to the

individual needs of each T2DM patient. Burridge et al. (2016) found that establishing

stronger provider-patient relationships improved patient self-management knowledge

needed to gain and maintain control of T2DM, and Koponen et al. (2018) found that

perceived autonomy support from a primary care physician contributes to improving

autonomous motivation and self-care knowledge regarding self-weight management**.**

Self-care behaviors are also influenced by stronger provider-patient relationships

that improved patient knowledge. Yao et al. (2020) found that T2DM patients who had

betterdiabetes knowledge and higher self-efficacy are more likely to adhere to diabetes

management care. Increasing provider engagement with T2DM patients in a primary

care setting has potential to increase patient knowledge and improve patient self-

management.

T2DM Education Programs Improve Patient Outcomes

Several studies found that there is an influential relationship between T2DM

education programs and patient outcomes. Flode et al (2017) demonstrated that the

implementation of an educational self-management program significantly improves

baseline diabetes knowledge. This improvement in knowledge persisted for three months

after program implementation (Flode et al., 2017). Gucciardi et al. (2020) integrated a

diabetes education program into a primary care setting which increased the proportion of

T2DM patients achieving a target A1C of less than or equal to 7%. In a study by Lin et

al. (2019), implementing a T2DM education program redirected patient behavior,

increasing patient participation in diet and exercise, foot care, blood-sugar monitoring

and management, and diabetes drug use. Furthermore, Oksman et al. (2017) found that

implementation of an educational coaching intervention produced lower healthcare costs in T2DM patients. Implementation of diabetes education programs also demonstrated a lasting impact on self-care behaviors, cost, and quality of life (Lin et al, 2019; Oksman et al., 2017).

Utilizing the identified themes that emerged from the comprehensive review of literature could lead to the expansion of effective T2DM management strategies. Although there remains a vast amount of literature available on T2DM management, none of the identified research articles studied patients in a rural healthcare environment. Application of a T2DM education-initiative in a rural primary care setting will have the capability to reinforce patient understanding and promote the adoption of healthy lifestyle modifications.

Theoretical Framework & Quality Improvement Model

Theory of Self-Care of Chronic Illness

The Theory of Self-Care of Chronic Illness is a middle-range theory that guided this DNP project. The use of this middle-range theory allows one to obtain a more holistic view of patients with multiple chronic conditions (Smith & Liehr, 2018).

Chronic conditions associated with the diagnosis of diabetes include hypertension, abnormal cholesterol and high triglycerides, and obesity, all of which require individuals to participate in self-care (American Heart Association, 2015). For this DNP project, the theory of self-care of chronic illness was used as a theoretical framework to initiate an office-based educational intervention for patients newly diagnosed with T2DM. Performed in both healthy and ill states, self-care is "a process of maintaining health through health-promoting practices and managing illness" (Smith & Liehr, 2018, p. 342).

However, individuals with a chronic illness such as diabetes, will require behavioral changes to control the illness process, decrease the burden of symptoms, and improve survival (Smith & Liehr, 2018).

The Theory of Self-Care of Chronic Illness is comprised of three self-care concepts: self-care maintenance, self-care monitoring, and self-care management (Smith & Liehr, 2018). Self-care maintenance represent the individual's behavior related to health promotion or illness. Maintenance behaviors such as smoking cessation, diet and exercise, and medication compliance were represented in this project through patient education. Smith & Liehr (2018) defines self-care monitoring as "the process of observing oneself for changes in signs and symptoms" (p. 343). Self-care monitoring for individuals with chronic illness requires a systematic approach that is incorporated into one's daily routine (Smith & Liehr, 2018). Individuals that are newly diagnosed with diabetes are required to engage in self-care monitoring such as point-of-care home blood sugars checks. Lastly, self-care management represents the individual's response and decision-making process when potentially experiencing signs and symptoms related to the chronic illness (Smith & Liehr, 2018). All the stages of self-care were represented through educational sessions provided via follow-up phone-calls and measured using the RDKT in a pre-test, post-test fashion.

Plan-Do-Study-Act (PDSA) Cycle

The Plan-Do-Study-Act (PDSA) Cycle guided this scholarly project. The PDSA Cycle serves as a tool that allows one to examine and assess change (Institute for Healthcare Improvement, 2017). This model requires four steps that include developing a plan to test change, implementing the test, examining the results of implementation, and

concluding if any potential modifications are needed for the next cycle (Institute for Healthcare Improvement, 2017).

A thorough assessment of the patient population and healthcare organization was conducted to identify a need for change. Lack of patient education regarding the treatment and management of T2DM was identified and determined to be the focus of this quality improvement project. The process of implementing change consisted of providing patient education to newly diagnosed type-2 diabetics via a follow-up phone-call. The RDKT was administered before and after patient education and scores were compared. Data were analyzed for potential adaptations in the management of adults with T2DM to determine change applicability within this healthcare organization. The implementation phase of this project occurred over an estimated 5-month period to increase the sample size.

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Project Design

Methodology

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Study Design

This office-based quality improvement project utilized a pre-test, post-test design to assess patient self-care knowledge of T2DM before and after a standardized education session. A standardized education session was provided to all participants via telephone by the project co-investigator. Additional study aims included reinforced patient understanding of T2DM, promotion of healthy lifestyle modifications to effectively manage this chronic disease, identification of disease specific knowledge gaps, and improved T2DM self-management. A long-term goal of this project is to decrease target organ damage that results from poor diabetes self-care.

Participants

Participants were recruited using purposeful sampling, and patients of the family practice that met the inclusion criteria were eligible to participate. Participation criteria included individuals 18 years or older, who sought care from any primary care provider at the privately-owned family practice for a recent or new diagnosis of T2DM. Identification of these participants was done through hemoglobin A1-C values (HgbA1C). Hemoglobin A1-C is a T2DM diagnostic lab value that measures the average blood sugar for the past two to three months; a HgbA1C greater than or equal to 6.5% is indicative of T2DM (American Diabetes Association, 2021). Participants were required to be English speaking and able to comprehend the informed consent form. Individuals excluded from this project include non-English speaking patients and those who sought medical care unrelated to diabetes management, as well as those with cognitive impairment or dementia as they were not responsible for managing their own self-care. For this project, a recent diagnosis of T2DM was defined as any new diagnosis made within the two months prior to the project's implementation, and a new diagnosis of T2DM was defined as any new diagnosis made during the one month following the project's implementation. It was believed these definitions would allow for an adequate sample size as patients with a recent diagnosis were generally scheduled for routine follow-up visit within three months.

Instrument

The RDKT is a printed questionnaire that was used to assess each participant's baseline knowledge of T2DM. This test served as a quick and cost- effective method in assessing general knowledge of diabetes and diabetes self-care. The RDKT is comprised

of 23-items total, including a 14-item general test and a 9-item insulin use subscale. For

this DNP Project, the RDKT was revised to an 18-item test to be applicable to the

population of interest (Appendix C). Participants were not assessed on items that

involved insulin administration due to current evidence-based practice guidelines that do

not include insulin as first-line therapy for management of T2DM. Administration of the

RDKT was completed using a pre-test, post-test method. The readability level for the

RDKT was measured by the Flesch-Kincaid grade level and calculated at the fourth grade

reading level. Fitzgerald et al. (2016) found the RDKT to be reliable and valid, and it is

availableto clinicians and researchers at no cost.

Education Intervention

This DNP project's education intervention was derived from the lack of a

standardized education process provided to patients newly diagnosed with T2DM. For

the educational intervention, three DM self-management brochures were provided to the

participants after the completion of the RDKT pre-test. The participants were instructed

to review these three diabetes self-management brochures at their own convenience. The

diabetes self-management brochures were created by the Diabetes Research and Wellness

Foundation and are free to the public. The three diabetes self-management brochures

utilized for this DNP project are entitled: What is Diabetes (Appendix D), Diabetes and

Exercise (Appendix E), and Diabetes and Healthy Eating (Appendix F). Together, these

three brochures covered the material tested on the RDKT. During the education

intervention, key information derived from the three diabetes self-management brochures

were reviewed with each participant. The project co-investigator administered the

education intervention over the telephone using a guided outline (Appendix G). All

educational materials were graded 10th grade reading level based on the Flesch-Kincaid

grade level score. Brochures were available online to print at

http://www.diabeteswellness.net/diabetes-brochures.

Procedures

Participants were obtained using purposeful sampling that was divided into two

processes. The first process involved a targeted retrospective chart review, and the second

process involved real-time participant selection who met all inclusion criteria.

The retrospective chart review served to identify patients who were recently diagnosed

with T2DM two months prior to the implementation start date. Recruitment via

telephone began as soon as the project was implemented, and patients were contacted by

the co-investigator who informed them of the project and offered the opportunity to

participate using a script (Appendix H). The co-investigator was responsible for

recruiting potential participants via phone while in the family practice during business

hours. If thepatient agreed to participate at the time of the call, the informed consent was

read aloud. No follow-up call was made if the patient declined participation. A copy of

the informedconsent was mailed to the participants' home address listed on file at the

family practice,which was verified at the time of the call.

The second component of the sampling and recruitment plan required real-time

purposeful sampling. Real-time purposeful sampling occurred for two months after the

implementation start date. Purposeful sampling allowed the recruitment of individuals

who were newly diagnosed with T2DM at a scheduled office visit that fell within the

implementation start and end dates.

Informed consent was obtained from all participants. All patient identifiers were

omitted. Copies of signed informed consents and measurable data were coded and

securely stored in a locked cabinet located at the family practice. Once informed

consents were obtained from each participant, implementation of the RDKT pre-test

commenced. Participants recruited by retrospective chart review wereadministered the

RDKT pre-test via telephone by the co-investigator. Each question was thoroughly read

aloud, and the participant's responses were recorded. These participants were

administered the RDKT post-test in person at their three-month routine follow-up visit

during patient intake. A standardized education session that used the three diabetes self-

management brochures was administered to these participants via telephone by the

project co-investigator prior to completion of their RDKT post-test.

Participants recruited by real-time participant selection were administered the

RDKT pre-test during their office visit where they were informed of their new T2DM

diagnosis. When on site, the co-investigator administered the RDKT in the patient

examination room prior to participants being seen by a family practice provider. When

the co-investigator was not onsite, the RDKT was administered during intake in the

patient examination room by the family practice's medical assistant and/or the licensed

practical nurse. Once the RDKT pre-test was completed, each participant received the

three diabetes self-management brochures and instructed to review at their own

convenience. A standardized education session using the three diabetes self-management

brochures was administered to these patients via telephone prior to the administration of

the RDKT post-test by the co-investigator. These participants then completed the RDKT

post-test in person during their T2DM routine follow-up visit.

Data Collection

In addition to the RDKT pre-test and post-test results, additional data collection occurred through chart review, and included participants' demographic information (e.g., age, gender, race) and objective information (e.g., blood pressure, height, weight, laboratory values). To link participant information to individual patients, a coding spreadsheet was used to record participants' initials, their assigned code number, date of next office visit, and if the education intervention needed to be mailed pending their recruitment process (Appendix I). Data obtained for this project was de-identified, coded, and recorded on a data collection sheet to maintain participant anonymity (Appendix J). Retrospective data was collected and a table prepared to capture the pre- and post-implementation samples (Appendix K).

All data collection sheets were securely stored in a locked cabinet located at the privately-owned family practice. Microsoft Excel software was utilized to create an organized electronic file and further store data. Data was then entered in the Statistical Package for the Social Sciences (SPSS) computerized software for data analysis. All data was securely stored onto a USB flash drive with encryption and locked in a filing cabinet located at the privately-owned family practice. All identifying participant data pertaining to this DNP project was destroyed at the conclusion of this DNP project.

Plan for Analysis

Descriptive statistics were utilized to review data related to age, gender, tobacco usage, race, and insurance carrier of the participants. Inferential statistics were utilized to review the primary data related to the participants' range and mean pre- and post-test RDKT scores. Secondary data including participants' blood pressure, height and weight

for body mass index calculation, and laboratory values that can indicate the severity of

the T2DM and risk for complications (e.g., hemoglobin A1C, glucose,

cholesterol/LDL/HDL/triglyceride, and Creatinine/GFR) were also analyzed.

Setting and Organizational System Analysis (SWOT)

This DNP project occurred at a privately-owned family practice located in

Maryland. The county serving as the project setting is a rural, underserved area and

home of 25,616 residents. It currently ranks 22nd out of 24 counites in the state of

Maryland for overall health outcomes and 23rd for overall health behavior such as adult

smoking and adult obesity (County Health Rankings, 2021; United States Census Bureau,

2019). The population is comprised of approximately 54.2% White, 41.5% Black or

African American, 1.0% Asian, and 4.0% Hispanic or Latino (United States Census

Bureau, 2019). Of this population, 54.1% are male and 45.9% are female, and 17.3% are

over 65 years old (United States Census Bureau, 2019).

The Family Practice consisted of three primary care providers, including two

licensed medical doctors and one family nurse practitioner that manage and provide care

to an estimated 5,000 patients. Other staff involved in the implementation of the project

included one medical assistant, one licensed practical nurse, one office manager, one

assistant manager, and one office secretary. The Family Practice housed four patient

exam rooms and one laboratory equipped to provide internal and family medicine to the

local, underserved population.

Internal and external factors that could impact the success of this DNP project

were identified by performing an organization SWOT analysis (Appendix L). Strengthsto

implementing this DNP project were derived from the number of providers at this

primary care office and the population it serves. The Family Practice is considered a

smaller provider practice where providers are dedicated and have a greater ability to

adopt new interventions into their practice. Also, the office staff at this family practice

office are also dedicated in providing quality care to the population they serve.

Weaknesses that may be harmful in implementing this DNP project involved

possible patient resistance and limitations that accompany the practice's electronic health

record.One aim of this DNP project was for patients to become aware of and adopt

healthy behavioral changes that improve disease management. However, alarming

statistics show that it may be difficult for individuals from a rural, underserved area to

accept andadopt these beneficial lifestyle modifications. In addition, many of the patients

that seekcare at this primary care office lack access to their electronic health record.

Possible opportunities derived from implementation of this DNP project include

integration into practice across other local primary care offices, a demand for a diabetes

specialist, and increased awareness of rural healthcare. Findings from this DNP project

may support the need to provide T2DM patients standardized care that align with current

evidence-based guidelines. This DNP project has the opportunity to also identify

common gaps in T2DM self-management. Furthermore, patients who are referred to an

endocrinologist for their diabetes must travel to larger neighboring counties. Findings

from the DNP project may contribute to eliminating this barrier and reducing the burden

of T2DM self-management. Threats that may have negatively impacted the

implementation of this DNP project included patient transportation barriers and

information overload. The location of the Family Practice requires patients to travel

longer distances compared to suburban areas. In addition, patients who consented to

participate in this DNP project may have become overwhelmed with their new T2DM

diagnosis, the information presented in the RDKT pre-test, post-test, and the information

provided in the three diabetes self-management brochures.

Implementation Timeline

A detailed timeline was developed and strictly adhered to, to ensure project

completion by May 2022 (Appendix M). The timeline included identification of the

clinical question; development of the project proposal with university and organizational

approvals; implementation and data analysis; and dissemination of the findings.

IRB and Agency Approval

Approval for this DNP project was obtained from Salisbury University's

Institutional Review Board (IRB) on Human Subject Research (Appendix N). A letter of

collaboration and agreement was also obtained from the family practice (Appendix O).

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Project Implementation

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Project implementation occurred over a four-month period, from August 30th, 2021,

to December 17[h], 2021. Immediately upon implementation, a targeted retrospective chart

review was conducted to identify patients that had a HgbA1C result greater than or equal

to 6.5 between May 31st, 2021, and August 27th, 2021. Real-time participant recruitment

occurred simultaneously and was extended in an attempt to gain alarger sample size.

Extending real-time participant recruitment occurred due to limitations found during

implementation created by inclusion criteria and the project's definition of newly

diagnosed patients. Real-time participant recruitment for newly diagnosed T2DM patients

occurred August 30th, 2021, through October 29th, 2021.

The RDKT pre-test was administered in-person or via mail, depending on the

participant's recruitment process and next scheduled follow-up visit. The RDKT used

from this DNP project was revised to 18-items valued at 1-point per item. Next, the three

diabetes brochures and standardized diabetes education sessions were provided once a

participant's pre-test score was obtained. Each participant received one standardized

diabetes education session from the project's co-investigator. Each standardized diabetes

education session regarding self-management was conducted by telephone prior to the

participant's next scheduled follow-up visit. Lastly, the RDKT post-test was administered

in-person during the participant's next scheduled follow-up visit. The RDKT post-test

was then graded and recorded in an Excel Spreadsheet.

Other data that was collected for data analysis included the participant's age,

gender, race, height, weight, BMI, blood pressure, HgbA1C, glucose, and lipids. In

addition, chronic comorbid conditions associated with T2DM such as hypertension and

hyperlipidemia were recorded. Participants' history such as current tobacco and alcohol

use were also recorded. Finally, reported signs and symptoms identified at the time of

being newly diagnosed with T2DM were recorded. These included polydipsia, polyuria,

weight changes, visual disturbances, chest pain, paresthesia, and skin changes. Although

all this information was collected, analysis only included descriptive statistics of the

demographic information of the project's sample size, HgbA1C, pre-test, and post-test

scores. In addition, data analysis included inferential statistics to determine statistical

significance in the difference of pre-test, and post-test scores.

Summative Evaluation of Implementation Process

The purpose of this Doctor of Nursing Practice (DNP) project was to assist

primary care providers to utilize the Revised Diabetes Knowledge Test (RDKT) to

identify knowledge gaps and improve self-management of patients with type-2 diabetes

mellitus (T2DM) residing in a rural, underserved area.

The Institute for Healthcare Improvement's PDSA (Plan, Do, Study, Act) Cycle

guided the project implementation process. The PDSA Cycle is a quality improvement

model used to test a plan of change by developing a plan, testing the change, observing,

and learning the results, and determining what modifications should be made to the test

(Institute for Healthcare Improvement, 2022). A thorough assessment of the patient

population and healthcare organization was conducted to identify a need for change.

Lack of patient education regarding the treatment and management of T2DM was

identified and determined to be the focus of this quality improvement project. The

process of implementing change consisted of providing patient education to newly

diagnosed type-2 diabetics via a follow-up phone-call. The RDKT was administered

before and after patient education and scores were compared. Data were analyzed for

potential adaptations in the management of adults with T2DM and was conducted to

determine change applicability within this healthcare organization.

In this particular setting, patients with T2DM lacked knowledge regarding self-

management. The construct of this project was designed to deliver a standardized

education session, a significant change in practice for this rural, underserved area. The

effectiveness of the standardized education session was evaluated by the administration

of the RDKT pre-test and post-test. In addition, each participant's interaction during the

delivery of the standardized education session was observed. Although all education

materials administered to each participant were at the appropriate reading level, the

approach to begin each education session varied based on topics requested by the

participant. Each participant demonstrated a willingness to learn self-management

strategies involving diet and exercise; however, these topics were all included within the

three educational brochures that were distributed after administration of the RDKT pre-

test.

Data collection of laboratory results associated with T2DM occurred t0

assess for improvement from baseline; however, the current medication regimen for each

participant was assumed to attribute to improvements in associated laboratory results. In

addition, the process of obtaining the RDKT pre-test and post-test scores for each

participant required tenacity from the co-investigator. Although a determined date and

time were assigned for each participant, obtaining RDKT pre-test scores via telephone for

participants required multiple attempts from the project co-investigator. This was also

encountered by the project co-investigator when administering the standardized education

session via telephone. At the conclusion of the implementation process, five out of six

participants successfully completed all project milestones which included completion of

the RDKT pre- and post-test and standardized education session.

In addition, written monthly formative evaluations were conducted to identify

current barriers and facilitators. Identified barriers and facilitators led to increasing

participant recruitment by one month. Feedback from each monthly reflection was taken

into consideration and independent decision-making was done accordingly. Although the

summative evaluation occurred at the end of implementation, the evaluation of the

implementation process could have been more reflective of how the conceptual and

theoretical frameworks impacted the overall process.

Barriers and Facilitators

Several barriers were discovered during project implementation. The combination of the defined target population and the amount of time to implement the project limited the project's sample size. Eligible participants were of a very specific population due to the project's defined inclusion criteria. During project implementation, the majority of patients with a HgbA1C result greater than or equal to 6.5 were receiving chronic T2DM management and were therefore ineligible to participate in this project. In addition, sample size was limited by conflicts involving participants' next scheduled follow-up visit. Follow-up visits needed to be scheduled within the four-month project implementation period for patients to be eligible to participate. The extension of participant recruitment by one month allowed the co-investigator to gain one additional participant.

Another barrier discovered during the implementation process involved participant recruitment via telephone. Some patients viewed this recruitment method as "cold-calling," which led to their refusal to participate in the project. Also, implementation of this project relied on contacting participants via telephone to obtain the RDKT pre-test scores and to administer the standardized education session. Unsuccessful attempts in contacting participants occurred and contributed to the project's attrition rate.

Provider inconsistency regarding recommended follow-up visits for recently and newly diagnosed type-2 diabetics hindered project implementation. Providers' recommendations for follow-up visits of 3 months, 3-4 months, or 6 months were documented in the participants' progress note. This impacted the project implementation

because each participant had to hit certain markers to successfully complete the project. In addition, there was inconsistency with ordering labs for participants' follow-up visits which affected inferential data analysis.

Multiple facilitators were also identified during project implementation. First, the staff's support and assistance were catalytic for the project's implementation process. Staff members screened for eligible participants on days that the co-investigator was not present in office. In addition, office staff positively impacted participant recruitment due to their rapport with the patients.

Another facilitator included the establishment of a participant status board for each participant, and this was beneficial for the implementation process in a couple ways (Appendix P). This assisted with project organization and identified participants' progress throughout the implementation period. The individualized timeline also allowed for numerical priority to be determined for each participant based on the date of their next scheduled follow-up visit.

Overall, this project achieved the intended goal. The project was successful in providing additional T2DM education to patients that were recently or newly diagnosed with T2DM. In addition, knowledge regarding self-management of T2DM in newly diagnosed patients improved after receival of a standardized education session. This project was an invaluable learning experience that allowed the co-investigator to identify his own strengths and weaknesses as a future DNP-prepared advanced practice nurse.

Analysis and Discussion of Findings

Once project implementation concluded, data recorded in Microsoft Excel was transferred to IBM SPSS Software for analysis with descriptive and inferential statistics.

The targeted, retrospective chart review identified 164 patients to have a HgbA1C result greater than or equal to 6.5; however, of these patients, only 13 were found to be newly diagnosed with T2DM during the two-month period and eligible to participate in this project. Six patients declined participation, while three patients were excluded due to hospitalizations. Informed consent was obtained from the four remaining eligible participants.

Real-time participant recruitment occurred simultaneously. A total of 120 patients were found to have a HgbA1C result great than or equal to 6.5; however, of these patients, only seven patients were found to be newly diagnosed with T2DM during this period. Three patients declined participation in this project while two patients were excluded due to scheduling conflicts involving their routine follow-up visit. Informed consent was obtained from the two remaining eligible participants. A total of six (*n=6*) participants were yielded from both participant recruitment strategies.

The participant sample *(n=6)* for this DNP project included four males (66%) and two females (33%) females (Table 1). Other gender categories were not identified as the collection tool used binary categories. In addition, the participant sample (*n=6*) was 66.7% Caucasian and 33% Black. Participants' ages ranged from 41 to 69 years (mean age 53.8± standard deviation 9.3). Median age of the participant sample (*n=6*) was 54.5 years.

Table 1

Demographic Characteristics of Project Sample

Characteristics	*n*	Percentage (%)	Range (Low- High)	Mean (SD)
Age (years)			41-69	53.8 (±9.3)
Gender				
Female	2	33.3%		
Male	4	66.7%		
Race/Ethnicity				
African American/Black	2	33.3%		
Caucasian/White	4	66.7%		
Smoker				
Current/Former	2	33.3%		
Never	4	66.7%		
Insurance				
Medicare/Medicaid	1	50.00%		
UHC	1	16.67%		
CareFirst BC	3	16.67%		
Priority Partners	1	16.67%		

Five out of six participants' pre-test and post-test scores were analyzed due to one participant failing to maintain follow-up (Table 2). Pre-test scores ranged from 39% to 83% with a mean of 58.6% ± standard deviation of 18.6%, and the median pre-test score was 55.0%. Post-test scores after delivery of the standardized education via telephone ranged from 61% to 94% with a mean of 73%± standard deviation of 13.6%, and the median post-test score was 72.0%.

Table 2

Results of RDKT Pre-test and Post-test Scores

Participant	Pre-test %	Post-test %	p
1	55	72	
2	72	77	
3	xxx	xxx	
4	83	94	
5	44	61	
6	39	61	
Range (low-high)	39-83	61-94	
Mean (SD)	58.6% (±18.6)	73% (±13.6)	
Normality of Distribution Shapiro-Wilks)			0.731
Difference in Pre- & Post-test scores			.004*
Validation of One-sample *t*-test (Wilcoxon Signed Rank Test)			.021*
			Significance p<.05

The initial visit HgbA1C ranged from 6.7 to 11.1 for participants, with a mean of

7.7 ± standard deviation of 1.7. Participants' HgbA1C at the follow-up visit ranged from

5.8 to 8.7 with a mean HgbA1C of 7.2 ± standard deviation of 1.2.

Participants' initial BMI ranged from 24.21 to 48.24 with a mean of 35.51 ±

standard deviation of 9.15. The participants' BMIat their follow-up visit ranged from

27.12 to 48.87 with a mean follow-up BMI of 35.81 ± standard deviation of 8.60.

Due to the small sample size (*n*=6), non-parametric tests were utilized when

conducting inferential statistics. First, a Shapiro-Wilks test was used to determine

normality of distribution of the RDKT pre-test and post-test difference, and it did not

show evidence of non-normality (*W = 0.95*, *p-value = 0.73,* Table 2). Based on this

outcome and after visual examination of the histogram of pre-test versus post-test

difference, a parametric test was used to determine statistical significance.

A one-sample *t*-test was conducted to determine statistical significance in the

RDKT pre-test and post-test scores, because there was no evidence to reject normality. A

one-sample *t*-test revealed a statistical significance in the difference between participants'

pre-test and post-test scores, *t* (4.922), *p < .05,* Table 2*).* In addition, a paired-sample *t*-

test revealed a significant increase in participant's post-test scores with a statistically

significant difference, *t* (4.922), *p < .05,* when comparing the pre-test mean of 58.6 to the

post mean of 73.0. A Wilcoxon Signed Rank Test was conducted to validate the one-

sample *t*-test, and this non-parametric test also showed a statistically significant change in

RDKT pre-test and post-test scores (*Z =* -2.032, *p = 0.021,* Table 2*).*

Recommendations

Economic Considerations

Minimal costs were associated with the project development and implementation.

The costs included office supplies that assisted organization strategies regarding

participant recruitment and associated data collection. There were no costs associated

with other project materials, such as the RDKT pre-test/post-test and the three education

brochures. However, if the project was replicated and instilled into current practice,

business owners will need to consider this as a financial investment.

Replicating this project will require employment of an individual with a

healthcare background that would mirror the responsibilities of the project's co-

investigator. By implementing a standardized education initiative involving self-management of T2DM,patients may have reduced health care costs related to decreased utilization of T2DM follow-up visits. In addition, the implementation process of this project can be easily replicated and implemented in other similar settings.

DNP Role

As the project's co-investigator, project identification, development, and implementation provided opportunities to gain and employ skills of leadership and innovation embedded within the American Association of Colleges of Nursing (AACN) eight DNP Essentials. In addition, this project is the DNP student's first venture into scholarly practice who demonstrated achievement in all eight DNP essentials.

Project planning, development, and implementation demonstrated skills of leadership and innovation garnered from: *DNP Essential* I: *Scientific Underpinnings for Practice*, *DNP Essential* II: *Organizational and Systems Leadership for Quality Improvement and Systems Thinking, DNP Essential* III: *Clinical Scholarship and Analytical Methods for Evidenced-Based Practice, DNP Essential* VI: *Inter-professional Collaboration for Improving Patient and Population Health Outcomes*, *DNP Essential* VII*: Clinical Prevention and Population Health for Improving the Nation's Health*, and *DNP Essential* VIII*: Advanced Nursing Practice*.

Research of nursing theories and conceptual frameworks occurred in the initial stages of this project's development. The middle range theory, Theory of Self-Care of Chronic Illness, and the quality improvement model, PDSA Cycle, influenced the project's construct to improve knowledge of self-management in patients with T2DM. In addition, an appraisal of evidence-based research was done using a table of evidence

analysis. Findings from the research motivated and stimulated the development of this quality improvement project.

The design of this DNP project was strategically developed to meet the current needs of the type 2 diabetic patients who received care at a privately-owned family practice. In addition, this DNP project served as a representation of an education initiative for type 2 diabetic patients residing in a rural, underserved area. Furthermore, advanced communication skills with all project stakeholders were needed to develop and implement this office-based quality improvement project.

The RDKT pre-test post-test was used to evaluate the effectiveness of implementing a standardized education session for T2DM patients of a rural, underserved area. The standardized education session was developed from research evidence supporting the use of education as a means to improve self-management. Common themes that influenced the design of this DNP project were synthesized from analyzing current supporting literature.

Inter-professional collaboration occurred continuously throughout the whole project and included brainstorming, planning, intervention development, and implementation. In addition, inter-professional collaboration took form of on-going discussions with members of the DNP committee regarding issues that were encountered during implementation. Professional guidance was sought to determine how to overcome barriers that may negatively impact the project's success. In addition, communication with DNP committee members and office staff facilitated the implementation process.

Collaboration and communication between these partnerships originated from the co- investigator's desire to improve health outcomes of patients residing in a rural,

underserved area. Assuming the responsibility as the co-investigator required taking

initiative to monitor all parts of the project's implementation process. The

implementation process involved two methods of participant recruitment, administration

of the RDKT pre-test, and a standardized education session. Importantly, all participants

remained unharmed, and data remained confidential throughout the entire process.

Clinical prevention strategies utilized within this DNP project included the

evidence-based standardized education session. The standardized education session was

utilized with the intent to improve patient knowledge of self-management. Participants

were educated and counseled on preventative self-management strategies involving diet

and exercise. In addition, the standardized education provided to this population was

shown to be therapeutic; patient self-management knowledge improved as evidenced by

improved RDKT pre-test and post-test scores. Furthermore, the partnerships created from

the implementation of this DNP project facilitated a supportive environment that

provided optimal patient care and improved self-management knowledge in patients with

T2DM.

Process and Outcome Recommendations

Project sustainability requires obtaining input and buy-in from the organization and

key decision makers, defining long- and short-term policy strategies that assure

sustainability, acquiring resources, and defining the process for ongoing documentation

and organization of the project (Moran et al., 2020, p. 293). As the project co-

investigator, there were ongoing discussions with external DNP committee members

regarding the sustainability of the DNP project. In addition, written formative monthly

evaluations were conducted to identify barriers and facilitators. Feedback from each

monthly reflection was taken into consideration which resulted in extending participant recruitment.

Financial and logistical concerns were identified as major barriers for project sustainability. First, the continuation of providing a standardized education session for newly type-2 diabetic patients would require funding from outside sources. Although this project improved patient knowledge, the agency does not view implementing this quality improvement initiative as a profitable investment. In addition, incorporating thisquality improvement project into daily practice within the family practice would not be feasible due to the practice's current business structure and patient care model. This is attributed to the current patient overload, billable services for reimbursement, and time limitations allotted for each patient encounter. Outside funding would be used to cover the project expenses including a T2DM educator's salary and office supplies.

Logistically, the continuation of this quality improvement project in the privately-owned family practice would not be feasible as it would alter the office dynamic and workflow. Although this project was conducted in a shared-office space, its continuation would need a designated area to minimize interruption of patient care. In addition, providers at this agency would have difficulty adopting the standardized education initiative due to patient care time restraints; therefore, hiring a diabetes educator specifically to implement diabetes education within the agency would be needed.

Continuation of this project at the current agency would require expansion of the staff inan office space that is already limited in size. However, project sustainability may occur through new partnerships with an agency that specializes in diabetes management. New partnerships with an agency ofsimilar interests of managing and educating diabetic

patients would be beneficial. Examples of this would be any local agency with a diabetic educator. Adoption of this quality improvement project at a specialized organization could add collaborative projectmodifications that would better serve patients such as the utilization of virtual education sessions. In addition, project sustainability needs the support of current and other local healthcare providers. Continuation of the project with a diabetic educator would require referrals from providers treating type-2 diabetic patients.

Also, project sustainability involves consideration of project modifications influenced by identified barriers and limitations of the project. One modification to enhance project sustainability includes expanding participant eligibility. This involvesthe timeframe of the participants being newly diagnosed with type-2 diabetes. The timing of a patient's new type-2 diabetes diagnosis within 30-days of project implementation hindered the project's sample size. Eliminating the new diagnosis cancontribute to a larger project sample size and its generalizability, as any education is worthwhile and could benefit all.

Dissemination Plan

Dissemination of findings will occur in multiple ways. First, a written DNP project paper will be completed and submitted to Salisbury University's School of Nursing and the DNP project committee. In addition, a two-hour virtual oral presentation to DNP Project committee members and Salisbury University's faculty, colleagues, and community members will be provided.

The DNP project's findings will also be submitted for journal publication. Two journals affiliated with the American Diabetes Association relevant to the findings of this DNP project include *BMJ Open Diabetes Research & Care* and *Diabetes Care.* This

journal publishes "high-quality basic and clinical research articles regarding type 1 and type 2 diabetes and associated symptoms, complications, and treatments" (American Diabetes Association, 2022). Findings from this DNP project have potential to contribute to the lack of data involving patient knowledge and self-management of T2DM. Furthermore, *BMJ Open Diabetes Research & Care* journal has a 39% acceptance rate and requires the co-investigator to submit an online manuscript for single blind peer review (American Diabetes Association, 2022).

      Diabetes Care is a journal copyrighted by the American Diabetes Association that aims to assist the health care practitioner to gain knowledge, stimulate research, and promote better management of people with diabetes (American Diabetes, 2022). Information published within this journal are divided among the following categories: *Clinical Care/Education/Nutrition/Psychosocial Research, Epidemiology/Health Services Research, Emerging Treatments and Technologies, Pathophysiology/Complications,* and *Cardiovascular and Metabolic Risk* (American Diabetes Association, 2022). In addition, *Diabetes Care* journal has a 11.06% acceptance rate and uses a single-blinded peer review process (American Diabetes Association, 2022). Findings from this project are applicable to *Diabetes Care* education category and could further improve clinical practice to other underserved areas on a local or national level.

      Furthermore, if the opportunity presents itself, dissemination of findings will occur in the form of a scholarly podium presentation at an evidence-based nursing conference. The Lambda Eta Chapter of Sigma Theta Tau International, Salisbury University's School of Nursing, and Tidal Health are sponsoring a local evidence-based practice conference that allows doctoral students to present research, evidence-based

practice, or quality improvement projects.

Conclusion

This project aimed to improve self-management knowledge in patients with T2DM. Data obtained from this DNP project suggested that there is a critical need for additional diabetes self-management education for patients residing in rural, underserved areas. Although the standardized education sessions provided participants information on proper self-management strategies, findings from this DNP project suggests the need for additional education and counseling to those living with other chronic illnesses. Providing additional education will always be invaluable to patients receiving care in all health care settings.

This DNP project found statistical significance in the difference of pre-test and post-test scores after the implementation of a standardized education session; however, this DNP project did not explore effective patient engagement and adoption of healthy lifestyle strategies. Data obtained from this DNP project can contribute to the development of future DNP projects that explore the adoption of effective T2DM self-management strategies into everyday life.

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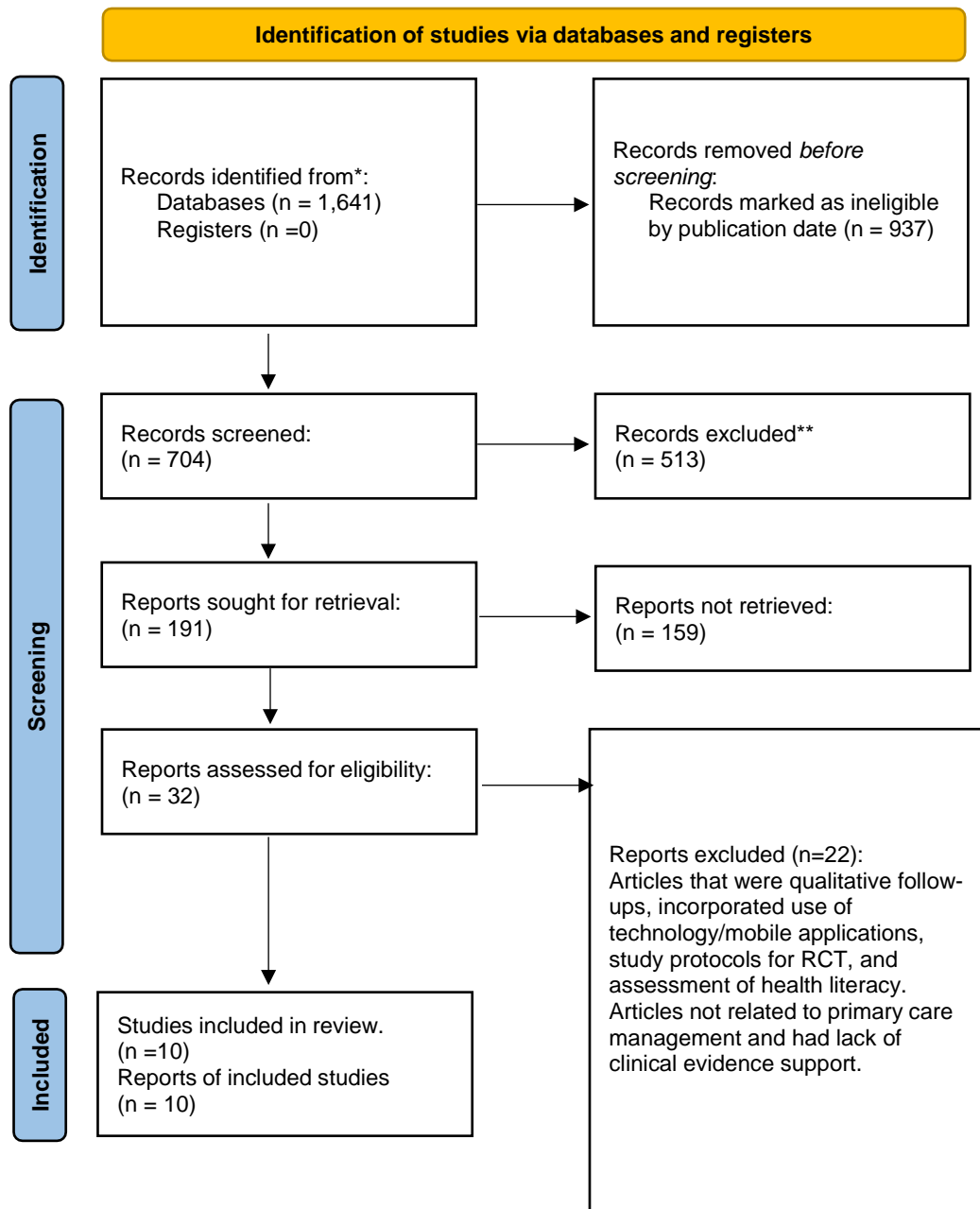
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Appendix A

PRISMA Flow Diagram 2020 (Page et al., 2021)

Identification of studies via databases and registers

Identification

Records identified from*:
Databases (n = 1,641)
Registers (n =0)

Records removed *before screening*:
Records marked as ineligible by publication date (n = 937)

Screening

Records screened:
(n = 704)

Records excluded**
(n = 513)

Reports sought for retrieval:
(n = 191)

Reports not retrieved:
(n = 159)

Reports assessed for eligibility:
(n = 32)

Reports excluded (n=22):
Articles that were qualitative follow-ups, incorporated use of technology/mobile applications, study protocols for RCT, and assessment of health literacy. Articles not related to primary care management and had lack of clinical evidence support.

Included

Studies included in review.
(n =10)
Reports of included studies
(n = 10)

Appendix B

Table of Evidence

PICO question: In adults 18 years of age and over recently diagnosed with T2DM, does early implementation of standardized disease-specific

education increase patient Revised Diabetes Knowledge Test (RDKT) scores and compliance with T2DM management over standard care?

Databases: CINAHL, MEDLINE

Citation	Conceptual Framework	Design/ Purpose	Sample/ Setting	Measurement of Major Variables	Study Findings	Appraisal of Worth to Practice	Strength & Quality of Evidence
Burridge, L. H., Foster, M. M., Donald, M., Zhang, J., Russell, A. W., & Jackson, C. L. (2016). Makingsense of change: patients' views of diabetes and GP-led integrated diabetes care. *Health Expectations, 19*(1), 74–86. https://doi.org/10.1111/hex.12331	Normalizat ion Process Theory (NPT)	Qualitative study that was part of a multisite mixed methods project incorporating a randomized control trial (RCT) Explore patients' views and experiences of a new model of diabetes	Purposive sampling, patients randomized to receive GP-led diabetes care at 2 interven-tion sites. N=30 Primary care setting	Face-to-face interviews using an interview guide, incorporating key topics and open-ended questions linked to the research aims and conceptual ideas of NPT.	Three themes found: Sensibility of change diabetes self-care is complicated ; change is a priority in minimizing long-term effects, some unable to connect current state with future	23% of consented patients declined the interview (n=9) Three themes formulated from findings. Intervention led by general practitioner	III-B

		care, in comparison with usual care and in relation to the personal meaning and experience of living with diabetes. Also aimed to expose factors that can facilitate or impede change and ways to enhance adoption and acceptability of the model of care.			characterist ic; Diabetic life: over time, participants became more committed to their diabetes self-care, and Diabetes care alliance; GP-led model of care appeared to create a positive environmen t and sense of an alliance with health-care professiona l s which was con-ducive to diabetes managemen t. Some	in primary care setting. Findings provide insights into how people begin and undertake the work of change that their diabetes requires of them, therefore enhancing understandi ng of patient's highly personal self-manageme n t work and their engagemen t with treatment routines and health professio nals.	

					participants experienced dissonance between rational view of T2DM management and their lived reality. Participants did appreciate a flexible and personalized approach to diabetes care.	Sample adequate for study design. Qualitative study.	
du Pon, E., Kleefstra, N., Cleveringa,F., van Dooren, A., Heerdink, E. R., & van Dulmen, S. (2019). Effects of the Proactive interdisciplinary self- management (PRISMA) program on self- reported and clinical outcomes in type 2 diabetes: a pragmatic randomized controlled trial. *BMC Endocrine Disorders, 19*(1), 1–9. https://doi.org/10.1186/s12902-019-0466-0	Self-Management Theory	RCT. To investigate the effects of Proactive Interdisciplinary Self-Management (PRISMA) training program on self- reported (knowledge,	Persons 18 years or older diagnosed with T2DM and Treated among eight primary care practices in the eastern part of Netherland s (n=193). Intervention group: usual care and	Self-reported data derived from validated questionnaire at 0 months (at end of two PRISMA meetings), 6 months, and 12 months. The Patient Activation Measure (PAM), The Summary of Diabetes Self-	No significant differences were found between groups at 0, 6, and 12 months on self-reported outcomes (PAM, SDSCA, EQ-5D, and	Randomizat ion was performed. Office-based primary care interventio n. 28% of interventio n group did	I-C

| | | skills and confidence for self-management, diabetes self-care behavior, health-related quality of life, and emotional well-being) and clinical outcomes.

PRIMSA program: consisted of two group meetings about T2DM guided by practical nurse and a dietician specialized in diabetes care. | PRISMA (n=95) Controlled group: Usual care only (n=98). | Care Activities Scale (SDSCA), The EuroQol Five Dimension (EQ-5D) scale, The World Health Organization Well-being Index 5-item scale. | WHO-5 scores).

Clinical outcomes (HbA1C, BMI, etc.) were not reported due to large number of missing values, therefore unable to make a statement about clinical effects. | not attend at least one meeting of PRISMA.

Lack of findings made it not possible to make a statement about the clinical effects.

A power calculation was carried out on the primary outcome measure resulting in 81 participants needed per group. | |
| Flode, M., Iversen, M. M., Aarflot, M., & Haltbakk, J. (2017). Lasting impact of an implemented self-management programme for people with type 2 diabetes referred from primary care: a one- | The implemented program had no explicitly expressed | A one group, before-after study.

To examine the impact of | Patients with T2DM referred by their general practitioner. N=115 | Questionnaire administered immediately before and after group DSME program (in- | Mean diabetes knowledge scores (69 [SD=16] vs. 78 [SD=16]; | Consistent benefits found from a DSME program and | II-B |

group, before- after design. *Scandinavian Journal of Caring Sciences, 31*(4), 789–795. https://doi.org/10.1111/scs.12398	theoretical underpinnings.	an established group-based diabetes self-management education (DSME) on DM knowledge, skills in self-management, and perceived self-efficacy. The education program was ledby an experienced DMeducator 12-15 hours (lectures, interactive discussions, andshared experiences) and spread over 2-3 weeks.		person) and then 3 months post-program (mailed). Michigan Diabetes Knowledge Test (first subscale only-14 questions). Patient Activation Measure (PAM), a 13-item self-reported questionnaire that assess patient knowledge, skills, and confidence in self-managing one's health or chronic condition. Self-efficacy assessed using General Self-Efficacy Scale to assess a person's general sense of perceived self-	*p*<0.001), mean patient activation measures (PAM) (64 [SD=15] vs. 70 [SD=14]; *p*<0.001), and mean self-efficacy scores (30 [SD=4] vs. 31 [SD=5]; *p*=0.022), improved significantly. However, results were stratified for participants who responded at all three time points.	implementation of daily practice. Generalizability was determined from evaluation of DSME efficacy. Limitation: no control group; definitive statements about the cause of the observed changes can not be made. Diabetes knowledge test scores showed those with the poorest metabolic levels have the greatest

				efficacy.		benefit of the program in terms of knowledge. Substantial attrition rate of 115 completing questionnaire before program, only 43 completed at 3 months following the program (62% attrition).	
Gucciardi, E., Xu, C., Vitale, M., Lou, W., Horodezny, S., Dorado, L.,Sidani, S., & Shah, B. R. (2020). Evaluating the impact of onsite diabetes education teams in primarycare on clinical outcomes. *BMC Family Practice, 21*(1), 1–10. https://doi.org/10.1186/s12875-020-01111-2	Chronic Care Model	A historical cohort design. To evaluate the impact of integrating diabetes education teamsin primary care on glycemic control	Patients newly diagnosed with T2DM who were ≥ 18 years old and had HgbA1c > 7% 11 Primary care sites of Ontario, Canada.	Generalized Estimating Equations (GEE) model: used to assess the effect of group and period on five clinical outcomes (A1C, LDL-C, TC-HDL ratio, DBP, SBP). Intervention	Implementing diabetes-education teams significantly increased the proportion of patients reaching A1C targets (p=0.012)	Results are generalizable. Integrating diabetes-education teams into primary care settings can meaningfully impact patients'	II-B

		(HgbA1C <7%), and lipid, and blood-pressure management. Educator teams were from 3 diabetes-education programs.	Of the 11 primary care sites. 8 were family health teams, 2 were family-medicine group practices, and 1 was a solo physician practice. Interventio n group: n=487 Control group: n=284	group: patients receiving care from the educator teams. Educator teams provided patients with self-management education, coaching, timely treatment adjustment, and system-navigation support with follow-up up to a year (number of visits varied by patient needs). Control group: patients who did not receive care from educator teams.	Greater effect size on all other outcomes in intervention group, although not statistically significant.	ability to meet recommend er A1C targets over a one-year period. Did not specifically obtain data on patient's DM knowledge, self-care behaviors and lifestyles. This would have provided better understandi ng of the impacts of the exposure to diabetes education.	
Kjellsdotter, A., Berglund, M., Jebens, E., Kvick, J., & Andersson, S. (2020). To take charge of one's life – group-based education for patients with	Lifeworld Theory: refers to the theoriesof 53haracteri	Qualitive phenomenol ogical study.	Samplesize: n= 12. Inclusion criteria: diagnosis of	*Taking charge of one's life with T2DM*: group-based education model consisting	The learning that occurred with support from the	Group-based education providing participants	III-B

type 2 diabetes in primary care – a lifeworld approach. *International Journal of Qualitative Studies on Health & Well-Being, 15*(1), 1–11. https://doi.org/10.1080/17482631.2020.1726856	stic and the natural attitude.	This specific aim in this study was to describe patients' experiences of group-based education using the *Taking charge of one's life with type 2 diabetes* model.	T2DM should not be older than 3 years and not less than 3 months. Sample was recruited from two primary care healthcare centers in western Sweden.	of five group sessions. Education sessions were followed by a round of presentations of patients' questions and thoughts from previous sessions. Post-education telephone interviews were conducted and comprised of open-ended questions.	group reflections and the reflection books contributed to the understanding of the complexity of the illness and increase in motivation to change. Motivation to change and desire to be responsible for the treatment and implementation of habits was a common theme found through group-based education.	awareness that each person was responsible for his or her own health. Learning to live with diabetes based on the patient's lifeworld perspective supports a more effective and pragmatic learning environment. Small sample size.	
Koponen, A. M., Simonsen, N., & Suominen, S. B. (2018). Success in	Self-determinati	Mail survey/questi	Sample size: N=5,167	Questionnaire measuring:	Perceived autonomy	Only evaluated	III-B

Weight Management Among Patientswith Type 2 Diabetes: Do Perceived Autonomy Support, Autonomous Motivation, and Self-Care Competence Play a Role? *BehavioralMedicine, 44*(2), 151–159. https://doi.org/10.1080/08964289.20 17.1292997	on theory (SDT)	onnaire. Cross-sectional study. To investigate whether the three central SDT variables – perceived autonomy support, autonomous motivation, and self-care competence-areassociated with success in weight management among patients with T2DM.	Participants were identified from the register of the Social Insurance Institution of Finland. Setting: two large municipalities and three small municipalities of Finland.	perceived autonomy support (from a physician), autonomous motivation, self-care competence, mental health, experience stress and social support, physical health, chronic diseases, BMI and health behavior. Cronbach's alpha= 0.75 to 0.95.	support was not directly associated with self-weight management. Perceived autonomy support was associated with autonomous motivation and self-care competence. The effectof perceived autonomy support on self-care competence was partially mediated by autonomous motivation. Four variable measuring mental health	weight management. Findings predict the importance of autonomous motivation and self-care competence for success in weight management. Confounding factors were controlledin the analysis.

					(energy, emotional well-being, diagnosed depression, sense of coherence), energy correlate most strongly with self-weight management (0.21, p<0.001).		
Lin, L., Lee, B., & Wang, R. (2019). Effects of a Symptom Management Program for Patients With Type 2 Diabetes: Implications for Evidence- Based Practice. *Worldviews on Evidence-Based Nursing, 16*(6), 433–443. https://doi.org/10.1111/wvn.12400	Symptom management model	Single-blind RCT To examine the effects of a diabetes symptom management program (DSME) on HbA1C levels, self-care behaviors, quality of life, and symptom	Medical center outpatient clinic in Taiwan, patients with T2DM.	Primary outcome: HgbA1C Secondary outcomes: self-care behaviors, quality of life, diabetes symptom severity. Control group: received usual care (20-minute face-to-face education session according to	Significant differences in A1C levels at T0 to T2 (p=0.02) and T0 to T3(p=0.028) in intervention group Significant increases in self-care behaviors (p < .001) and QoL (p	Retention rate for each group of participants :96.8% Findings support individualized T2DM education in improving A1C, self-care and QOL, and	I-B

| | | | | Taiwanese Association of Diabetes Educators guidelines) and pamphlet.

Intervention group: received Diabetes Self-Management Program (DSMP)- 60 minute individualized face-to-face education focused on 5 components. HbA1C levels, self-care behaviors 17-item Diabetes Self-care scale, quality of life 42-item Chinese Version of the Diabetes QOL, and symptom severity 34-item Taiwan version of the Diabetes symptom check-list revised. | = 0.001) from T0 to T1 and from T0 to T2 in intervention group.

Significant decrease in diabetes symptom severity from T0 to T2 (p = .006) in intervention group.

Increase in A1C in control group at T0-T2 andT0-T3 | symptom control.

Limitation: setting of a medical center in Taiwan affecting generalizab ility.

Experiment al and control groups wereevenly matched by personal characterist ic. | |

severity over standard care.

Oksman, E., Linna, M., Hörhammer,I., Lammintakanen, J., & Talja, M. (2017). Cost-effectiveness analysis for a tele-based health coaching program for chronic disease in primary care. *BMC Health Services Research, 17*, 1–7. https://doi.org/10.1186/s12913-017- 2088-4	Self-Management Theory	RCT To evaluate the cost effectiveness of 12 months of telephone-basedhealth-coaching intervention (theTERVA trail) among patients with type 2 diabetes, coronary artery disease, and congestive heartfailure.	1570 patients were blindly randomized to intervention (n=970) and control (n=470) groups. Intervention group: Received monthly individual health coaching by telephone from a specially trained nurse for 12-months along with routine social and healthcare. Separated into three groups: T2DM, CAD, and CHF. Controlled group: received	Health-coaching intervention: 8 recommendations: 1. Know how andwhen tocall for help. 2. Learn about the condition and set goals. 3. Take medicines correctly. 4. Get recomm ended tests and services. 5. Act to keep the condition well. 6. Make lifestyle changesand reduce risk. 7. Build on strength and overcome obstacles .	Cost-effectivenes s of health-coaching was highest in patients with type 2 diabetes. Cost per quality-adjusted life years was found to be lowest in the type2 diabetes group. An improveme nt of quality-adjusted life years (0.008) was achieved with a small increase in cost of care.	Randomizat ion 2:1 Short follow-up period. Significant health behavior changes take at least 6 months. Long-term outcomes need to be studied.	I-B

				routine social and healthcare. Finland	8. Follow up with specialists and appoint ments			
Silva-Tinoco, R., Cuatecontzi-Xochitiotzi, T., De la Torre-Saldaña, V., León-García, E., Serna-Alvarado,J., Orea-Tejeda, A., Castillo- Martínez, L., Gay, J. G., Cantú-de- León, D., & Prada, D. (2020). Influence of social determinants, diabetes knowledge, health behaviors, and glycemic control intype 2 diabetes: an analysis from real-world evidence. *BMC EndocrineDisorders, 20*(1), N.PAG. https://doi.org/10.1186/s12902-020- 00604-6	Multivaria ble-adjusted models: Mediation Model	Multi-center cross-sectional study. This study aimed to explore the determinants of glycemic control, particularly in mediation of self-care behaviors in theassociation between diabetes knowledge and glycemic control among type 2 diabetic patients and low socioeconomi c status from Mexico City.	N=513, Type 2 diabetes patients. 28 primary outpatient centers located in urban areasof Mexico City.	Spoken Knowledge in Low Literacy Patients with Diabetes (SKILLD) scale: 10-item used to measure knowledge of lifestyle interventions, glucose management, recognition, and treatment of hypo- and hyperglycemia, and activities to prevent long-term diabetes-related complications. Summary of Diabetes Self-Care Activities (SDSCA): 11-item scale to	SES was linked to education level (p value < 0.001) Multivariab le-adjusted models showed that SES was associated with diabetes knowledge (β: 0.009, 95% Confidence Interval [95% CI] 0.003, 0.015, p-value < 0.001). Univariable and	Strength: SKILLD scale is designed for vulnerable populations. Results obtained were from real-world data among a representati ve population from a low-income subset of patients from one of the largest urban areas. Unable to conduct causality	II-B

				measure participants' self-care behaviors.	multivariable-adjusted models showed a positive and statistically significant association between education and on diabetes knowledge	due to design. Samplesize: Relatively small compared toother diabetes studies. Findings may not be representative of other urban areas across the world.	
Yao, J., Wang, H., Yin, J., Shao, D., Guo, X., Sun, Q., & Yin, X. (2020). Factors associated with the utilizationof community-based diabetes management care: A cross-sectional study in Shandong Province, China. *BMC Health Services Research, 20*(1), 1–10. https://doi.org/10.1186/s12913-020-05292-5	Theory of Health Behavior	Cross-sectional study. Aimed to study the utilization of community-based diabetes management care services in both urban and rural China.	Multi- stage, stratified, randomized samplingused to select patients registered non-communicable disease management system. (n=2,166) Community-	Self-designed Diabetes Knowledge Questionnaire for Patients: 16-items Cronbach's alpha=0.76. Diabetes Empowerment Scale-Short Form (DES-SF): 8-items, Likert	The delivery of community-based diabetes management care among 63 public health institutions has no significant difference (85.7 vs.	Patients who had higher knowledge of diabetes and better self-efficacy in controlling the condition were more likely to fully utilize diabetes management care.	II-C

| | | This study alsoexplored the possible factors influencing utilization. | based diabetes management services for patients provided in63 primaryhealth institutions.

Characteristics of participant s: urban (n=1,070) versus rural communities (n=1,096). | scale. Cronbach's alpha=0.85.

Control variables: individual-level variables such asresidence, gender, age, household income, durationof diagnosis, knowledge of diabetes, & self-efficacy in control of diabetes. | 88.6%, $p=0.17$)

There was no Significant difference in diabetes knowledge between urban and rural patients with T2DM (15.3 vs. 14.9, $p=0.34$).

There was no statistically significant difference in self-efficacy between urban and rural patients (32.1 vs. 31.8, $p=0.49$).

There was | Due tocross-Sectional nature of the study, inferences about causality or temporal ordering of variables cannot be made, such as the relationship between the diabetes knowledge and the utilizations of diabetes management services.

Potential for selection and recall bias.

Questionnaires used in this study were self-developed, therefore | |

					no significant difference in utilization of community-based diabetes management care between urban and rural patients (48.6% vs. 50.6%, p=0.36).	results cannot be feasibly compared with other studies dueto non- uniform evaluation of criteria. Larger sample should be used in future studies to monitor and evaluate the progress of community-based diabetes management are in China.	

Appendix C

Pre-test/Post-test Tool

Revised Diabetes Knowledge (RDKT) Test & Answer Key

1.   The diabetes diet is:
a.   The way most American people eat.
b.   A healthy diet for most people
c.   Too high in carbohydrate for most people
d.   Too high in protein for most people

2.   Which of the following is highest in carbohydrates?
a.   Baked chicken
b.   Swiss cheese
c.   Baked potato
d.   Peanut butter

3.   Which of the following is highest in fat?
a.   Low fat (2%) milk
b.   Orange juice
c.   Corn
d.   Honey

4.   Which of the following is a "free food"?
a.   Any unsweetened food
b.   Any food that has "fat free" on the label
c.   Any food that has "sugar free" on the label
d.   Any food that has less than 20 calories per serving

5.   A1C is a measure of your average blood glucose level for the past:
a.   Day
b.   Week
c.   6-12 weeks
d.   6 months

6.   Which is the best method for home glucose testing?
a.   Urine testing
b.   Blood testing
c.   Both are equally good

7.   What effect does unsweetened fruit juice have of blood glucose?
a.   Lowers it
b.   Raises it
c.   Has no effect

8.   Which should not be used to treat low blood glucose?
a.   3 hard candies
b.   ½ cup orange juice
c.   1 cup diet soft drink
d.   1 cup skim milk

9.   For a person in good control, what effect does exercise have on blood sugar?
a.   Lowers it
b.   Raises it
c.   Has no effect

10.   What effect will an infection most likely have on blood glucose?
a.   Lowers it
b.   Raises it
c.   Has no effect

11.   The best way to take care of your feet is to:
a.   Look at and wash them each day
b.   Massage them with alcohol each day
c.   Soak them for 1 hour each day
d.   Buy shoes a size larger than usual

12.   Eating foods lower in fat decreases your risk for:
a.   Nerve disease
b.   Kidney disease
c.   Heart disease
d.   Eye disease

13.   Numbness and tingling may be symptoms of:
a.   Kidney disease
b.   Nerve disease
c.   Eye disease
d.   Liver disease

14.   Which of the following is usually not associated with diabetes:
a.   Vision problems
b.   Kidney problems

c.   Nerve problems
d.   Lung problems

15.   Signs of diabetic ketoacidosis (DKA) include:
a.   Shakiness
b.   Sweating
c.   Vomiting
d.   Low blood glucose

16.   If you are sick with the flu, you should:
a.   Drink less liquids
b.   Eat more proteins
c.   Test blood glucose more often

17.   If you are beginning to have a low blood glucose reaction, you should:
a.   Exercise
b.   Lie down and rest
c.   Drink some juice

18.   A low blood glucose reaction may be caused by:
a.   Heavy exercise
b.   Infection
c.   Overeating

Answer Key

1.   The diabetes diet is:
a.   The way most American people eat
b.   ==b. A healthy diet for most people==
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a.   Shakiness
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c.   <mark>Vomiting</mark>
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a.   Drink less liquids
b.   Eat more proteins
c.   <mark>Test blood glucose more often</mark>

17.   If you are beginning to have a low blood glucose reaction, you should:
a.   Exercise
b.   Lie down and rest
c.   <mark>Drink some juice</mark>

18.   A low blood glucose reaction may be caused by:
a.   <mark>Heavy exercise</mark>
b.   Infection
c.   Overeating

Appendix D, E, & F

Education Materials

DIABETES

What is diabetes?

Diabetes is a defect in the body's ability to convert glucose (sugar) to energy. Glucose is the main source of fuel for our body. When food is digested it is changed into fats, protein, or carbohydrates. Foods that affect blood sugars are called carbohydrates. Carbohydrates, when digested, change to glucose. Examples of some carbohydrates are: bread, rice, pasta, potatoes, corn, fruit, and milk products. Individuals with diabetes should eat carbohydrates but must do so in moderation.

Glucose is then transferred to the blood and is used by the cells for energy. In order for glucose to be transferred from the blood into the cells, the hormone - insulin is needed. Insulin is produced by the beta cells in the pancreas (the organ that produces insulin).

In individuals with diabetes, this process is impaired. Diabetes develops when the pancreas fails to produce sufficient quantities of insulin – Type 1 diabetes or the insulin produced is defective and cannot move glucose into the cells – Type 2 diabetes. Either insulin is not produced in sufficient quantities or the insulin produced is defective and cannot move the glucose into the cells.

There are two main types of diabetes:

Type 1 diabetes occurs most frequently in children and young adults, although it can occur at any age. Type 1 diabetes accounts for 5-10% of all diabetes in the United States. There does appear to be a genetic component to Type 1 diabetes, but the cause has yet to be identified.

Type 2 diabetes is much more common and accounts for 90-95% of all diabetes. Type 2 diabetes primarily affects adults, however recently Type 2 has begun developing in children. There is a strong correlation between Type 2 diabetes, physical inactivity and obesity.

	NORMAL	DIABETES
Fasting blood sugar	80-99 mg/dl	126 mg/dl and above
Random blood sugar	80-139 mg/dl	200 mg/dl and above
2 hour glucose tolerance test	80-139 mg/dl	200 mg/dl and above

What are the symptoms of diabetes?

If you have more than one of these symptoms you may want to ask your doctor to test your blood sugar.

- Blurred vision
- Unusual thirst
- Frequent urination
- Slow-healing cuts
- Unexplained tiredness
- Rapid weight loss (Type 1 diabetes)
- Erectile dysfunction
- Numbness or tingling in hands or feet

Symptoms may occur rapidly with Type 1 diabetes; however, with Type 2 diabetes the onset is more insidious and may not be noticed.

SYMPTOMS

How is diabetes diagnosed?

The diagnosis of diabetes is made by a simple blood test measuring your blood glucose level.

Usually these tests are repeated on a subsequent day to confirm the diagnosis.

A diagnosis of diabetes is a frightening and bewildering experience because there is so much information to take in and the diagnosis may come as a shock.

People with Type 2 diabetes may hear their condition described as "mild," but Type 2 diabetes is not a "mild" medical condition. Both forms and all stages of diabetes are serious, with many possible complications, including eye, heart, kidney, and nerve damage.

If you are diagnosed with diabetes, what should you do?

- Request a referral to a certified diabetes educator and/or a dietitian.
- Obtain a prescription for a glucometer and testing supplies.
- Begin to make life style changes.
    - Begin an exercise program
    - Make healthy food choices
    - Increase your fiber intake
    - Decrease portion size
    - Limit your intake of concentrated sweets
    - Test your blood sugar at varying times of the day

Get informed. If you have diabetes, there are many things you can do to help yourself. Medication is only one aspect of your care; maintaining a healthy weight, increasing your physical activity, eating healthy foods, testing your blood sugars, taking your medications as prescribed, attending diabetes education programs, and consulting with your health professional to keep your blood sugar in control will help you control your diabetes and stay well. The amount of self-management you can achieve will affect the quality of life you lead.

What is the treatment for diabetes?

As yet, there is no "cure" for either type of diabetes, although there are many ways of keeping diabetes under control. Diabetes treatments are designed to help the body to control the sugar levels in the blood. Studies have shown that good control of blood sugar is the key to avoiding diabetic complications.

- Type 1 diabetes requires insulin. Injected insulin replaces the insulin missing in the body. You will need to learn how to balance your insulin with your food intake and your physical activity. It is important that you work with a diabetes educator and are under the care of a diabetes team, who can assist you in managing your diabetes
- Type 2 diabetes treatment will vary dependent on your blood sugar levels. Many patients are counseled to change their lifestyle and lose weight. It is important to work with a diabetes educator and dietitian. Treatment begins with changing certain food choices and beginning an exercise program. Diabetes is a progressive disease, and the treatment may change over time, requiring oral medication; if you are already taking medication, you may need an increased dose or multiple medications, and eventually, you may need to start on insulin. To find a diabetes educator contact the American Association of Diabetes Educators at 800-832-6874, or on the web: www.diabeteseducator.org

See your doctor every three months until your blood sugar is in control, once it's under control, your numbers and medication regimen should be reviewed every six months.

STAYING HEALTHY UNTIL A CURE IS FOUND.

What is good control?

The A1C test provides you and your doctor with an assessment of the overall control of your diabetes. In simple terms, this test measures the sugar coating on red blood cells. The life of a red blood cell is three months, so this test should be done every three to six months to assess your blood sugar control. Your daily blood sugar results will also provide you with helpful information on the impact of foods, physical activity, and medications. Together these tests should help you manage your diabetes.

Although you may not feel sick, high blood sugar levels are damaging blood vessels and your organs. Complications of diabetes are preventable if you keep your blood sugar as close to normal as possible. The goal is an A1C level between 6.5% -7%.

It is important to take care of your self. Be sure you work with your doctor

Yearly:

- Complete physical exam, foot exam, creatinine, cholesterol, triglycerides, and urine microalbumin tests.
- You may have an electrocardiogram and/or a stress test
- Dilated eye exam by an ophthalmologist.
- Referral to a diabetes educator or nutritionist
- Referral to a smoking cessation program.

Every 3-6 months:
- A1C
- A dental exam.

Each Doctor visit:
- Weight and blood pressure
- Review all medications and supplements
- Review lifestyle changes, physical activity, how you are coping with your diabetes at home and at work.
- Discuss changes that may be necessary in the future.
- Review problems: vision, numbness, tingling in your hands or feet, low blood sugar reactions, digestive problems, and sexual problems.

DIABETES RESEARCH WELLNESS FOUNDATION®

An Organization for People Who Live with Diabetes Every Day.

The mission of **Diabetes Research & Wellness Foundation** (DRWF) is to help find the cure for diabetes, and until that goal is achieved, to provide the care and self-management skills needed to combat the life-threatening complications of this terrible disease.

Thank you for your confidence in the programs and services that the Diabetes Research & Wellness Foundation® provides to the community.

Please designate us in the Combined Federal Campaign & United Way. Check box #11629.

DIABETES AND EXERCISE HEALTHY EATING

What can I eat?

This is a very common question for people diagnosed with diabetes. Developing a meal plan that also helps manage weight, cholesterol, and blood pressure can seem overwhelming. Taking steps to learn about your nutritional needs—while also learning how food can impact blood glucose control—will help you better manage diabetes and prevent complications.

Become aware of your current diet and eating habits.

Consider keeping a 1-3 day food journal. Note what, when, and how much food you eat. Read nutrition labels on foods and beverages. Note the item's suggested serving size and total carbohydrate content. Notice sugar and fiber grams are listed below the total carbohydrate; these values are included in the total amount. For weight management note calories per serving; to lower LDL cholesterol, choose foods with low or no trans or saturated fat.

Begin to learn where carbohydrates are found in food.

Carbohydrate is a necessary nutrient that supplies energy to body cells and tissues. People often recognize bread and potatoes as "carb foods," but carbohydrates can be found in various foods, and most are healthy food choices.

Learn how much carbohydrate you need.

Since carbohydrates are the most efficient source of energy for our bodies, most people need 40-50 percent of their calories to be in the form of carbohydrates. Generally, this is three to four servings of carbohydrate-rich food per meal, plus a serving or two as a snack. A serving size of carbohydrate is 15 grams.

Nutrition Facts
Serving Size 1/4 Cup (30g)
Servings Per Container About 38

Amount Per Serving

Calories 200 Calories from Fat 150

	% Daily Value*
Total Fat 17g	26%
Saturated Fat 2.5g	13%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 120mg	5%
Total Carbohydrate 7g	2%
Dietary Fiber 2g	8%
Sugars 1g	
Protein 5g	

Vitamin A 0% • Vitamin C 0%
Calcium 4% • Iron 8%
*Percent Daily Values are based on a 2,000 calorie diet.

Fruit: While the sugar in fruit is natural, it will affect your blood glucose. Fruits are a rich source of antioxidants, vitamins and minerals. Most people should aim to eat two servings a day. A fresh fruit serving is the size of a baseball, while a cooked or canned fruit serving is one-half cup.

Milk/yogurt: Many people are familiar with the term lactose, also known as milk sugar. Milk and yogurt both contain this natural sugar. A serving of milk is one 8-ounce cup, and a serving of yogurt is 6 ounces (¾ cup). Both contain 12 grams of carbohydrate. Yogurt may have fruit and/or sweeteners added, which increases the carbohydrate content. Read labels carefully.

Grains: Whole grains such as corn, wheat and oats provide the carbohydrate found in bread, pasta and cereal. A serving of whole-grain bread is one slice (1 oz); hot cereal such as oatmeal is one-half cup; dry/cold cereal would be approximately 3/4 cup, cooked rice or pasta is one-third cup. Most people need a minimum of 6 servings a day. An average sandwich would be 2 servings, a cup of pasta would provide 3 servings.

Vegetables: Generally speaking, vegetables can be broken down into two categories, "starchy" or "non-starchy." Examples of starchy vegetables include potatoes, peas, legumes, and winter squash. A 1/2 cup portion would equal the carbohydrate content of a slice of bread or 15 grams of carbohydrate. Non-starchy vegetables are higher in water content than starchy

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vegetables, and generally do not significantly impact blood glucose. A 1/2 cup portion of cooked vegetables such as carrots, greens, tomatoes or broccoli is low in calories and contains only 5 grams of carbohydrate. Add a generous portion of colorful vegetables to your meals. Choose raw, non-starchy vegetables for a healthy snack.

Simple sugar: Table sugar, honey and corn syrup are common ingredients in condiments, sweets and snacks. These sweeteners can be added to foods as a flavor enhancer or as a preservative. Simple sugars will impact your blood glucose levels.

Determine protein and fat needs.

Protein: The main sources of protein are meat, fish, eggs and cheese. About 20 percent of our calorie needs should come from protein. Animal sources do not make a significant impact on blood glucose, but the choices should be low in fat— as animal fat can negatively affect cholesterol levels. Vegetable sources of protein include beans, peas and lentils.

Fat: Fat is an essential nutrient for many body functions. Vegetable sources of fat such as olive oil, nuts, seeds and avocados can promote good cholesterol—while the saturated fat from animal sources should be limited. Generally, 30 percent of our calories should come from fat.

Plan your healthy meals.

A balanced meal includes a source of lean protein with a variety of fruit, vegetables and whole grains, served with a healthy fat for a rich source of nutrients. Portion sizes will vary with calorie needs. The Plate Method is the simplest form of portion control. If half of your plate is filled with non-starchy vegetables such as salad, broccoli or carrots, the other two quarters of your plate remains for protein and starch. A serving of fruit, milk or yogurt can round out the meal.

Monitor your blood glucose.

To learn how a food affects your blood glucose, consider testing before you eat and again two hours after the first bite. A rise in blood glucose of less than 40 points is desirable. Review the amount of carbohydrate eaten at the meal. If the change in blood glucose is significant, it may be necessary to reduce your portion size.
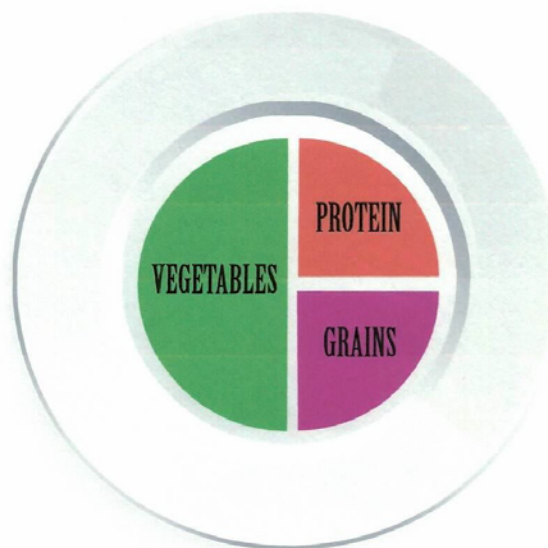
STAYING HEALTHY UNTIL A CURE IS FOUND.

Things you can do

- Schedule an appointment with a dietitian to learn more about portion control and carbohydrate counting.
- If you are trying to lose weight, contact a dietitian to help calculate your personal calorie needs based on your weight goal.
- Keep and review a food diary to assess variety and portion sizes.
- Read nutrition labels.
- Test your blood glucose levels before and two hours after a meal.

The more you understand how food affects blood glucose, and your health in general, the easier it is to make adjustments to your diet.

Resources

- **www.gomeals.com** GoMeals is a web site and app that includes features for eating healthy, staying active and tracking blood glucose levels.
- **www.sparkpeople.com** Sparkpeople offers a calorie counter, meal plans, personalized fitness program, mobile apps and trackers
- **www.MyFitnessPal.com** tracks food and physical activity, mobile app available, large food database.
- **www.supertracker.usda.gov** Create a personalized nutrition and physical activity plan, track your foods and physical activities, offers tips and support to help you make healthier choices and plan ahead.

DIABETES RESEARCH WELLNESS FOUNDATION®

An Organization for People Who Live with Diabetes Every Day.

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Thank you for your confidence in the programs and services that the Diabetes Research & Wellness Foundation® provides to the community.
Please designate us in the Combined Federal Campaign & United Way.
Combined Federal Campaign #11629 · United Way #8588

DIABETES
and Exercise

By: Andrea Cameron
Program Leader Sport and Exercise,
University of Abertay, UK

DIABETES AND EXERCISE

It is known that a clear correlation exists between having a more active lifestyle and having less disease/illness. People who exercise have lower blood pressure, lower heart rates, and improved circulation. They also have lower cholesterol, lower blood glucose levels, lower body mass indices (BMI) and less body fat; as well as higher metabolic rates and better weight control. They sleep better, have more energy, are less stressed/anxious and are happier and more confident. Exercise can improve someone's social life and regular exercisers are also able to maintain independence for longer in their own homes.

Why is exercise especially important for someone with diabetes?

Unlike medication, exercise is low cost and side-effect free. Those with diabetes who don't exercise are three times more likely to have poor blood glucose control and are more likely to suffer diabetes complications. However, those who exercise regularly— apart from getting the benefits listed above—have improved sensitivity to their body's own insulin and their bodies become better at transporting glucose. This happens because exercise stimulates the body's muscles.

Exercise also reduces the level of fat in the body, particularly around the abdominal area. It is thought that it is this mobilization of the body's fat stores by exercising that might improve the person with diabetes' blood glucose control. There is less glucose in the blood because it's now stored in the body's muscle, which means improved blood glucose control and reduction in the complications associated with diabetes.

How long do these effects from exercise last?

The good news is that if someone regularly exercises these benefits can be permanent, and for someone with diabetes it can mean reducing their medication. For those with a family history of Type 2 diabetes, engaging in a routine exercise program may prevent or at least delay the onset of Type 2 diabetes.

A single session of exercise can benefit the body's sensitivity to insulin for 16-18 hours—exerting effects on blood glucose control for 24-48 hours, but these effects have worn off by 60-72 hours. Even a little bit of exercise is better than none at all, and an "a-little-and-often" approach to exercise can be of benefit.

How much exercise should I be doing?

To obtain health benefits, it is recommended that adults should be aiming to exercise at a moderate intensity for 30 minutes a day for a minimum of five days a week (preferably seven days). However, the same health benefits can be gained by breaking this down into 10 minute intervals of moderate activity. The overall aim should be to accumulate at least 150 minutes of moderate activity per week.

Before you start!

- Get a medical clearance if you have not exercised in over a year, if you are a man over 45 years old or a women over 55 years old.
- Start with 5-10 minutes of activity per day for the first week, then add on 5 minutes per day each week until the target goal of 150 minutes of moderate activity is reached.
- Build up slowly and gently increase activity levels over a series of weeks.
- If using a pedometer, aim initially to build up an extra 3,000 steps/day; alter this each week by just doing a little more within the daily routine (see below for some ideas) until the target 10,000 steps/day is reached.

What do we mean by moderate activity?

A scale known as Borg's scale of Rate of Perceived Exertion (RPE) is used to rate how hard the exerciser is working. Moderate activity means the exerciser should feel some breathlessness, be aware that his/her pulse is raised, be sweating, know that he/she is using his/her muscles but still be able to hold some brief conversation.

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What types of exercise should be performed?

Three S's make up the components of all-round exercise. These are strength, suppleness and stamina. To gain the benefits of exercise all of these components should be included in the exercise routine, as this will mean having sufficient power, strength and range of movement to repeatedly undertake activities of daily living.

Traditional exercise prescriptions focused on aerobic exercise, but it is now recognized that health benefits—particularly for people with diabetes—are best conferred by doing some strength (resistance) exercises too. To develop these components and achieve the benefits of exercise you don't have to join a gym or an exercise class, but these methods are recommended—as you will have company exercising, someone is likely to be supervising what you are doing, and if in the gym you will probably have been prescribed a personal exercise plan by a professional trainer.

But if the gym or exercise class is not for you, there are still ways to exercise in and around your home and during your daily routines.

- Walking is an inexpensive and easy way of getting exercise and can be built into daily routines by parking the car further away from work, getting off the bus a stop earlier, or intentionally going for a walk at lunchtime or after work.

- Purchase a pedometer; as counting the number of steps you take each day can be a good motivational tool and demonstrates your progress in reaching your target.

- Use the stairs instead of elevators.

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- If doing a home-based exercise routine, instructor-led exercise videos/DVDs can be readily bought or borrowed from the library, or a range of simple and not too expensive exercise equipment can be purchased. Check the want ads or thrift stores for used equipment.

How do I get started?

- Check with your health care professional that your diabetes is presently stable enough to allow you to begin an exercise routine.
- Start with small sessions of exercise of low intensity and build up gradually.
- Find an exercise partner — this could be a family member, your child or grandchild, or a friend or work colleague — and make it fun.
- Choose something you enjoy, as you are more likely to stick with it.

How do I make sure I'm exercising safely?

In order to prepare the body for exercise there must always be some kind of warm-up, which involves gently raising the pulse and getting the muscles warm for 5-10 minutes before the main exercise activity. Instructor-led sessions will build this into the activity.

However, if you are exercising independently, and this includes doing heavy housework, work around the house, and gardening, remember to start the activity gently and build up.

It is also important to cool-down following exercise, to avoid feeling faint and dizzy and to help the body return to a resting state. Again instructor-led sessions should automatically include this, but if exercising independently, spend 5-10 minutes repeating the activities undertaken in the warm-up.

STAYING HEALTHY UNTIL A CURE IS FOUND.

How to avoid becoming an exercise casualty

- Build up slowly—this is both within a single exercise session as well as within a whole exercise program.
- Don't ever try to lift maximum weights, and never hold your breath when doing any weight or resistance-based exercises.
- Don't try to do too much or advance too quickly; stick to moderate intensity exercise.
- If new to exercise it may be best for you to monitor your blood glucose before, during, and after exercise until a routine is established. If doing any prolonged exercise or heavy household, gardening, or DIY chores—check blood glucose during the activity and adjust food as necessary. You may need to discuss your medication regiment with your health care professional.
- Do not exercise if you are feeling ill, vomiting, or have an infection.
- Exercise is very important during a pregnancy for you and the baby. Talk to your health care professional about your exercise program.
- Be sure you are wearing proper, well-fitting shoes and inspect your feet daily.
- If you've been diagnosed with retinopathy you may not be able to engage in strength-training activities. Be sure to contact your health care professional for guidance.
- If you have been diagnosed with autonomic neuropathy or peripheral neuropathy, be sure to contact your health care professional for special guidance in developing an exercise program.

And finally...

To have all the benefits of exercise you must do it regularly and stick with it; so make sure you find something that is enjoyable and fun. Taking up exercise or becoming more active won't just benefit your diabetes, it can also impact on any other disease and age-related problems you may have. A more active you will also benefit your family, friends, and work colleagues too.

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Helpline Questions 1-800-941-4635 · Administrative offices 202-298-9211

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Appendix G

Educational Intervention Outline Script

Good morning/afternoon_____,

This phone call serves as your education session following your diagnosis of T2DM. As a reminder, your informed consent was obtained to participate in this DNP project. This education session is a part of a DNP project.

What is diabetes?
- Discuss two types with focus of T2DM.
- Informed participant of four symptoms associated with diabetes.
- Discuss how diabetes is diagnosed.
- Steps after diagnosis of diabetes.
- Discuss treatment for diabetes.
- Explain what is "good control."
- Education regarding routine care.

Diabetes & Healthy Eating
- Explore their current eating habits.
- Discuss carbohydrates and where they are found.
- Discuss protein and fat needs.
- Discuss healthy meal planning.

Diabetes & Exercise
- Discuss importance.
- Name three effects of exercise.
- What to know before starting to exercise.
- Moderate activity.
- How to start.
- Exercise safety.

Review and answer any questions the participant may have regarding education.
***End of educational intervention.

Appendix H

Recruitment Script

Telephone Script & In-Person: (for Project Co-Investigator)

As the project co-investor, I would like to invite you to participate in my research study to identify patient knowledge deficits and improve management compliancy in individuals with diabetes. You may participate if you are individuals 18 years or older, who are English speaking and seeking care regarding a diagnosis of type 2 diabetes.

As a participant and upon receiving your consent, you will be asked to complete a brief diabetes knowledge test, participate in a standardized education follow-up administered via telephone, and retake the brief diabetes knowledge test during your next routine visit.

Risks associated with this project are minimal; however, participation in this project requires your understanding of these risks. All costs associated with your medical visit must be satisfied at the expense of your health insurance or personal financing. Individuals may experience emotional distress when being newly diagnosed of a chronic illness such as diabetes. However, this project is guided by theoretical underpinnings regarding self-care of chronic illnesses.

The benefits of this project include early identification and management of a chronic illness for patients residing in an underserved area. This quality improvement project is designed to assess, improve, and maintain patient knowledge involving the type 2 diabetes disease process. Participation in this project aims to improve knowledge deficits and self-care behaviors that involve adapting health lifestyle modifications to prevent future health complications associated with type 2 diabetes. Although participation in this project will be accompanied with anticipated benefits, there will be no monetary compensation for participation in this project.

Participation is voluntary. In addition, participation in this project will have no impact on any existing relationships with neighboring educational or health organizations. For this project, the following health information is being collected: age, gender, race, insurance, pre-test and post-test scores, and lab results pertaining to the diabetes disease process.

> You may choose to stop participation in this project at any time and will not result in any penalty or change in care. Furthermore, personal data will not be retained if you choose to withdraw from this project.

> If you would like to participate in this research study, I will complete your informed consent form and have it witnessed by my medical assistant or licensed practical nurse.

In-Person Script:
(For Medical Assistant [MA] or Licensed Practical Nurse [LPN])

MA/LPN:

You are invited to participate in a research study to identify patient knowledge deficits and improve management compliancy in individuals with diabetes. You may participateif you are individuals 18 years or older, who are English speaking and seeking care regarding a diagnosis of type 2 diabetes.

As a participant and upon receiving your consent, you will be asked to complete a brief diabetes knowledge test, participate in a standardized education follow-up administered via telephone, and retake the brief diabetes knowledge test during your next routine visit.

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You may choose to stop participation in this project at any time and will not result in anypenalty or change in care. Furthermore, personal data will not be retained if you choose to withdraw from this project.

If you would like to participate in this research study, please review and sign the informed consent form. Be sure to print your name, provide your signature with date andtime, and indicate method of consent as "In-person consent."

Appendix I

Coding Spreadsheet

Initials	Code #	Next Office Visit	Brochures Mailed

Appendix J
Data Collection Spreadsheet

Code #	Initials & Insurance	Age	Gender	Race	Height, Weight, & BMI		Blood Pressure		Pre-Test Score	Post-Test Score	Hemoglobin A1-C (%)		Glucose mg/dl		Total Cholesterol		LDL		HDL		Creatinine /eGFR	
					Initial Visit (IV)	Second Visit (SV)	IV	SV			IV	SV	IV	SV	IV	SV	IV	SV	IV	SV	IV	SV
001	CF-BC	54	M	W	5'7" 197lb 30.85	5'7" 193lb 30.23	146/90	130/80	10/18 55%	13/18 72%	11.1	8.4	167		207		92		28		1.26/64	
002	UHC	48	F	W	5'7" 278lb 43.54	5'7" 252lb 39.47	110/72	120/60	13/18 72%	14/18 77%	6.7	5.80	129	88	111		47		28		.86/80	
003	Medicare Medicaid	56	F	W	5'2" 203lb 37.13		134/74		XXXXX	XXXX	6.9		172		226		136		49		1.01/62	
004	PP	41	M	B	6'6" 296lb 34.21	6'6" 289lb 33.40	120/80	130/80	15/18 83%	17/18 94%	8.0	6.7	164		190		131		36		.83/>125	
005	Medicare BCBS	69	M	W	5'10" 206lb 29.14	5'10" 200lb 27.12	138/80	136/78	8/18 44%	11/18 61%	6.7	6.6	128		152		78		60		1.4/64	
006	Medicare Medicaid	55	M	B	5'7" 308lb 48.24	5'7" 312lb 48.87	110/80	148/100	7/18 38%	11/18 61%	6.8	6.7	121	160	150		85		51		.99/99	

Key:
CF-BC: CareFirst Blue Choice　　　　　= Completed Pre-test/Education Intervention/Post-test
UHC: United Health Care
PP: Priority Partners　　　　　　　　= Did not complete
BCBS: BlueCross BlueShield

Appendix K

Participant Recruitment & Sample Identification

Recruitment Methods	
Retrospective	Real-time
05/31/21-08/27/21	08/30/2021 - 10/ 29/2021
# Patients identified with HgA1C greater than or equal to 6.5: (Via patient inquiry reports): 164 / 5,989 patients	# Patients identified with HgA1C greater than or equal to 6.5: 120 / 5,989 patients
# Patients "recently diagnosed with T2DM" (new A1C >6.5 during this time): Recently diagnosed defined as any new diagnosis made within two- months prior to implementation start date. 13 / 164 patients	# Patients "newly diagnosed with T2DM" (new A1C >6.5 during this time): Newly diagnosed defined as any new diagnosis made two months after implementation start date. 7 / 120 patients
# Patients Consented: 4	# Patients Consented: 2
# Patients Refused: 6 # Patients Excluded: 3 Hospitalized (3)	# Patients Refused: 3 # Patients Excluded: 2 Follow-up visit scheduled outside of four-month implementation period. (2)
Final Recruitment Sample Size: *n*=6	

Appendix L

SWOT Analysis Table

Strengths	Weakness
• Smaller provider practice where providers are dedicated and have a greater ability to adopt new interventions into their practice. • Office staff also dedicated in providing quality care to the population they serve. • Stronger/respectful provider-patient relationships.	• Possible patient resistance • Difficult for individuals from a rural, underserved area to adopt these beneficial lifestyle modifications. • Accessibility limitations of the I-lack access their electronic health record.
Opportunities	**Threats**
• Identify a demand for a diabetes specialist. • Increase awareness of rural healthcare. • Support the need to provide T2DM patients standardized care that align with current evidence-based guidelines. • Identification of common gaps in T2DM self-management. • Patients who are referred to an Endocrinologist for their diabetes must travel to larger neighboring counties. Findings from the DNP project may contribute to eliminating this from occurring and decreasing the burden of T2DM self-management.	• Patient transportation barriers. • Information overload • Lack of telephone access. • Missed connections.

Appendix M:

Timeline

Fall 2020

- CITI Training

- Topic Approval

- DNP Project Committee Formation

- Organization Confirmation

- Executive Summary

Spring 2021

- Identification of Theoretical Framework & EPB/QI Model

- Formulation of Project Design

- PRISMA & Synthesis/Analysis of Literature

- IRB Application & Approval

Summer 2021

- Development of education material for office staff.

Fall 2021 – Winter 2022

- Project Implementation

  - Recruitment & Data Collection

    - Recruitment and patient de-coding.

    - Administration of Pre-Test

    - Brochures to be administered/mailed.

    - Schedule and perform educational intervention via telephone.

    - Administration of Post-test.

- o   Data Analysis

Spring 2022

- • Dissemination of Findings

  - o   Final paper for publication

  - o   DNP Project Presentation

Appendix N

University IRB Approval

<div align="right">
Salisbury University
Institutional Review Board
Committee on Human Research
Phone: (410) 548-3549
Fax: (410) 677-0052
Email:humanresearch@salisbury.edu
</div>

IRB Research Protocol Approval Notification

Date: 5/28/2021

To: J. Hart
     H. Ward
 RE: Protocol #41
 Type of Submission: Exempt
 Type of IRB Review: Exempt
 Protocol is scheduled to begin 8/2021 end 5/2022

 Approval for this project is valid from 5/28/2021 to 5/31/2022.

 This letter serves to notify Dr. Elsie Walker that the Salisbury University (SU) Institutional Review Board (IRB) approved the above referenced protocol entitled, Implementation of a Diabetes Education Initiative in a Privately Owned Family Practice on May 28, 2021.

Pursuant to Federal regulations 21 CFR 56.109, the IRB has determined that this protocol qualifies for Exempt review.

Federal regulation 45 CFR 46.103 (b)(4)(iii) requires Primary Investigators (PI), except when a subject is in immediate danger, to assure any change to an approved protocol is not initiated prior to IRB review and approval. Additionally, the PI must also inform the IRB of unanticipated problems involving risks to participants.

These same federal regulations require continuing review of research be conducted by the IRB at intervals appropriate to the degree of risk. Your research is scheduled to begin 8/2021 and end 5/2022**.** It is the PI's responsibility to submit continuing review reports in a timely manner (at least 3 weeks prior to scheduled end date on the protocol approval).

The SU IRB is organized and operated according to guidelines of the United States Office for Human Research Protections and the United States Code of Federal Regulations and under Federal Wide Assurance No. FWA00020237.

If you have any questions about this review or questions, concerns, and/or suggestions regarding this process, please do not hesitate to contact the Office of Graduate Studies and Research at 410-548-3549 or humanresearch@salisbury.edu.

Appendix O

Agency Letter of Support

November 24, 2020

Salisbury University, School of Nursing

To whom it may concern:

███████████████████████ extends our support to Mr. Howard Ward, a doctoral student at your institution, who seeks to implement a quality improvement project regarding management of type 2 diabetes in Fall 2021. We are looking forward to assisting Mr. Ward along with collaborating with his D.N.P. Project Chair Dr. Jennifer Hart, throughout all stages of his project. Please contact our office if any further questions are needed.

Sincerely,

Appendix P

Participant Status Board

Participant	Consent	Brochures	Pre-Test	Edu.	Post-Test	Scheduled F/U Appt.
1	O	R	C	C	C	11/30/21
2	O	R	C	C	C	12/17/21
3	O	R	X (Participant not answering telephone after multiple attempts)	X	X	~~10/25/21~~ Rescheduled for 11/05/21. Participant noshowed for 11/05/2021 appointment. Unsuccessful in contacting participant during implementation period.
4	O	R	C	C	C	10/25/21
5	O	R	C	C	C	12/16/21
6	O	R	C	C	C	10/25/21
Final Sample Size (n=6)						

Key:
O: Obtained
R: Received (In office or via mail)C: Completed