PREDIABETES: PROVIDER AWARENESS AND THE IMPLEMENTATION OF THE PREVENT DIABETES STAT TOOLKIT

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Prediabetes: Provider Awareness and Implementation of the Prevent Diabetes STAT Toolkit Resources

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

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ABSTRACT

Increased proactivity and improved management of prediabetes is a growing need amongst providers in the primary care setting. Nearly one third of North Dakota residents over the age of 20 have prediabetes, but only one out of ten are aware of this reversible medical condition. Without early correction and identification, 15-30% of people with prediabetes will develop type 2 diabetes. Based on the need for increased proactivity towards prediabetic management, evidence-based resources were created by the Centers for Disease Control and Prevention and the American Medical Association. The Prevent Diabetes STAT Toolkit was developed to guide medical professionals in assisting their patients at risk for type 2 diabetes and encourage referral to the Diabetes Prevention Program (DPP). The DPP is a lifestyle change program that focuses on promoting weight loss, physical activity, and nutrition education for patients who meet the criteria of a BMI ≥ 25, $\geq$ age 18, are not currently pregnant and either have a history of gestational diabetes, have been diagnosed with prediabetes, or score high risk on the Prediabetic Risk Assessment.

The project included knowledge surveys, educational presentations, and chart reviews at a rural primary care clinic. The providers' awareness of prediabetes knowledge, best practice standards, and barriers to practice were identified. An educational module was then presented and the PDS Toolkit resources were dispersed to the staff of the clinic. Overall, the effectiveness of the education was affirmative, despite a high baseline understanding of prediabetes. Prior to implementation, the management of at-risk patients was suboptimal, as preventative action was not taking place. With education and the initiation of the Prediabetes Risk Assessment, PDS Toolkit resources, defined screening standards, and an Epic referral, the providers and ancillary staff showed increased uptake of understanding and improved proactivity towards prediabetes.

The findings also displayed adherence to initiating referrals for individuals with prediabetic risk factors, such as obesity, and following implementation. Recommendations can be made regarding the efficacy and importance of preventing type two diabetes through enhanced staff screening awareness, management knowledge, and patient guidance on prediabetes.

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DEDICATION

To my parents, Greg and Rondee. Their unwavering support has guided me through the challenges and triumphs of my educational and personal journey. The consistent gift of self-lessness, provision, and love will forever be appreciated.

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LIST OF ABBREVIATIONS

AMA .....American Medical Association

CDC .....Center for Disease Control and Prevention

DPP .....Diabetes Prevention Program

PDS .....Prevent Diabetes STAT

T2DM.....Type Two Diabetes Mellitus

UMC .....Unity Medical Center

CHAPTER 1: INTRODUCTION

Background and Significance

Prediabetes is a growing health concern for Americans today, with one out of three adults diagnosed (Center for Disease Control and Prevention [CDC], 2019). Prediabetes can be defined as an intermediate state of hyperglycemia, with blood sugar levels that are higher than normal but not high enough to be considered diabetes (Bansal, 2015). The rate of conversion from prediabetes to type 2 diabetes (T2DM) is nearly five to ten percent of the population per year. Fortunately, efficacy of lifestyle interventions has been proven to reduce the transition to diabetes by 40-70% in adults with prediabetes. As the rate of prediabetes continues to increase, the importance of addressing the problem of prediabetic risk could help to reverse the prevalence of future chronic disease across the country. Identifying and managing prediabetes will improve provider awareness, increase diabetes prevention referral rates, positively impact diabetes prevention, and ultimately limit the effect of diabetes on the population.

Prediabetes can be considered an intermediate hyperglycemic state. The American Diabetes Association (ADA, 2020a) defines prediabetes as an impaired fasting glucose between 100 and 125 mg/dL. The ADA recommends screening any person older than 45 who is overweight plus has one of the following risk factors for prediabetes: physical inactivity, minority, history of elevated glucoses, hypertension, low HDL, diagnosis of polycystic ovary syndrome, or gestational diabetes history. With such criteria in place, the CDC suggests that 37% of adults older than 20 and 51% of adults older than 65 in the United States have prediabetes (Bansal, 2015). Applied to the population of the country, nearly 86 million Americans are faced with the reality of a prediabetes diagnosis.

The health risks associated with prediabetes could affect the population through various facets. VenHuizen (2019) detailed that the health risks associated with impaired glucose metabolism and elevated glucose in the blood can cause detrimental health problems in the future. Some permanent complications could be avoided, and prediabetes could be reversed with early correction and identification. When prediabetes is left without intervention, progression to T2DM occurs in 5 to 10% of people annually. With the conversion of prediabetes to T2DM, complications such as neuropathies that affect the blood flow to the kidneys, eyes, brain, systemic vasculature, and heart may arise. When complications continue to progress, the development of other chronic diseases, such as kidney disease, heart disease, stroke, retinopathy, and neuropathic pain could also occur. If prediabetes is not addressed, the consequences of diabetes will continue to burden the health of Americans and the healthcare system.

Along with the health concerns related to the increased prevalence of chronic diseases, the economic impact of chronic disease is substantial. Nhim et al. (2018) wrote that diabetes has proven to be a prevalent, expensive, and morbid disease for Americans. In 2017, the estimated cost of diabetes in the United States was 327 billion dollars and nearly 200,000 individuals died, making diabetes the seventh leading cause of death. Nationally, 84.1 million people have prediabetes, with the cost reaching nearly 43.4 billion dollars spent on prediabetes alone (O'Connell & Manson, 2019). With a transition of prediabetes to diabetes, the annual cost per patient can reach $13,240/individual for those diagnosed with diabetes and $4,250 for those undiagnosed. The amount spent on the management of diabetes has one of the highest dollar amounts for chronic disease management. The heavy economic burden makes increasing the access to programs for prediabetes, diabetes, and risk factor reduction even more crucial for the American population.

A management plan for the prediabetes endemic was developed by the CDC and the American Medical Association (AMA) entitled the Prevent Diabetes STAT (PDS) criteria and the use of the nationwide Diabetes Prevention Program (DPP). As the rate of prediabetes continues to increase, so too does the need for robust efforts to reverse the prevalence of future chronic disease across the country. The DPP has proven to be an effective measure in reversing the risk of diabetes and helping individuals to make necessary lifestyle changes that will lead to healthy habits in the future. According to Holliday et al. (2019):

> a landmark 2002 Diabetes Prevention Program, a randomized controlled trial, found that an intensive lifestyle change program focused on diet, physical activity, and weight loss reduced the risk of developing type 2 diabetes by 58% among adults aged 18 or older and by 71% among adults aged 60 or older compared with adults on placebo and that the program was significantly more effective for reducing diabetes risk than metformin (para. 7).

The DPP was introduced to communities throughout the nation in 2010 with an effort to create partnerships between public and private organizations to offer cost effective evidence-based interventions to help prevent T2DM in the United States (CDC, 2021a). To assist providers in understanding the need for screening and referral to a lifestyle management program, the CDC and AMA have created the Prevent Diabetes STAT Toolkit, a toolkit for healthcare teams to screen, test, and act today.

Unfortunately, there is provider inconsistency relating to overall knowledge, testing, and treatment for risk factors of prediabetes. Although many providers understand the hazards of impaired glucose metabolism, there is a lack of awareness regarding when to screen patients and a hesitancy to refer to appropriate resources. The inaction in the healthcare system could result in

an increased number of people progressing to a chronic disease that could have been prevented. A standardized approach towards prediabetes, such as the DPP, may ensure that those who are at a risk for prediabetes are identified and referred to appropriate and available resources.

Problem Statement

As of 2018, 34% or nearly 198,000 North Dakota adults 20 years and older have prediabetes, but only one out of ten people have been diagnosed. Without weight loss and moderate physical activity, 15 to 30% of people with prediabetes will develop T2DM within five years (North Dakota Department of Health, 2018). The practice improvement project took place at a rural critical access clinic in a North Dakota community with a population of 4,159. A comprehensive process for diagnosing and managing prediabetes needed to be established at the clinic to enhance the already existing DPP. For primary care providers in the clinic setting, there was a need for increased knowledge and improved processes surrounding prediabetes screening, diagnostic, and management criteria. A screening and management process to improve accuracy of diagnostic rates and referral management of patients at risk for prediabetes was not widely utilized at the facility. The reactive approach toward prediabetes may be positively impacted by the implementation of a robust prediabetes screening and referral process to a lifestyle modification program, such as the DPP.

Purpose of the Project

The DPP in place at Unity Medical Center is an effective resource for the rural-based population but depends on clinician awareness of patient risk factors for prediabetes, as well as clinician understanding of the referral process to a lifestyle modification program. The organization's "2019 Community Needs Assessment" identified lack of physical activity, obesity, diabetes, and wellness and disease prevention as significant health needs among the

patient population (Unity Medical Center, 2019). The main purpose of the project is to assess provider awareness of prediabetes management and then implement the PDS Toolkit resources to improve provider identification of prediabetes risk factors and to increase referral rates to the DPP. The data obtained will facilitate the education and implementation of the toolkit resources to improve the screening and referral process for patients with and at risk for prediabetes. The toolkit was created for early detection and management of prediabetes by improving provider knowledge and confidence (CDC, 2019). With a screening and referral process in place, the goal is to increase providers' likelihood to screen an at-risk patient for prediabetes and then properly refer the patient to a lifestyle modification program, all with the help of the PDS Toolkit resources.

Defined Objectives

Four objectives will direct the practice improvement project. Each of the listed objectives pertain to the execution of the evidence-based practice improvement project at Unity Medical Center.

1. Objective One: Assess the knowledge and understanding of prediabetes screening and management practices of providers, per the ADA guidelines, at a rural North Dakota clinic.
2. Objective Two: Develop and deliver an educational module explaining the current recommendations and the Prevent Diabetes STAT (PDS) Toolkit resources to the providers and ancillary staff of the rural North Dakota clinic.
3. Objective Three: Implement the use of the PDS Toolkit resources to increase preventative action taken on patients with high risk for prediabetes over a three-month period.

4. Objective Four: Increase patient referrals to the Diabetes Prevention Program by 25% in a three-month period.

CHAPTER 2: THEORETICAL FRAMEWORK AND LITERATURE REVIEW

A review of literature of various databases was conducted. A total of four electronic databases were used to obtain the adequate amounts of evidence including Cochrane Database of Systematic Reviews, PubMed, Health Source-Nursing/Academic Edition (EBSCO), and Cumulative Index of Nursing and Allied Health Literature (CINAHL). Access was gained to the listed databases through the North Dakota State University Library page by narrowing the databases to only nursing academic databases. Keywords used for the search included: prediabetes, provider awareness, primary care providers, diabetes prevention program, lifestyle modification program, and prediabetes prevalence. The search was limited by articles that were published between 2010 to 2021 within an American journal. English language and full text only were also applied to the search.

List of Definitions

Prediabetes: defined as "preclinical or early diabetes mellitus, detected by a slightly elevated blood glucose level or impaired glucose tolerance" (Oxford Dictionary, 2019). According to the American Diabetes Association [ADA] (2020a), prediabetes diagnostic criteria is as follows: a hemoglobin A1c between 5.7% to 6.4%, **or** a fasting plasma glucose of 100 mg/dl to 125 mg/dl, **or** an oral glucose tolerance test of between 140 mg/dl to 199 mg/dl.

Primary Care Providers: defined as "a healthcare practitioner who sees people that have common medical problems. This person is most often a doctor. However, a primary care provider may be a physician assistant or nurse practitioner" (Medline, 2020, para. 1). Primary care, according to the World Health Organization, is "a whole-of-society approach to health a well-being centered on the needs of individuals, families, and communities," and "focused on comprehensive and interrelated aspects of physical, mental, and social health and well-being"

(World Health Organization, 2020, para. 1). The primary care providers focused on in this study are medical doctors, physician assistants, and nurse practitioners that are practicing within a primary care clinic.

Lifestyle modification programs: The definition given to lifestyle modification programs is relating to a program that focuses on forms of behavior change for the purpose of weight loss, increased participation in exercise, and education on informed healthful decision making. An example of such program is the Diabetes Prevention Program developed by the CDC and American Medical Association (AMA) (CDC, 2019).

Clinic setting: This is defined as rural primary care clinics with or without affiliation to a larger network of healthcare systems.

Theoretical Framework

The Chronic Care Model

The Chronic Care Model is a conceptual framework that promotes effective change within health plans and provider groups, fosters improvement initiatives, and creates and distributes resources that allow for the collaborative strategy to create systemic changes within institutions or associated care clinics (Anderson et al., 2015). The Chronic Care Model encompasses six components that affect functional and clinical outcomes associated with disease management. These include organization of healthcare, self-management support, decision support, delivery system design, clinical information systems, and community resources and polices (Stellefeson et al., 2013). The Chronic Care Model is an organizing framework developed by Edward Wagner for improving chronic illness care rather than acute illness treatments and assumes that enhancement in care requires an approach that incorporates patient, provider, and system level interventions.

The topic of prediabetes management follows this model as it is related to a provider's ability to diagnose, care for, and refer the patient to community resources such as the DPP. There are six areas that comprise intervention with the Chronic Care Model:

1. The community- included the community resources along with policy developments. The model encouraged linkages with the community for example, the DPP, for peer support, care coordination, and community-based interventions. The previously established DPPs will be utilized to allow for communal support and the use of proven interventions to aid in the patients' lifestyle change.
2. Self-management support- empowered the patient to set goals and identify barriers such as weight and glucose control. Referral to the DPP allowed patients the ability and structure to set goals for self-management through guided step by step monthly meetings and a lifestyle coach for accountability.
3. Delivery system design- allowed the practitioner to coordinate with other providers and established follow up care for the patient. The workflow regarding prediabetes evaluation and referral to a lifestyle change program was enhanced by educating the providers on current prediabetes management recommendations and providing resources for improved identification and referral ease. With increased awareness and toolkit resources, the process of detecting and managing prediabetes within the health system was positively impacted.
4. Decision support- ensured that interventions were evidence-based and that specialists, such as registered dietitians, were included in the care. With the use of the PDS Toolkit resources, decision support regarding the screening and referral support were available, as the providers had access to the most up to date evidence-based guidelines. The

handouts and education included in the toolkit allowed ease for the provider when integrating the DPP referral process and prediabetes awareness for the patients in the clinic setting.

5. Clinical information systems- incorporated informatics and supported technology usage, for example to watch referral trends, in the charting system. Information regarding the providers' previous acknowledgment of elevated blood glucose readings and referral management was assessed. Following the implementation of the toolkit, data was collected regarding referrals to the DPP of the patients over 18 seen in the clinic for a wellness exam over a 3-month time frame.
6. Organization of healthcare- guaranteed the system supported and advocated for quality improvement of chronic diseases throughout the healthcare system. Implementing the use of the PDS Toolkit resources increased consistency amongst the providers and allowed for a measurable improvement strategy.

The interventions listed above, along with informed, activated patients and a proactive practice team, led to productive interactions and improved outcomes. When observing the provider management of prediabetes, the Chronic Care Model gave a valued approach to deliver and implement change for not only the providers, but also for the patients, the clinic setting, and the healthcare system as a whole.

IOWA Model

The IOWA Model provided a guideline for clinicians when decision making about clinical and administrative practices that have an impact on healthcare outcomes (Melnyk & Fineout-Overholt, 2019). IOWA follows a feedback loop process that includes the identification of triggering issues/opportunities, stating a question or purpose, forming a team, appraisal of a

body of evidence, designing/piloting a practice change, identifying the practice change, and disseminating the results. The use of the IOWA model allowed the investigator to easily follow defined steps for the implementation of practice change for providers in the primary care setting. This model allowed for the use of the feedback loop to assist in reflection, evaluation, and modification to ensure that implementation was individualized, evidence-based, and simply adopted into practice.

Topic selection. EBP topics were chosen by identifying clinical concerns or by gaining new clinical knowledge that has not yet been applied to practice. Reasons for practice change are typically triggered by a problem-focused or knowledge-focused approach. Triggers for problem-focused practice change looked at existing data that has evidence for areas of improvement, while knowledge-focused triggers investigate new research and guidelines that help healthcare providers to question and promote changes in current practice standards (Melnyk & Fineout-Overholt, 2019). Currently, diabetes screening is a class B recommendation by the US Preventive Task Force, and there is a lack of provider knowledge and accuracy of prediabetes diagnosis and referral management. The PDS Toolkit resources aim to provide a comprehensive approach to navigating the risk factors, diagnostic criteria, and management of prediabetes and overall diabetes prevention.

Team formation. The topic was presented as a priority for the organization, and the co-investigator assessed buy-in from the location of the project implementation. After the establishment of a team and support from the facility was achieved, the team then was fully developed which ensured that implementation, evaluation, and sustainability of practice change was attained. The members of the committee included stakeholders from the School of Nursing, primary practice providers, interdisciplinary University colleagues, and experts on the topic.

Committee members were chosen based on selection criteria and include: Dr. Mykell Barnacle, DNP, FNP committee chair, Dr. Dean Gross, Ph.D., FNP, Julie Ketterling, MSN, FNP, and Dr. Yeong Rhee, Ph.D. Other members include the staff at Unity Medical Center including the medical director, nurses, the registered dietitian, and support staff.

Evidence retrieval. The retrieval of evidence started with identifying available resources and key terminology that is useful for guided research. Various scholarly databases are used for the collection of valid evidence from different perspectives and sources (Melnyk & Fineout-Overholt, 2019). The information was obtained from the search criteria including prevalence, economic impact, diagnosis, pathophysiology, current management, provider knowledge, and the impact of a DPP. Electronic databases, textbooks, and healthcare professionals in the field helped to contribute to the evidence collection.

Grading evidence. The team then worked together to evaluate the found evidence of the individual research and the overall strength of the body of evidence (Doody & Doody, 2011). The effectiveness, necessity, applicability, and feasibility of the evidence obtained was done during this stage of the IOWA model. Evidence had to be sufficient to continue with an evidence-based change project. The research-based evidence that had been gathered was a combination of both quantitative and qualitative research regarding the prevalence of prediabetes, provider knowledge, and the effectiveness of lifestyle change in preventing the onset of T2DM.

EBP standard development. With the critique of the literature completed, the recommendations for practice improvement were developed. Recommendations were set based on benefits and risks to the patients, which then set a standard for practice guidelines, actions, assessments, and treatment plans. Proper evidence-based practice ensured a patient centered

approach that is highly individualized (Doody & Doody, 2011). The objectives for this project were based on the gaps in provider awareness of prediabetes and determining the most effective evidence-based resources to ensure that diagnosis and prediabetes management was addressed within the primary care setting.

EBP implementation. Implementation of the project occurred with the use of toolkit resources developed by the CDC and AMA and evidence-based guideline education. The primary care providers, the organization, and institutional leadership were counted on to implement the practice change and raise support behind the proposed workflow enhancement. The evidence that was conveyed focused on the strengths and perceived benefits through education, audit, and feedback from team members (Doody & Doody, 2011). The employees at the hospital were provided with an educational session that described the benefit of prediabetes prevention and reinforced the need for preventative action to achieve support and buy-in for the project's objectives.

Evaluation. Evaluation provided the ability to see the contribution and value of the dissemination of evidence into practice. The program's impact was highlighted by actual change that did occur and was measured appropriately and timely (Doody & Doody, 2011). The evaluation of the co-investigator's project included a series of pre and post intervention surveys and assessment of EHR data that determined rates of referrals to the DPP. Statistical analysis took place with the data collected and qualitative and quantitative information obtained from the providers in practice at Unity Medical Center.

Literature Review

Pathogenesis of Prediabetes

Blood glucose levels tend to rise due to progressive loss of insulin production and the continual increased presence of insulin resistance (Weisenberger, 2018). The progression to the development of T2DM typically starts with the dysfunction of beta cells alongside insulin resistance but a continuation of normal blood glucose levels. Genetics can play a role in the development of this stage, as some individuals may have genes that predispose them to beta cell break down. The beta cells become resistant to insulin, which requires the existing functioning beta cells of the pancreas to increase insulin production and facilitate the movement of glucose from the blood stream to the cells. The result is higher than normal insulin levels but normalized blood sugar levels.

Movement to the stage of prediabetes is when the pancreas stops releasing the appropriate amount of insulin to maintain a blood glucose below 100 mg/dL. The progression to full T2DM occurs when the beta cells begin to fail even more, and the pancreas cannot keep up with the demand of the amount of circulating glucose. There is not enough insulin to keep blood sugars below 100 mg/dL, and therefore, blood sugar continues to rise without intervention (Weisenberger, 2018). According to Copstead and Banasik (2015), “the insulin resistance of type 2 diabetes is defined as a requirement for more insulin for the same biological action, along with lowered glucose utilization at all levels of insulin concentration” (p. 824). The disease progresses as the pancreatic beta cells impair insulin production and the pancreatic alpha cells increase glucagon which further leads to hyperglycemic states.

Genetic and Environmental Factors

The risk factors for both prediabetes and T2DM are similar, as a diagnosis of prediabetes is a direct correlation to a diagnosis of T2DM. The factors that may place a person at higher-than-average risk include age, especially those over the age of 45 years old (Weisenberg, 2018). Sex also plays a role as men are at higher risk than women. Ethnicity is considered a significant risk factor as African American, Latino, Native American, Asian American, and Pacific Islander individuals have a two to six times more likelihood of developing prediabetes, along with a 39% increased risk for those carrying an immediate family history of T2DM (McCulloch & Udler, 2021). There are also gynecological considerations, such as history of gestational diabetes during pregnancy or polycystic ovarian syndrome, both of which place a patient at increased risk for the development of T2DM (Weisenberger, 2018).

Various controllable risk factors exist that considerably increase a patient's risk for prediabetes. The escalation in the rates of obesity and Westernization of the American lifestyle both are significant factors in the rise in diabetes diagnosis (McCulloch & Udler, 2021). Weight and obesity are major contributing factors to the development of prediabetes, leading to T2DM and the associated complications. For both men and women with a BMI between 25 and 30, there is an increased risk of prediabetes by 30 and 10 percent respectively (Gray et al., 2015). Significant correlation to inactivity, high blood pressure, high triglyceride levels, low high-density lipoproteins, and heart disease or blood vessel problems is evident among those with a diagnosis of diabetes. Sleep deprivation can have an effect on insulin resistance, as does smoking (Weisenberger, 2018). The health associated risks that correlate with diabetes increase the importance of reaching the population at the prediabetic stage as movement to T2DM is highly likely.

Prevalence and Economics

The cost of prediabetes and diabetes has had a toll not physically, but also financially, on the American population. The substantial burden of diabetes care can be seen in the 26% increase in healthcare costs from 2012 to 2018. The American Diabetes Association determined 327 billion dollars were spent on diabetes over a one-year period, with 237 billion dollars in direct medical costs and 90 billion dollars associated to reduced productivity of medical providers (ADA, 2018). In 2012, only 322 billion dollars were spent on diabetes, which means there has been a 25% increase in five years' time. For a person diagnosed with diabetes, the average cost of $16,750 per year is associated with medical expenses. An average total of $9,600 a year can be priced for the direct management of diabetes for a person diagnosed with the disease. This price tag is 2.3 times higher than the expenses of those without diabetes. In total, one in four healthcare dollars is spent on diabetes in America (ADA, 2018).

Nationally, in 2019, people with diagnosed diabetes were estimated to be 37.5 million and 8.5 million had undiagnosed diabetes (ADA, 2022). Prediabetes accounted for 96 million individuals in 2019. Among adults, 11.3% of the American population has diagnosed diabetes and 34% of the population have prediabetes. These statistics underscore the importance of the necessity for lifestyle change. The burden of diabetes annually exceeds $1,240 per person in the US. Therefore, urgency should be placed on the need for a comprehensive inclusion of diabetes prevention and screening to assist in the increase of effectiveness of diabetes self-management education and support (Dall et al., 2019). The multi-faceted impact of diabetes from the medical costs, productivity loss, premature mortality, and the overall loss of quality of life perpetuates the need for not only early diagnosis, but prevention.

Prediabetes Diagnosis

Several expert bodies in the United States have established guidelines for prediabetic and diabetic screening and management. The differing recommendations can be challenging to ascertain as organizations including the ADA, American Association of Clinical Endocrinologists (AACE), and United States Preventative Task Force (USPFT) all have minor differences in screening criteria. The CDC and AMA have additional inclusion criteria that is associated with individuals that qualify for preventative action to be taken regarding risk factors.

Table 1

Screening Guidelines

	Screening Guideline	Recommendation
USPSTF	Asymptomatic adults between the ages of 35 and 70 years old who are overweight or obese. (USPSTF, 2021)	Grade B: Recommend screening all individuals between 35-70 years old that are overweight or obese.
ADA	Testing for prediabetes and/or T2DM should be considered in asymptomatic people of any age that are overweight or obese (BMI greater than or equal to 25kg/m^2 or 23kg/m^2 in Asian Americans) and or who have one or more additional risk factor: • First degree relative with diabetes • High risk ethnicity (e.g. African American, Latino, Native American, Asian American, Pacific Islander) • History of CVD • Hypertension (> or equal to 140/90 mmHg or on therapy for hypertension) • HDL <35 mg/dL and/or triglycerides >250 mg/dL • Women with polycystic ovarian syndrome • Physical inactivity • Other clinical conditions that are associated with insulin resistance (such as acanthosis nigricans and severe obesity) (ADA, 2020b)	Grade B: Testing for prediabetes and/or T2DM should be considered in asymptomatic people of any age that are overweight or obese and or who have one or more additional risk factor. Grade B: Screening for prediabetes and type 2 diabetes with an informational assessment of risk factors or validated tools should be considered for asymptomatic adults Grade B: For all people, testing should begin at age 45 Grade B: Testing should occur for those women that are planning pregnancy that are overweight or obese and have one or more additional risk factors for diabetes. Grade C: In the event tests are normal, retesting should occur every three years. Grade B: To test for prediabetes and diabetes, fasting plasma glucose, 2-h plasma glucose during a 75-g oral glucose test, and an A1C are all clinically appropriate. (ADA, 2020b)
AACE	AACE recommends that individuals that meet any of the risk factors listed below should be screened for prediabetes or diabetes: • ≥45 years and older without other risk factors: • CVD or family history of T2D • Overweight or obese • Sedentary lifestyle • Member of an at-risk racial or ethnic group: ○ Asian, African American, Hispanic, Native American (Alaska Natives and American Indians), Pacific Islander • High-density lipoprotein cholesterol (HDL-C) <35 mg/dL (0.90 mmol/L) and/or a triglyceride level >250 mg/dL (2.82 mmol/L) • Impaired glucose tolerance (IGT), impaired fasting glucose (IFG), and/or metabolic syndrome • Polycystic ovary syndrome (PCOS), acanthosis nigricans, or nonalcoholic fatty liver disease (NAFLD) • Hypertension (blood pressure >140/90 mm Hg or on antihypertensive therapy) • History of gestational diabetes or delivery of a baby weighing more than 4 kg (9 lb) • Antipsychotic therapy for schizophrenia and/or severe bipolar disease • Chronic glucocorticoid exposure • Sleep disorders in the presence of glucose intolerance (A1C >5.7%, IGT, or IFG on previous testing), including obstructive sleep apnea (OSA), chronic sleep deprivation, and night-shift occupation (AACE, n.d.(a))	Screening recommended as stated to the left. In the event of a normal test result, repeat testing every 3 years. Clinicians may consider retesting annually for those with two or more risk factors. (AACE, n.d.(a))

For the purpose of the project, the recommendations set forth by the ADA will be followed concerning screening criteria. With regards to the implementation of the project, the CDC recommends the inclusion of those 18 years and older and a BMI > or equal to 25 to join the lifestyle management program; therefore, the guidelines that have been set forth for inclusion to a DPP by the CDC will be followed, but the ADA recommendations will continue to be incorporated for screening and education purposes.

The Mayo Clinic (2020) detailed the testing criteria set by the ADA. There are multiple different tests that could be completed. First is the hemoglobin A1c test, which shows the average blood sugar level for the last three months. Specifically, the test measures the percent of blood sugar that is attached to the hemoglobin, or oxygen carrying protein, in red blood cells. The higher the blood sugar levels are circulating in the blood stream, the more sugar that will be attached to the hemoglobin molecule. Hemoglobin A1c tests can be considered inaccurate in conditions of pregnancy or if the patient has a history of anemia. Levels associated with a prediabetes diagnosis are as follows according to the ADA guidelines and Mayo Clinic (2020):

- An A1c level below 5.7% is normal.
- An A1c level between 5.7% and 6.4% is considered prediabetes.
- An A1c level of higher than 6.5% on two separate occasions support a diagnosis of type two diabetes.

Another test that is used is a fasting blood sugar test, which is a blood sample that is obtained following a fast of at least eight hours. According to the ADA guidelines and Mayo Clinic (2020), levels associated with this test are as follows:

- A fasting blood sugar level below 100 milligrams per deciliter (mg/dL) is considered normal.

- A fasting blood sugar level from 100 to 125 mg/dL is considered a prediabetes range. This result is at times considered impaired fasting glucose.
- A fasting blood sugar level of 126 mg/dL or higher indicates type two diabetes.

The final test that can be used for prediabetes diagnosis is the oral glucose tolerance test. This test is typically only used to confirm a diagnosis of diabetes during pregnancy. A blood sample is taken after an eight hour fast. The patient will then drink a sugary solution, and the blood sugar level will be reassessed after two hours. According to the ADA guidelines and Mayo Clinic (2020), the levels associated with prediabetes and diabetes diagnosis are as follows:

- A blood sugar level less than 140 mg/dL is normal.
- A blood sugar level from 140 to 199 mg/dL is considered prediabetes.
- A blood sugar level of 200 mg/dL or higher indicated diabetes type two.

Each of these screening modalities has been recognized by the ADA as an appropriate method to screen for both prediabetes and diabetes in individuals.

Provider Knowledge

Providers have not demonstrated consistency with testing for and treating the risk associated with prediabetes. Although many of the providers understand the consequences associated with impaired glucose metabolism, there seems to be a lack of awareness and motivation regarding when to screen patients as well as how to refer them to appropriate resources (Nhim et al., 2018). This lapse in current practice could mean an increased number of people proceeding to a chronic disease that could have been prevented.

The absence of provider knowledge can be seen in a study by Tseng and colleagues (2017). A survey was administered to 155 primary care providers (PCP) to assess their knowledge of risk factors of diabetes and lab findings consistent with diagnosis criteria, potential

treatment options, management practices, and provider attitudes and beliefs relating to prediabetes (Tseng et al., 2017). Only six percent of PCPs identified the risk factors that should prompt prediabetes screening. Regarding laboratory findings, only 17% of providers identified the correct parameters for diagnosing prediabetes relating to both fasting glucose and A1c. It was also determined that only 11% of PCPs decided to select a referral for their patients to a behavioral weight loss program. Despite the success of preventative related interventions in decreasing the incidence of prediabetes leading to diabetes, the literature shows that 90% of people with prediabetes are unaware of their diagnosis and are not obtaining evidence-based interventions from their providers. Evaluating provider knowledge is necessary to improve screening, referral, and intervention implementation in the future.

Another instance of barriers and reduced levels of provider knowledge was assessed in a study which included the use of clinicians, comprised of nurse practitioners, physicians, and residents. To test their knowledge of prediabetes, a 47-question survey with domains in understanding prediabetes, prediabetes management, barriers to management and knowledge of the DPP was administered (Keck et al., 2019). Of the participants, 100% of the clinicians agreed that a prediabetes diagnosis would be effective in increasing patient awareness for lifestyle modifications, but less than 42% reported being familiar with DPPs. When clinicians were surveyed, 48.4% reported knowledge regarding the referral process, 41.9% reported understanding which organizations offer DPP, and 16.1% reported understanding of insurance coverage. When the data from the electronic health records was further assessed, it was found that clinicians were screening patients according to the USPSTF guidelines, but there was a lack of consistency with diagnosis. There was a deficiency of the use of the correct ICD-10 code or diagnosis for prediabetes with only 51% of those eligible being correctly labeled as such in the

electronic health record. The concluding evidence again shows the need for improvements in provider awareness and referral management of prediabetes.

Risk factor identification and lack of provider to patient counseling could also be considered significant challenges in the prediabetes diagnosis, referral, and management process. Obesity affects nearly 40% of the adult population, and prediabetes prevalence closely follows this trend. Valero-Elizondo et al. (2019) reported that almost 1 in 3 individuals with a mild form of obesity and 1 in 4 with severe obesity were not counseled by providers on the need to improve diet or exercise patterns. Overall, nearly 40% of people with prediabetes were not informed of the need for lifestyle counseling, nor were they given a referral to a program for lifestyle assistance. Research in the past has demonstrated that adequate patient/provider communication is necessary for success in proper lifestyle counseling adherence. The findings will motivate healthcare providers to encourage lifestyle counseling for those at risk for prediabetes and obesity, subsequently leading to improved adherence by patients.

The problem could also be sourced from the beginning of provider practice, as schools do not prepare students and future primary care providers about prediabetes prevalence and management. Kahn et al. (2019) conducted a cross-sectional study relating to medical students' knowledge relating to prediabetes and diabetes prevention. The 258 student respondents were comprised of those attending an AMA's annual meeting and used a six-item multiple choice questionnaire with an assessment of specific knowledge areas including diagnosis, epidemiology, management, treatment options, and clinical guidelines. Alarmingly, only 13% of the students could correctly answer the questions regarding the USPFT's recommendations for screening, but 60% could answer the question regarding optimal weight loss range for preventing type 2 diabetes. The survey determined that only half of the respondents knew the prediabetes

prevalence and risk factors, while a quarter answered the questions regarding prediabetes diagnosis correctly. This study suggests a knowledge gap in education regarding prediabetic diagnosis and management.

The importance of addressing the problem of prediabetic risk of T2DM development, the effect it has on the population, the lack of provider awareness, and the solution of the diabetes prevention referral all remain clinically and economically significant. Beyond clinician inaction regarding prediabetes, the literature reviewed does not specify which component of comprehensive prediabetes care is lacking. A process of improving education and awareness for providers could reduce the impact of prediabetes, thereby reducing costly and potentially life-threatening T2DM.

Current Prediabetes Management

The AACE (n.d.(b)) details the current management of prediabetes guidelines. The primary goal for prediabetes management is to reduce or normalize a patient's glucose levels and delay or prevent full progression to diabetes. Patients should also have proper management of prediabetes comorbidities, such as hypertension, hyperlipidemia, obesity, cardiovascular disease, and chronic kidney disease. The first step in management is the use of lifestyle modification. Therapeutic lifestyle management includes "medical nutrition therapy (the reduction and modification of caloric and saturated/hydrogenated fat intake to achieve weight loss in individuals who are overweight or obese), appropriately prescribed physical activity, avoidance of tobacco products, adequate quantity and quality of sleep, limited alcohol consumption, and stress reduction" (AACE, n.d. (b), para. 2). Physical activity that includes 150 minutes of regular to moderate intensity exercise weekly is suggested, and weight loss should be aimed at a 5 to 10% reduction in total body weight with a recommended goal of a BMI between 18.5 and 24.9.

Medication approaches should only be considered if lifestyle modification does not produce necessary results in three to six months. Currently there are no medications that are approved by the US Food and Drug Administration for the treatment or management of prediabetes (AACE, n.d. (b)). Therefore, a careful risk benefit assessment would need to be conducted for the use of off label medications. Drug therapy should be considered for high-risk rather than lower risk patients. High-risk patients include those with impaired fasting glucose, impaired glucose tolerance, and/or metabolic syndrome with other considerations including cardiovascular disease, nonalcoholic fatty liver disease, and a history of gestational diabetes. Medications to be considered include the use of metformin, which when paired with lifestyle change has been correlated with a 58% reduction of diabetes in comparison to 31% with the use of metformin alone. Other medications that could be considered include thiazolidinedione and GLP-1 receptor agonists.

Prevent Diabetes STAT

In 2015, the AMA and the CDC joined together to launch a project entitled Prevent Diabetes STAT. The goal of the project was to introduce a long-term initiative that increased the amount of screening and intervention for prediabetes to hopefully slow the progression, as T2DM threatens nearly one in three Americans. The STAT acronym in Prevent Diabetes STAT stands for screen, test, and act today and expands on current efforts brought forth by the two organizations in the past. This national initiative aims to give providers and patients easy to follow guidelines and algorithms for prevention, diagnosis, and management of prediabetes. As a result of the partnership between the AMA and the CDC, they have created a comprehensive toolkit to screen and refer patients to appropriate community DPP (CDC, 2015). The AMA and the CDC had been laying the foundation for this resource years prior with the introduction of the

DPP in 2012 by the CDC and the Improving Health Outcomes initiative in 2013 by the AMA. The opening remarks of the provider toolkit includes the statement (ADA, 2018):

> The United States Preventive Services Task Force (USPSTF) issued a Grade B recommendation in 2015 which states that all adults aged 40 to 70 years who are overweight or obese should be screened for type 2 diabetes mellitus. The recommendation also notes that physicians can consider screening younger adults or adults with normal weight if they have a family history of type 2 diabetes mellitus, a past medical history of gestational diabetes or polycystic ovarian syndrome, or if they are a member of a racial or ethnic minority. The USPSTF also recommends that all adults with abnormal glucose be referred to an intensive behavioral counseling intervention such as a CDC-recognized diabetes prevention program (para.1).

The toolkit, along with the Prevent STAT website, provide necessary resources for patients, providers, and businesses alike. The provider toolkit (see Appendix L) is composed of the following guided resources (ADA, 2018):

- *You can prevent type 2 diabetes*- healthcare provider fact sheet
- *Diabetes risk test*
- *Promoting prediabetes awareness to your patients*- "8 x"11 poster
- *Are you at risk for type 2 diabetes?* – Patient handout
- *So you have prediabetes…now what?* –Patient handout
- *M.A.P to diabetes prevention for your practice*- One-page overview
- *Point-of-care prediabetes identification algorithm*- Infographic narrative
- *Patient letter/email and phone script*
- Sample patient referral form/table for calculating body mass index

- *Commonly used CPT and ICD codes*- Table
- Link to sample "Business Associate Agreement" –presentation

Knowledge regarding the toolkit and the resources is also lacking amongst providers. Nhim et al., (2018) used a cross-sectional web-based survey to assess providers' screening, testing, and overall referral behaviors. The results determined that 38% of PCPs knew about the DPP, only 19% of the providers knew about the PDS STAT Toolkit, about 27% screened their patients using the risk test for prediabetes, and 23% the providers made referrals. On a positive note, 97% of the PCPs ordered the correct blood tests associated with the risk factors. The implementation of the toolkit resources in practice is a simple, yet effective, means for providers to improve understanding and consistency of prediabetes management for patients.

Diabetes Prevention Program

The original Diabetes Prevention Program was funded by the National Institute of Health and was developed on the biases of a randomized multicenter controlled clinical trial of 3,234 overweight adults with prediabetes. The study demonstrated that structured, focused behavioral counseling intervention could reduce the prevalence of T2DM by 58 percent over three years in comparison to the placebo population. The intervention was found to be that effective when patients' body weights were lowered by seven percent with the help of a controlled low-fat diet and physical exercise (Knowler et al., 2002). In a follow up study 15 years following the original NIH-funded project, 2,776 people were assessed for prevalence of diabetes with a 27 percent reduction in comparison to the placebo group.

Daftarian & Bowen (2020) detailed the National Diabetes Prevention Program's research-based aims to help people make healthy lifestyle changes to prevent the onset of T2DM. Prior to the application of the DPP, a Finnish study found that there was a decrease in half of the

participants developing T2DM in comparison to a control group following lifestyle modifications. Therefore, the goal of the DPP is as follows: to help patients reduce their body weight by 5-7% through exercise of 150 minutes per week and healthy eating. In the latest version of the program called Prevent Diabetes STAT, there are specific coaches that are trained in helping people succeed through assistance in food choices, encouraging physical activity, and assisting those in reducing their stress.

According to the text *Prediabetes: A Complete Guide* by Jill Weisenberger, the goal of the DPP lifestyle change plan is to help patients lose 7% of their body weight and engage in 150 minutes of exercise each week (2018). The facilitators of the program guide participants to monitor their weight regularly, reduce their calorie intake, eat a wholesome/balanced diet, manage stress, focus on stopping negative thoughts, maintain motivation, and develop problem solving skills related to healthful eating and being active. An important aspect of reversing prediabetes is preserving insulin production and boosting insulin sensitivity. The four key components to halting the progression process is through weight loss, diet, physical activity, and sleep.

The CDC labels the key components of the program (CDC, 2021c):

- *CDC-approved curriculum* with lessons, handouts, and other resources to help people make healthy changes.
- *A lifestyle coach, specially trained to lead the program*, to help people learn new skills, encourage them to set and meet goals, and keep them motivated. The coach will also facilitate discussions and help make the program fun and engaging.
- *A support group of people with similar goals and challenges.* Together, they can share ideas, celebrate successes, and work to overcome obstacles. In some

programs, the participants stay in touch with each other during the week. It may be easier to make changes when they are working as a group rather than doing it on their own.

The CDC (2021c) has determined that the following qualifications must be met for program enrollment:

- Age greater than 18 years old **and**
- Be overweight, with a BMI greater than or equal to 25

And one of these factors:

- A blood glucose result that is in prediabetic range:
  - Fasting plasma glucose of 100 to 125 mg/dL **or**
  - Hemoglobin A1c of 5.7% to 6.4% **or**
  - Plasma glucose measured 2 hours after a 75 gm glucose load of 140 to 199 mg/dL.
- **OR** A high risk score on the Prediabetes Risk Assessment
- **OR** A history of gestational diabetes

A diagnosis of prediabetes is not a specific requirement of the program as the focus is based on modifying patient risk factors and promoting a healthy lifestyle. The basis of determining the need for a lab draw is to be made with provider discretion (CDC, 2019). Insurance coverage can be a barrier to testing, and screening lab values for diabetes are rarely covered by insurance companies. Shared decision making and risk factor awareness play an integral part in determining the need for a defining diagnosis. Providers understanding their patients' risks is the starting point for appropriate management and the use of preventative practices.

Barriers to Prediabetes Diagnosis and Intervention

In the United States, adults make more than 500 million visits to a primary care setting per year, which makes the clinic an optimal place to identify patients with risk factors for prediabetes (Halliday et al., 2019). Barriers to implementing and achieving results with a prediabetes toolkit can be broken down into both provider and patient related obstacles.

Providers. As highlighted previously, provider awareness of the DPP and the ADA testing guidelines are not widely recognized or known by providers. Factors that may influence the adherence of primary care providers to introduce screening criteria and management guidelines to patients include various facets such as inertia of previous practice attitudes, reduced self-efficacy related to a lack of confidence in their ability, and a lack of confidence in their patients change of outcome expectancy (Tseng et al., 2017). Various other barriers may reduce provider adherence to screening for managing prediabetes; this includes time constraints in the office, reduced staffing ratios and resources, and skepticism of clinicians along with lack of knowledge regarding guidelines. Providers may also form some hesitancy regarding offering or ordering a glucose screen, as only 46% of the screening tests are covered nationally (Keck et. al., 2019). Technology could also be improved, as busy practices could benefit from a flagging tool on patients with a HbA1c of 5.7% or higher (Voelker, 2019). A standardized order set could reduce the number of missed referrals and improve the screening and management process.

Patients. Lack of insurance and affordability of screening can be considered a large barrier for many patients. The Affordable Care Act has helped to gain improvements for those that are unable to afford screening with Medicaid. Currently, Medicaid does not cover preventative screening for diabetes, which reduces the number of patients that may be screened. Another barrier comes in the form of the availability of basic resources, such as the proximity of

grocery stores that sell healthy foods and safe community spaces for exercise (Voelker, 2019). Finally, the proximity of the program for the patient may reduce the number of patients that can attend meetings. To date, there are over 2,000 organizations that offer programs that meet the CDC standards. Informing patients of the prevalence of prediabetes, the risk factors associated, and the ease of the referral process can be a solution to the problem.

CHAPTER 3: METHODS

Overall Project Design

The project was a practice improvement project to educate the providers regarding prediabetes risks, screening, and referral management with the use of the PDS Toolkit resources in a rural community clinic in North Dakota. The execution of the project was completed at Unity Medical Center (UMC) in Grafton, North Dakota. The population of the town is 4,159, and the clinic also services surrounding communities within Walsh County. The health system has two clinic sites that are located in Grafton, ND and 15 miles away in Park River, ND. Selection of the site was based on the requests of the healthcare system and upon the most recent needs assessment of the community. The clinic setting, as a health system, sees around 235 patients per week including all age ranges, from neonates to elderly. The county is comprised of 10,641 people with 83.5% of the people of Caucasian decent and 12% of the population of Hispanic decent, with the other 3.5% from other non-white origin (U.S. Census, 2021).

The participants of the project included the providers and ancillary staff of the rural clinic. The composition of those involved include eight providers, four medical doctors, and four nurse practitioners, along with six clinic nurses. Inclusion criteria was based on employment at the clinic, practicing in the primary care setting, and willingness to participate. The providers and the ancillary nursing staff were the sources of data, as the ancillary staff, including clinic nurses and the registered dietitian/DPP coordinator of the clinic, were used to implement the project. The medical director and clinic management granted approval for their clinic nurses and primary care providers to participate in the project (Appendix O). Participation by the providers and ancillary staff was voluntary. Therefore, there was no exclusion criteria aside from ensuring that the provider was part of the primary care realm, rather than only acute care practice. The group

of patients that were eligible to be part of the data analysis included men or women who met the screening criteria of being older than 18 years old, had a BMI at or greater than 25, and presented for an annual wellness exam during the implementation period.

Various personnel were required to ensure that accurate and adequate project implementation, evaluation, and analysis took place. First was the inclusion and willingness of the leadership team at the rural North Dakota clinic to allow for ultimate success and adherence to the project's goals. The additional staff included were the physicians, nurse practitioners, nurses, and clinic support staff. Brooke Feltman functioned as the co-investigator in the project with the role of implementation, facilitation, data collection, and education of the clinic staff. The appointed dissertation committee, which included the chair, Dr. Mykell Barnacle and committee members Dr. Dean Gross, Julie Ketterling and Dr. Yeong Rhee, also assisted in the project's success. Rondee Feltman, UMC registered dietitian and DPP coordinator, and Kari Novak, UMC clinic manager, served as liaisons and key stakeholders for the project.

Project Implementation

The main purpose of the evidence-based practice improvement project was to increase provider awareness of prediabetes pathogenesis, prediabetes risk, and guideline-directed interventions. The toolkit resources were implemented as a guide to allow for improved identification of those at risk for prediabetes and to provide informational materials for the providers, nurses, and patients to use in the process change. The toolkit and associated resources were not implemented in full, but rather served as a manual for information following the educational session provided.

Phase 1

The first phase in the implementation of the practice improvement project was to gain the support of the organization personnel at UMC for the education of the staff and implementation of the PDS Toolkit resources. The registered dietitian at UMC, who is the instructor of the DPP course at UMC, was the first person to agree and buy into the project. She had been identified as a key stakeholder due to her wealth of knowledge regarding the current practices at UMC and the awareness of knowledge gaps amongst the providers. Overall support from the primary care providers and nursing staff was obtained after the educational PowerPoint presentation (Appendix M) regarding current prediabetes research, recommendations, management algorithm, and the toolkit resources (Appendix G, H, I, J, K).

The presentation was given to the providers and the nursing staff individually during a luncheon. Nursing staff was included in the education on the process change in the clinic; therefore, data collection was obtained from the ancillary staff. UMC primary care providers and nurses, 14 in total, completed a short pre-survey regarding their understanding and attitudes relating to prediabetes management (Appendix C). The pre and post survey was supplied with approval by the AMA association and research group of Halliday et al., (2019) study (Appendix P). The goal of providing the current guidelines and recommendations regarding prediabetes management and obtaining feedback from providers was to bring forth support in the implementation and to evaluate gaps in the knowledge and current practices of the staff regarding prediabetes.

Phase 2

The development of the second phase of the project involved the assistance of information technology (IT) to develop an electronic referral SmartSet in the electronic health

record (EHR) in order for referral to the DPP to be made by clinicians upon determination of qualification. The SmartSet allowed the provider to refer the individual to the DPP at Unity Medical Center, starting on June 2021, to an online or in person DPP at Altru Health System in Grand Forks, ND. Because electronic referrals were not in place prior to the implementation of the project, the baseline data for DPP referrals cannot be assessed; rather, a chart review of the type of referrals placed to the registered dietitian was obtained. The dietitian was also interviewed regarding the previous referral process and success of the DPP in the past to evaluate barriers and the needs of the clinic.

Phase 3

The third step in the practice improvement project was the implementation of the use of the PDS Toolkit resources, including accessory infographics from the CDC and AMA. The process change started with improving staff awareness of the prevalence of prediabetes and current recommendations through the educational presentation to both the providers and nursing staff (Appendix M). The next step was to distribute the PDS Toolkit in full (Appendix N) and the education handout that included:

- Prediabetes Screening Tool
- *To Join CDC's National DPP Lifestyle Change Program* poster
- Prediabetes Management poster
- Referral process to the DPP via the Epic ordering system handout
- DPP dates and patient education handout

Patient information packets (Appendix J, K, L) were also placed within each exam room to be distributed to those that qualified or were interested in learning more about prediabetes management. The CDC *To Join CDC's Life Style Change Program* (Appendix H) and the

Prediabetes Management graphic (Appendix I) were displayed in each room behind the computer to allow for ease of identification of qualified patients and steps for prediabetic management.

To determine qualification, the nurse administered a Prediabetes Assessment Tool (Appendix G) to each patient presenting to the clinic for a wellness visit that is over the age of 18 and had a BMI at or greater than 25. The nurse then scored the tool as either low or high-risk with a score greater than five. The nurse was then encouraged to leave the assessment in the patient's room for the provider and patient to converse about management options. At the time of the visit, the provider and patient then had tools to make informed decisions on whether to screen for prediabetes and/or make a referral to the DPP. The use of the referral SmartSet to the DPP was encouraged to ensure the appropriate action took place for enrolling the willing patient to the DPP. An education packet for the patient, which included the DPP schedule at both Unity and Altru Health Systems (Appendix J), the contents of the DPP (Appendix K), and information regarding prediabetes (Appendix L), was made available.

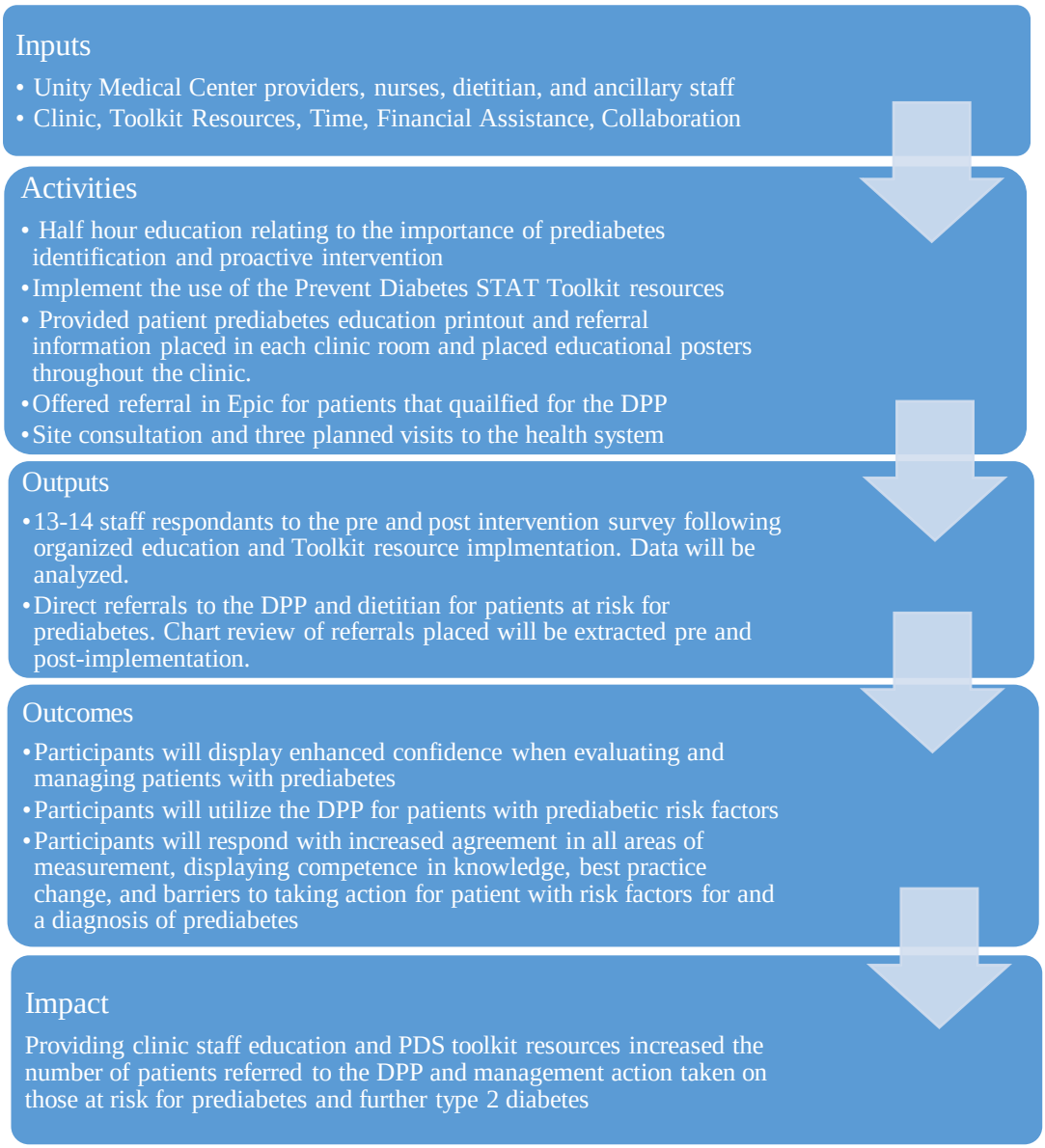
Phase 4

Evaluation of provider and ancillary staff knowledge acquisition was completed and analyzed with a post-implementation survey (Appendix D). The number of referrals made to the DPP and the knowledge of prediabetic management criteria, outlined in the educational session, were measured with the use of pre and post-implementation surveys and quantified the level of understanding among providers. The number of individuals referred to the DPP and the registered dietitian was obtained with the help of the IT. Data was extracted within the Epic EHR system both three months prior to the project and during the three-month implementation period.

Access to the EHR was granted by the administration at UMC. The plan and projected outcomes can be seen through the use of a logic model in Figure 1.

Figure 1

Process Logic Model



The logic model in Figure 1 can be used to explain the steps in the practice change process and to the extent to which an effect was made at each phase in the project. The main

target of the project was to increase awareness of prediabetes awareness and management along with a growth in referrals made to the DPP. The inputs, activities, outputs, outcomes and impacts of the resources, education, and evaluation were displayed to show how the ultimate goal of the project is reached.

Evaluating the providers and nurses was necessary to determine any weaknesses or barriers that those providing care were experiencing. When areas of knowledge gaps were presented, a plan could be put in place to better increase understanding, consistency of diagnosis, and identification of prediabetes among the patient population. Through the pre-implementation survey, areas in need of improvement were identified. By providing an educational session, providers gained an understanding of best practices relating to prediabetes identification and management. The development of an educational session gave step by step explanation of the use of the PDS Toolkit resources, patient education, referral algorithm, and electronic referral SmartSet. Final evaluation was completed through a post-implementation survey.

Within the health system, the providers' use of the toolkit resources was assessed by analyzing the number of referrals made to the DPP. Criteria to qualify for this program included: age 18 or older plus a BMI of equal to 25 or greater. Additionally, individuals must either have met the qualifications through lab results, high score on the risk assessment tool, or a history of gestational diabetes. The referral rates to the DPP and those made directly to the registered dietitian for weight and diabetes-related counseling were evaluated. This allowed a more impactful way for providers to recognize if the patient may be at risk for prediabetes and a potential missed opportunity for a DPP referral. Advocating for more interdisciplinary work with the registered dietitian, who remains the main DPP educator and diabetic resource for the clinic setting, was necessary for increased compliance and overall success of the project.

Table 2

Project Implementation Timeline

Month	Action to Take Place
May 2020-August 2020	• Meet with committee chair to discuss topic and location. • Develop proposal outline.
September 2020	• Identify project site and complete dissertation committee.
October 2020	• Meet with key organization and stakeholders for approval of project.
April 2021	• Obtain NDSU and organization approval.
May 2021	• Develop provider education and prepare prediabetes screening tool for healthcare staff. • IRB application submission. • Proposal meeting with dissertation committee.
June 2021-August 2021	• Evaluate EHR prediabetes risk factor rates (%) prior to implementation (use as baseline data). • Disseminate prediabetes prevalence evidence to primary care providers and implement one-hour educational in-service to at least eight providers. • Educate ancillary staff on how to administer the questionnaire. • Provide information regarding prediabetes diagnostic criterion, referral management, and the screening tool. • Administer provider pre-implementation survey.
September 2021	• Post-implementation survey and EHR referral rate (%) data acquisition.
October 2021- January 2022	• Measure clinical outcomes and analyze data. Meet with a NDSU statistician. • Finalize data and write dissertation.
February 2022- March 2022	• Dissertation defense and disseminate results of project. Update stakeholders.

Technology

The technology required for the implementation and evaluation of the project included the use of EHR. The EHR allowed for accurate documentation of predisposing conditions for prediabetes and the screening criteria that was met. The use of the EHR also allowed for reporting of referrals and patient treatment plans. Microsoft Excel spreadsheets were used to ensure the accurate transfer and dissemination of data collected from the referrals to the DPP and pre and post surveys. The information that was described in the spreadsheet did not include any

forms of patient identification. A Microsoft PowerPoint was also used for the purpose of education for the staff.

Budget

The improvement project requires various minor expenses. The personnel included in the practice improvement project are current employees of the clinic; thus, the cost for recruitment and collection of data was not anticipated. To obtain survey and screening tool results, loose leaf paper was purchased and printing cost ascertained for the creation and distribution of the toolkit resources and the pre and post-implementation surveys. The estimated costs for printing was around $78.75. Additional education for the staff was done through one initial meeting, and the co-investigator offered what was needed at the educational session. Four trips were made to the clinic, totaling $25 per trip. Therefore, the estimated cost was around $178.75 total.

Table 3

Estimated Costs for Project

Activity / Materials	Cost per Unit	Estimated Time/ Number	Totals
Screening Toolkit Printing	$0.15/page	500	$75
Survey Printing	$0.15/page	25	$3.75
Trips to Grafton	$25	4	$100
Total Cost			**$178.75**

Note. Adapted from Rousch (2019).

Evaluation Methods

Objective One

Assess the knowledge and understanding of prediabetes screening and management practices of providers, per the ADA guidelines, at a rural North Dakota clinic. The first objective assessed the knowledge and understanding of prediabetes screening and management practice of providers at the rural clinic. Analysis was completed through the distribution of a pre-

implementation survey (Appendix C) and the use of descriptive statics of the providers' knowledge and understanding of prediabetes. This action was completed with the use of a survey tool that was developed by the AMA and originally disseminated by Dr. Halliday et al., 2019 (Appendix P). Information was obtained through use of a print survey which was distributed to the providers and collected prior to the educational module.

Objective Two

Develop and deliver an educational module to the providers and ancillary staff of the rural North Dakota clinic explaining the current recommendations and the use of the PDS Toolkit resources for prediabetic management. Following the three-month implementation period, analysis of the provider understanding and implementation attitudes was assessed through the post educational survey (Appendix D). The survey was again presented in a paper format to the providers following the implementation period. Data were analyzed with descriptive statics and compared with the prior survey results. The pre and post-implementation qualitative data from the survey were evaluated and transcribed into an Excel spreadsheet for further review and comparison.

Objective Three

Implement the use of the PDS Toolkit resources to increase preventative action taken on patients that meet the qualifications over a three-month period. To assess the effectiveness of the toolkit resources in practice, a baseline data collection occurred through an Epic chart review of the previous three months of patients that were referred to the DPP/dietitian for weight management or diabetes related counseling. Access to the Epic portal was granted and data were reviewed regarding the number of patients with action taken, those who met criteria for referral, and the diagnosis used to refer the patient to the registered dietitian.

Objective Four

Increase patient provider referrals to the Diabetes Prevention Program by 25% in a three-month period. A comparison of the baseline data and 3-month follow up chart review of the individuals that were referred to the DPP and the registered dietitian was assessed. The data were analyzed to measure the percentage increase of referrals that were placed for qualified individuals. Overall, assessment of the types of referrals placed showed the areas for improvement and gaps in knowledge for future development in screening and referral process for patients to a life style modification program.

IRB Approval

The project participants include employees of the UMC; providers, nurses, and ancillary staff. The design of the project included a pre and post education survey/interview and the use of descriptive statistical information from the EHR (without the use of patient identifiers). Neither of these forms of data required personal protected information. Institutional Review Board Exempt status approval was obtained from North Dakota State University, as there was no personal identifying information used in the study. Application for approval occurred following the successful proposal of the project (Appendix A). Approval for the overall project was obtained from Dr. Matthew Viscito, medical director, and Kari Novak, nurse manager, at Unity Medical Center (Appendix Q).

CHAPTER 4: RESULTS

Objective One: Assess the knowledge and understanding of prediabetes screening and management practices of providers, per the ADA guidelines, at a rural North Dakota clinic

The first objective for the project was met by assessing the knowledge and understanding of prediabetes screening and management practices of providers and ancillary staff, per the ADA guidelines, in the clinic. The data from the survey were evaluated in the form of a Likert scale and the items were summarized using frequency tables to assess the participant responses. The confidence of the participants in the recognition, evaluation, and management of prediabetes was analyzed according to three themes including best practice standards, barriers to practice change, and prediabetes knowledge.

Pre and Post Intervention Questionnaires

Prior to the educational presentation, a printed pre-intervention questionnaire was distributed to the participants. The questions in the presented survey included five knowledge-based questions, three practice standard related questions, and two regarding barriers of implementation of change in practice, all in Likert scale format. A total of 14 participants completed the pre-intervention questionnaire and 13 participants completed the post-intervention questionnaire. The results were totaled, and an Excel spreadsheet was used to evaluate the results in correlation to the answered questions. Pre and post-intervention mean average totals of the participants answers were calculated and the difference of the two are displayed in Tables 4-6.

The pre and post-surveys paired related questions to determine the participants' level of confidence regarding identifying and addressing prediabetes. The pre-survey asked the respondents to rate their confidence regarding knowledge of prediabetes and the likelihood of

performing tasks. The post survey asked participants to rate how their confidence had changed as a result of the educational presentation and implementation of the toolkit resources.

The answer choices for both the pre and post surveys were "Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree, and Doesn't Apply." A number was assigned to each answer choice to allow for numerical evaluation of the difference in results pre- and post-implementation. Numerically, the numbers assigned were as follows, Strongly Disagree (5), Disagree (4), Neither Agree nor Disagree (3), Agree (2), Strongly Agree (1), and Does Not Apply (0). Does Not Apply was considered an outlier and was removed from the mean average total. The frequency tables with the results of the questions evaluated are listed at the end of each line of data sets. However, there was a one-participant discrepancy between the number of pre-education (14) compared to post-education participants (13), which may have affected results.

Prediabetes Knowledge

Participants responded to a Likert scale survey regarding their confidence and knowledge of prediabetes and the resources available for management. Prior to the implementation phase, eight providers and nurses (57.1%) responded that they strongly agreed with understanding the medical definition of prediabetes. Following implementation, ten (76.9%), of the respondents had the highest level of confidence understanding the medical definition of prediabetes. A total of six respondents (42.9%) strongly agreed to the statement regarding awareness of community resources that help patients prevent diabetes. After implementation, the total number of respondents that achieved the highest level of agreement increased to ten (76.9%). All of the knowledge-based questions showed an increase in confidence as detailed in Table 4.

Table 4

Prediabetes Knowledge Survey Results

Prediabetes Knowledge	Question	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	N/A	Mean
I understand the medical definition of prediabetes	Pre 1 (n=14)	8	6	0	0	0	0	4.57
	Post 1 (n=13)	10	3	0	0	0	0	4.76
I know how to screen for prediabetes	Pre 2 (n=14)	8	6	0	0	0	0	4.57
	Post 2 (n=13)	10	1	2	0	0	0	4.61
I refer my patients with prediabetes to community resources	Pre 3 (n=14)	6	5	3	0	0	0	4.21
	Post 3 (n=13)	7	4	1	0	0	1	4.90
I routinely screen for prediabetes	Pre 4 (n=14)	5	4	4	1	0	0	3.93
	Post 4 (n=13)	7	3	2	0	0	1	4.81
I am aware of community resources that help my patients prevent diabetes	Pre 5 (n=14)	6	8	0	0	0	0	4.71
	Post 5 (n=13)	10	3	0	0	0	0	4.77

Strongly Disagree = (1)
Disagree = (2)
Neither Agree nor Disagree = (3)
Agree = (4)
Strongly Agree = (5)
Doesn't Apply = (0).

Best Practices

Participants also responded to the Likert scale survey questions regarding standards of prediabetes management in their current practice. Prior to implementation, eight respondents (57.1%) "strongly agreed" and five respondents (35.7%) "agreed" with the statement that prevention of diabetes is an important ideal in their practice. Following the implementation of the toolkit resources, nine participants (69.2%) achieved the highest level of agreement, while two (15.4%) of the respondents reported "agree" with the importance of prediabetes prevention. The other two best practice related questions displayed similar results with an increase in agreement with the statements regarding advising patients about preventing diabetes and the

prevention of diabetes being a part of caring for patients. The final display of results can be seen in Table 5.

Table 5

Practice Ideals Regarding Prediabetes

Practice Ideals	Question	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	N/A	Mean
Prevention of diabetes is an important in my medical practice	Pre 6 (n=14)	8	5	1	0	0	0	4.5
	Post 6 (n=13)	9	2	1	0	0	1	4.67
Taking time to advise a patient about preventing diabetes has an effect on their behavior	Pre 7 (n=14)	7	5	1	1	0	0	4.29
	Post 7 (n=13)	8	5	0	0	0	0	4.61
Prevention of diabetes is part of caring for patients	Pre 8 (n=14)	9	5	0	0	0	0	4.64
	Post 8 (n=13)	9	2	1	0	0	1	4.66

Strongly Disagree = (1)
Disagree = (2)
Neither Agree nor Disagree = (3)
Agree = (4)
Strongly Agree = (5)
Doesn't Apply = (0).

Barriers in Practice

The final questions within the Likert scale pre and post-implementation survey were relating to the barriers to prediabetes counseling and management in the practice setting. Favorable responses to the questions in this section switched, making the "disagree" and "strongly disagree" end of the Likert scale the goal. The questions assessed feeling uncomfortable with talking to patients about lifestyle change and how attending to immediate medical needs may keep one from talking to patients about prediabetes. The ninth question had a growth of two more respondents strongly disagreeing to the statement of feeling uncomfortable talking about patient life style change, from three (21.4%) in the pre-implementation phase, to five (38.5%) in the post-implementation phase. Regarding the tenth question, the number of respondents that felt addressing immediate medical needs kept them from talking to their patients

about prediabetes did not improve, as three (21.4%) strongly disagreed with this statement prior and 0% strongly disagreed following implementation. The post results displayed that attending to medical needs in the tenth question had five (38.5%) of the respondents neither agreeing nor disagreeing and five (38.5%) disagreeing to the statement rather than strongly disagreeing, which was favored in comparison to the pre-implementation survey.

Table 6

Barriers to Practice Change

Barriers to Change	Question	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	N/A	Mean
I feel uncomfortable talking to my patients about lifestyle changes	Pre 9 (n=14)	1	0	2	8	3	0	3.85
	Post 9 (n=13)	1	0	1	6	5	0	4.07
Attending to immediate medical problems keeps me from talking to patients about prediabetes	Pre10 (n=14)	2	3	0	5	3	1	3.31
	Post 10 (n=13)	0	2	5	5	0	1	3.25

Strongly Disagree = (5)
Disagree = (4)
Neither Agree nor Disagree = (3)
Agree = (2)
Strongly Agree = (1)
Doesn't Apply = (0).

Follow-Up Question

The eleventh question in the post-implementation survey asked how likely the respondent was to use the toolkit resources and referral in practice. Of the thirteen respondents, three (25%) strongly agreed to utilizing the resources, four (33.3%) agreed, and five (41.6%) indicated that they neither agreed or disagreed to the statement. One person specified the statement did not apply, and this was recognized as an outlier. There were no pre-implementation data collected for this question.

Objective Two: Develop and deliver an educational module to the providers and ancillary staff of the rural North Dakota clinic explaining the current recommendations and the use of the PDS Toolkit resources for prediabetic management

The second objective was achieved by developing and delivering an educational presentation to the providers and ancillary staff of the rural North Dakota clinic. The presentation explained the current recommendations, the use of the PDS Toolkit resources for prediabetic management, and the use of the Epic referral to the DPP. The objective was measured through observing the "teach back" method of the educational module information and the post-implementation survey results.

The objective was met by individually educating each of the providers and nurses about the current prediabetes screening recommendations and the newly developed referral process to the DPP. A PowerPoint developed by the CDC and AMA entitled *Making the Business Case for Diabetes Prevention* (Appendix M) was presented to each of the staff involved. The following resources from the toolkit were given to the participants for reference (Appendices E-I). Each of the elements was explained to the clinic providers and ancillary staff of the clinic individually, and verbal agreement of understanding was obtained from each participant. The post-implementation survey was then distributed three months following the educational session, at the end of the implementation period. The comparison of the pre and post-implementation results can be seen in the depiction of Figures 2-4 below.

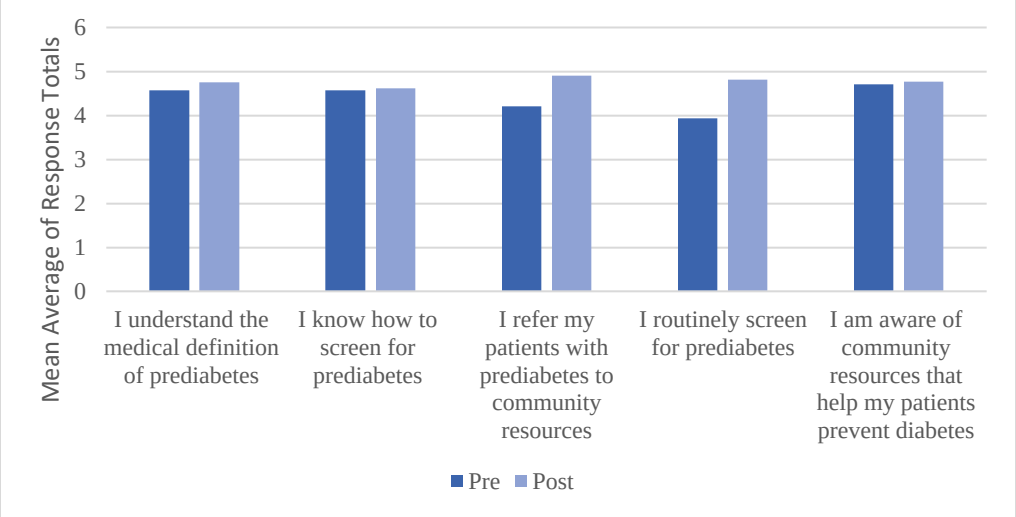
Post-Implementation Survey Results

A display of the amount of change in confidence that occurred via the Likert scale results was compared by paired questions of the pre and post-implementation surveys regarding the efficacy of the education module and distribution of the toolkit resources (Figures 2-4). The

knowledge related questions, displayed in Figure 2, show that for all five questions asked, the mean average of the question total increased by a sum average of 0.38 points. For the data in Figure 3, the increase in confidence resulted in a three-question average mean of 0.17 points regarding improvement in prediabetes best practice. Finally, concerning the theme of barriers in practice, there was an improvement in favorable response to the ninth question showing an increase in 0.22 point of the mean of respondents. The tenth question, regarding attending to immediate medical needs, showed the confidence of the respondents had a -0.05 reduction in the mean average post-implementation.

Figure 2

Prediabetes Knowledge Pre and Post Intervention



Consistently, the rate of knowledge regarding prediabetes increased across all five questions proposed. The educational presentation detailed the guidelines for screening, diagnosing, and managing prediabetes. The results of the post-implementation survey detailed the mean growth of 0.19 in respondents' understandings of the medical definition of prediabetes. The second question concerning how to screen for prediabetes had a growth of 0.04 of the mean average post-implementation. The fifth question on availability of community resources for

prediabetes management had mean growth increase of 0.06. Largest growth was seen in the referral of patients to community resources in question three, with an increase in agreeance by 0.69 mean average response.

Figure 3

Best Practice Pre and Post Intervention

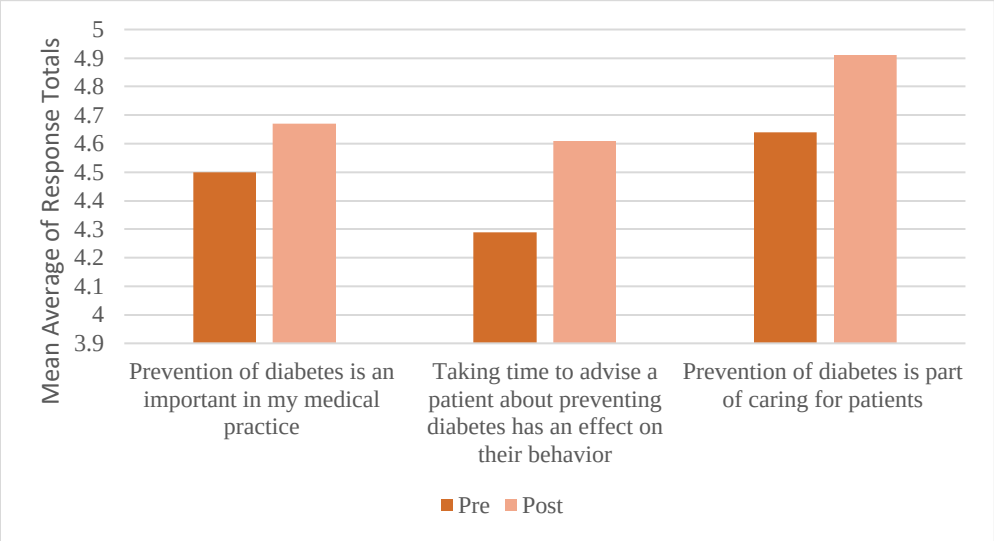
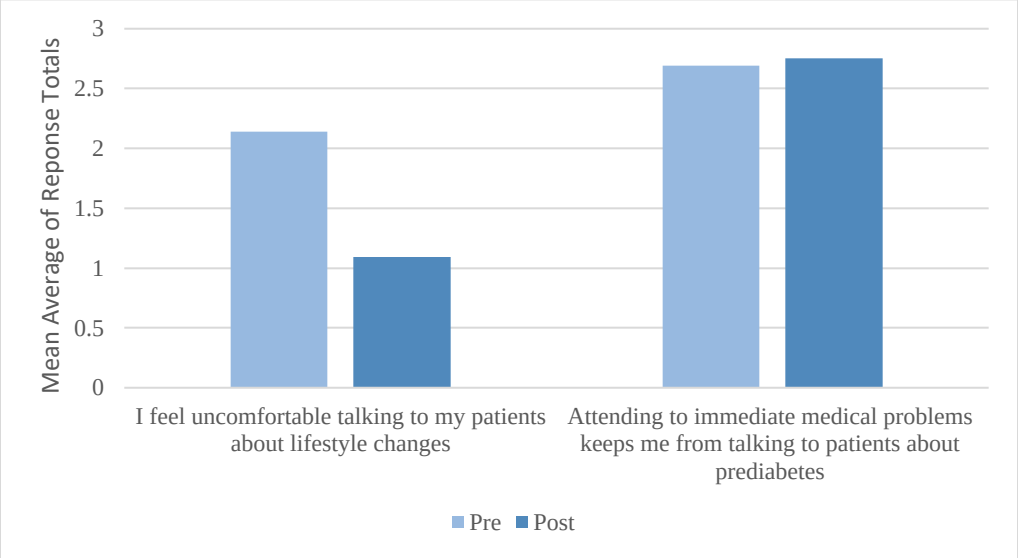


Figure 3 represents the increase in favorable responses regarding provider and staff proactivity toward prediabetes. In the sixth question, 0.17 growth of the mean was measured in providers' perception of prediabetes being an important aspect of their clinical practice The seventh question too showed a 0.32 mean growth in the respondents' willingness to take time to advise patients on prediabetes in the clinic setting. The best practice standard, as detailed in the eighth question, regarded prevention of diabetes as a part of caring for patients, also displayed a mean of 0.02 growth in confidence among the survey respondents. The educational presentation outlined the best practice guidelines of referring patients and using informatics to outline the need for improvement in knowledge regarding clinical concepts pertaining to prediabetes.

Figure 4

Barriers in Practice Pre and Post Intervention



The barriers to practice were also evaluated via Likert scale, with answers aligning with strongly disagree most congruent with best practices. For the ninth question, the respondents did strongly disagree with the statement regarding feeling uncomfortable talking with their patients about prediabetes, with an improvement observed by 0.22 points of the mean average. Regarding the tenth question, "attending to immediate medical problems keeps me from talking to patients about prediabetes," there was a reduction of strong disagreement of -0.05 points of the mean average following the successful implementation of the educational module.

The eleventh question stated, "I utilize AMA referral tools in my practice as a result of the AMA DPP Physician Referral Pilot." Three of the total 13 respondents indicated that they were strongly agreeable to use the tool in practice. A total of four individuals indicated that they "agreed" with the likelihood to use the presented resources and referral. Increased adherence to prediabetes education and use of referral source can be seen in the displayed results.

Objective Three: Implement the use of the PDS Toolkit resources to increase preventative action taken on patients that meet the qualifications over a three-month period

The third objective was met through the implementation of the PDS Toolkit resources to increase preventative action for patients who met the qualifications over a three-month period. To assess the extent to which this objective was met, a description and handout of resources was distributed to the staff members in the educational module. A chart review of the referrals placed to the DPP and the registered dietitian referrals at UMC for three-months prior to implementation was also completed.

PDS Toolkit Resource Education

Implementation of the project was completed in a stepwise process. First education regarding which patients qualified for prediabetes screening and referral to the DPP was provided. The informational PowerPoint was presented to all the staff. A handout including:

- Prediabetes Screening Tool
- *To Join CDC's National DPP Lifestyle Change Program* poster
- *Prediabetes Management* poster
- Referral process to the DPP via the Epic ordering system handout
- DPP dates and patient education handout

The resources were distributed to the staff for further reference. A copy of the full Toolkit (Appendix N) was also made available in printed form within the clinic nurse station. The *To Join the CDC's National DPP Lifestyle Change Program* and *Prediabetes Management* (Appendices H, I) posters were hung up in each of the exam rooms and above each computer of the nursing staff. Patient information including the content, time, date, and location of each of the DPP class offerings (Appendices J, K) and a one-page patient education (Appendix L)

handout were stapled together, and 20 were placed in each of the exam rooms. The folder with the patient resources was labeled and placed in plain view for the nurses or providers to give to qualified patients.

The second step in the implementation process was providing the nurses specific education on the use of the Prediabetes Risk Assessment (PRA) tool and to what patient population the PRA should be distributed (the number of completed assessments was not counted). The patients that were encouraged to be screened with the PRA were those who qualified via the specified criteria. The criteria included: Age of 18 or older, and overweight, and not currently diagnosed with T2DM, and not currently pregnant. Additionally, inclusion of either diagnosed with prediabetes, previously diagnosed with gestational diabetes, or scored high risk on the PRA must be included. The tool was to be left on the desk in the exam room to facilitate a conversation between the provider and patient regarding their potential qualification for the DPP and the need for prediabetes screening now or in the near future. If the patient met qualifying DPP criteria, then a patient education handout would be given to the individual, and if willing, a referral via Epic would be placed to either the UMC or Altru DPP.

Prior to Epic Referral

To accurately assess the type and number of referrals that were placed to the registered dietitian or the DPP, a cumulative list of the referrals that were placed to both sources was extracted from the Epic database. Table 7 depicts the ICD-10 codes (Appendix N (p. 128)) and type of referrals that were placed prior to the implementation of the direct DPP referral.

Table 7

Referrals Prior to Intervention

Date	Entered Referral	Associated Diagnosis
5/4	AMB Referral to Diabetes Center	Type 2 diabetes mellitus with hyperglycemia
4/16	AMB Referral to Diabetes Center	Type 2 diabetes mellitus with retinopathy
4/28	AMB Referral to Dietitian	Obesity
5/13	AMB Referral to Diabetes Center	Type 2 diabetes mellitus
5/24	**AMB Referral to Dietitian**	**Impaired glucose tolerance**
3/31	AMB Referral to Dietitian	Type 2 diabetes mellitus
4/2	AMB Referral to Diabetes Center	Type 2 diabetes mellitus w/ retinopathy
4/5	AMB Referral to Diabetes Center	Type 2 diabetes mellitus w/o complication
4/16	AMB Referral to Dietitian	Type 2 diabetes mellitus w/o complication
5/5	AMB Referral to Dietitian	Obesity
5/21	AMB Referral to Dietitian	Type 2 diabetes mellitus w/o complication
3/29	AMB Referral to Diabetes Center	Type 2 diabetes mellitus w/ hyperglycemia
3/30	AMB Referral to Diabetes Center	Type 2 diabetes mellitus w/ hyperglycemia
4/1	AMB Referral to Diabetes Center	Type 2 diabetes mellitus w/ hyperglycemia
4/13	AMB Referral to Diabetes Center	Type 2 diabetes mellitus w/ neuropathy
4/22	AMB Referral to Diabetes Center	Type 2 diabetes mellitus
5/21	AMB Referral to Diabetes Center	Type 2 diabetes mellitus w/o complication
5/25	AMB Referral to Diabetes Center	Type 2 diabetes mellitus w/ hyperglycemia

The table represents the list of referrals made to the registered dietitian and the DPP over a three-month period from March 25, 2021-June 24th, 2021, prior to implementation. At this time, there was no referral in place specifically for the DPP at UMC or Altru Health Systems. One referral was placed to the dietitian regarding impaired glucose tolerance.

Objective Four: Increase patient provider referrals to the Diabetes Prevention Program by 25% in a three-month period

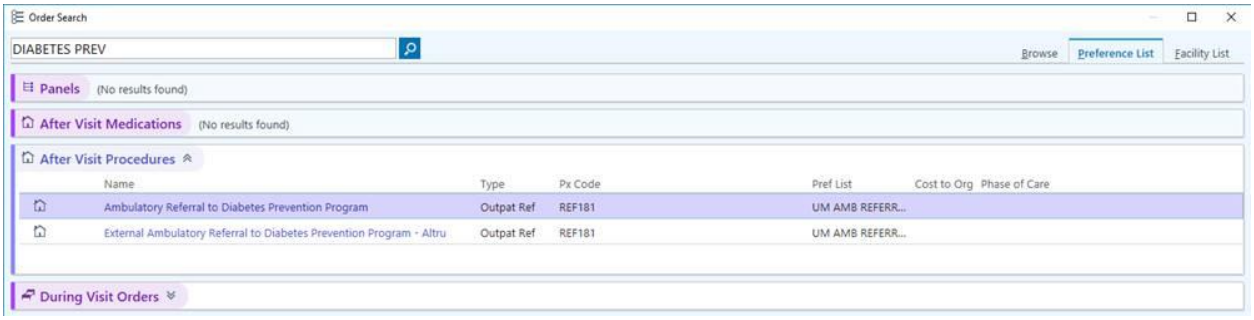
The extent to which the objective was met was examined through a data analysis of the referrals placed to the registered dietitian and specifically the DPP over a three-month time span. A total of two referrals were placed via the developed and implemented DPP referral source while a total four referrals were placed to the registered dietitian for impaired fasting glucose. An increase in the referral rate totaled to two direct and three indirect referrals (without the use of the developed referral), up from zero direct referrals prior to the implementation of the project.

Epic Referral

Figure 5 represents the Epic referral was developed to improve the ease of the process for clinicians to directly refer at risk and prediabetic patients to the DPP at UMC or Altru Health Systems. See in full in Appendix E.

Figure 5

Epic Referral



Prior to the implementation of the practice improvement project, there was no clarified referral process for patients. In an analysis of the previous patients referred to the registered dietitian or DPP, all but one of the patients were referred to the registered dietitian based on their elevated A1c value and medical diagnosis of type two diabetes. After the implementation of project resources and the referral source in Epic, there was an increase of two direct referrals to the Unity DPP, and zero were logged to the Altru in Grand Forks site. The referral Epic resource was utilized in two of the referrals. This goal was reached with the new referral process in place. In an interview with the registered dietitian, she stated “I have received more referrals than ever before regarding obesity and impaired fasting glucose.” She also commented that, “Even though the specific referral was not utilized to its greatest extent, I still was able to be in contact with more patients that are at risk for diabetes than prior to the implementation of the project,” (R. Feltman, personal communication, September 30, 2021). The type of referrals placed three

months prior and then during the three-month implementation period can be seen in Tables 7 & 8.

Tables were used to display the number and type of referrals placed to the registered dietitian over a three-month period from June 25th until September 25th. Following the implementation and final follow-up period, communication continued with the stakeholder and UMC registered dietitian. The dietitian noted that four more referrals had been placed to the DPP for prediabetes and obesity in the six months following the completion of the project.

Table 8

Referrals Placed to the Registered Dietitian Post Intervention

Date	Entered Referral	Associated Diagnosis
6/25	**AMB Referral to Dietitian**	**Prediabetes**
7/13	AMB Referral to Dietitian	Hypoglycemia
7/20	**AMB Referral to Dietitian**	**Impaired fasting glucose**
8/31	AMB Referral to Dietitian	Obesity
7/12	AMB Referral to Dietitian	Class 3 severe obesity
8/26	AMB Referral to Dietitian	Type 2 diabetes without complication
9/9	AMB Referral to Dietitian	Obesity
9/13	AMB Referral to Dietitian	Obesity
6/25	**AMB Referral to DPP**	**Prediabetes**
7/23	AMB Referral to Dietitian	Type 2 diabetes without complication
8/4	AMB Referral to Dietitian	Type 2 diabetes with hyperglycemia
7/28	AMB Referral to Dietitian	Hyperlipidemia
8/13	AMB Referral to Dietitian	Type 2 diabetes without complication
8/17	AMB Referral to Dietitian	Type 2 diabetes without complication
9/15	AMB Referral to Dietitian	Attention deficit hyperactivity disorder
7/23	AMB Referral to Dietitian	Decreased appetite
8/2	AMB Referral to Dietitian	Hyperlipidemia
7/28	AMB Referral to Dietitian	Essential primary hypertension
8/13	AMB Referral to Dietitian	Type 2 diabetes without complication
8/17	AMB Referral to Dietitian	Type 2 diabetes without complication
8/23	**AMB Referral to DPP**	**Impaired fasting glucose**
7/8	AMB Referral to Dietitian	Weight gain
7/14	AMB Referral to Dietitian	Class 2 morbid obesity
7/21	**AMB Referral to Dietitian**	**Impaired fasting glucose**
7/23	AMB Referral to Dietitian	Type 2 diabetes with hyperglycemia

Table 8 details the referrals placed to the registered dietitian over the three-month period. Five total referrals were placed regarding impaired fasting glucose/prediabetes with two of the

referrals placed via the developed referral resources in Epic, compared with zero in the months prior to project initiation. Of the five referrals initiated, one was placed from a physician, two were placed from one nurse practitioner, and two were placed from another nurse practitioner of the clinic. No referrals were placed by the nursing staff, although they assisted in evaluating patient risk factors and the induction of the Prediabetic Risk Assessment.

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

Summary and Synthesis

A rural clinic in North Dakota undertook a practice improvement project intended to educate the providers and ancillary staff about prediabetic risk and establish a process change to increase referral rates to the pre-existing DPP at the medical facility. The project included the presentation of prediabetic education to staff, the use of the PDS Toolkit resources, informational handouts for patients, and the development of a referral process in Epic for providers. The clinic staff was educated on the use of the provided resources and how to apply the information to their practice. Referral rates to the DPP, along with provider and ancillary staff knowledge, were assessed to determine the impact of the presented interventions.

Objective One

Objective one evaluated the level of the health professionals' confidence, knowledge, and barriers to identifying and referring patients with prediabetes to a DPP. The pre and post-surveys provided valuable key findings and guidance for further practice changes to occur. Strong baseline knowledge was determined in each category prior to implementation of the project.

A pre-intervention gap in awareness of how to guide patients with risk factors for prediabetes was displayed as eight (57%) of the respondents strongly agreed with understanding the medical definition of prediabetes and how to screen for prediabetes compared with an improvement to ten (77%) of respondents having strong confidence following implementation of the education module. In the literature, a similar lack of confidence was determined as a Tseng et al. (2017) survey of providers found that only 17% of survey respondents (n=155) understood the specific prediabetic diagnostic criteria. These findings support an evident lack of

understanding around the diagnosis of prediabetes and guidance for screening, the crucial first step in prevention and reversal of prediabetes.

Respondent confidence to act in the form of referral to community resources was not well understood with a rate of six (64%) strongly agreeing to this statement and six (64%) also strongly agreeing to the awareness of resources available for patients in the pre-intervention survey. In the literature, Tseng et al. (2017) also showed that only 11% of the providers surveyed referred their patients to a behavioral weight loss program. Keck et al. (2019) also completed a similar survey where only 42% of the surveyed clinicians made referrals to the DPP opposed to 100% of the respondents agreeing that a prediabetes diagnosis would increase patient awareness of lifestyle modification. This finding further defines the knowledge gap and need for improvement in prediabetic practice change. The American Journal of Preventative Medicine (Mainous, 2021) explains "early detection and screening for prediabetes is needed because of the utility of treatment to prevent diabetes complications and target organ disease" (para. 2). Healthcare providers in primary care are instrumental in improving prediabetes knowledge and practices to prevent the proliferation of chronic disease.

Within the ideals portion of the survey, pre and post-intervention survey results showed that providers strongly agreed that prevention of diabetes is an important part of their medical practice. The respondents also showed strong agreement that prevention of diabetes is part of caring for patients. Gaps in the literature and pre-implementation data show that although providers find that identifying and referring patients with prediabetes to appropriate resources is important, action is not mirroring the need. Validation can be seen from the study conducted by Vlero-Elizondo et al. (2019) which concluded that nearly 40% of people with prediabetes were not informed of the need for lifestyle counseling. Early action prevents the need for reaction.

The findings of the pre-implementation survey detailed a high level of baseline knowledge regarding the medical definition of prediabetes, screening criteria, and awareness of community resources. In correlation with the data of the referrals placed in Epic, a gap in the translation of knowledge to practice was seen by the lack of preventative actions by the providers. Observing the association between knowledge and action, the co-investigator recognized a need for improvement in streamlining, educating, and encouraging the process of identifying at-risk patients and ensuring proper management was initiated for the patient.

Objective Two

Objective two, developing and delivering an educational presentation to the providers and ancillary staff and the use of the PDS Toolkit resources for prediabetic management and referral to the DPP, was successful in part due to the toolkit resources created by the AMA and CDC. The providers and ancillary staff were receptive to the educational PowerPoint that was presented to each of the participants individually along with conversations with the co-investigator. The post-intervention surveys were distributed three months following the education presentation and DPP referral integration. Comparison between the pre and post-implementation surveys provided further identification for areas of practice improvement and of themes that exhibited significant growth.

The themes of confidence, practice ideals, and barriers in understanding prediabetes were evaluated through ten total questions in the pre-implementation survey. Overall, an increase could be seen in the level of confidence that the providers showed in their ability to define, screen, refer, and show awareness of prediabetes and the referral to appropriate community resources such as the DPP. Knowledge gaps that were noted had been determined in the pre-implementation survey included lack of awareness for diagnostic criteria, referral of patients to

community resources, and community resource awareness, all of which posed a challenge to practice change. Keck et al. (2019) also discussed barriers to the number of patients referred to the DPP, including lack of insurance coverage, a reduction in the streamline of the referral process, and perceptions from the patients and clinicians of what lifestyle change looks like. The education module was designed to provide definitions, guidelines, and a helpful referral tool to the clinicians of the clinic, which would attempt to alleviate the knowledge gaps.

Objective Three

Objective three was met to the furthest extent due to the successful implementation of the resources into practice. Following each of the educational sessions, a verbal response of understanding of the education was verified from each participant. A handout of resources was given to each participant to reference the information and referral process over the three-month implementation period and into the future. The extraction of pre-implementation referral data in Epic detailed the interprofessional utility of the registered dietitian in practice and the need for further prediabetic awareness and diabetes prevention measures. Most of the referrals that were placed were for T2DM, which is too late to prevent the onset of diabetes. The data showed the gap in the clinic staffs' process for managing prediabetes.

Resources were made available on the unit, and clinic providers and staff verbalized understanding of the information and process. More consistent and continued follow-up may have been necessary over the implementation period to ensure that those involved had a clear understanding of the information that was presented. This goal posed challenges for evaluation, as there were various resources presented to the staff to assist in education by means of the toolkit. The entire PDS Toolkit was not utilized to the furthest extent as there were multiple resources that were tailored to aspects regarding budgeting, recruitment, and coding. This was

not the purpose of the practice improvement project; rather, ensuring participant knowledge acquisition and application was at the forefront.

When evaluating the project as a whole, there was an evident gap in knowledge translation from the high baseline understanding in the pre-implementation surveys. Even though there was a large percentage of participants who had responded favorably prior to the education, there was little action taken on managing or referring the at-risk patients to lifestyle intervention. Recognizing this weakness within the clinic encouraged that the referral process become more streamlined and that an introduction of educational resources would be helpful to increase compliance and awareness.

Objective Four

Objective four was analyzed regarding the number of referrals that were placed directly to the DPP via the developed Epic referral resource. Following project completion and conducting an interview with the registered dietitian that teaches the DPP class at Unity Medical Center, the fourth objective was evaluated descriptively and was found to be beneficial in respect to the project outcomes.

The chart reviews were completed to analyze if referrals were being made to the current DPP, how the referral was being placed, and the current management of at-risk individuals. Prior to the implementation period, referrals placed to the registered dietitian were almost exclusively placed for management of T2DM. After the process change, there were two direct referrals to the DPP. In addition, two referrals were placed to the registered dietitian for impaired fasting glucose and one for prediabetes but were not done via the DPP referral source. Patients were also being referred to the registered dietitian for other diagnoses that could impact an individual's chances of developing prediabetes or diabetes in the future. Although the patient was not directly

referred to the DPP, referral to the registered dietitian allowed for potential lifestyle management rather than no intervention. Though only a total of two referrals were placed with the use of the created resource, more referrals were placed to the registered dietitian than in the previous three months. Even more compelling, many of the referrals placed were for conditions other than T2DM, a rarity prior to the project implementation.

The increase in referrals was viewed as beneficial by the registered dietitian as more people now have the ability to receive individualized counseling on their diet and nutrition habits than before, along with the chance to address prediabetic risk factors. Referrals were placed due to impaired glucose tolerance, obesity, and weight loss management, which opened conversation between the registered dietitian and patient on whether participation in the DPP was right for them or if they preferred one-on-one counseling. According to Moin et al. (2020), obesity is one of the greatest causal factors of prediabetes as increased adipose tissue can lead to insulin resistance. Therefore, reaching those with a BMI ≥ 25 holds merit when initiating preventative action for those who may be disposed to prediabetes development. In comparison to the three months prior to project implementation, no patient had been referred to the DPP, and only one patient was referred to the registered dietitian for impaired fasting glucose. Education on the use of the referral source and screening process is necessary to ensure continuation of care and identification of at-risk patients.

Evaluating the Theoretical Framework

As previously discussed in Chapter Two, the Chronic Care Model and the Iowa Model were used in the design, facilitation, and implementation of the project. The Chronic Care and IOWA Models both had proven efficacy in the success of the project planning and execution.

The project results can be associated with the appropriateness and guidance from both the theory and model.

The Chronic Care Model was used in the context of this project to assist in understanding the process of caring for individuals that live with a chronic disease. By understanding this concept, the healthcare staff can better bring together the patient, provider, and system interventions to reach the goal of improving chronic illness care. The model helped the co-investigator methodically improve the approach of the clinic staff to educating, screening, and referring patients with chronic diseases and increased risk factors to necessary assistance for the best outcomes. The Chronic Care Model served as an adaptable and applicable model for managing chronic illness prevention. Recommendations for further use of the model in the context of this research would be supported.

The IOWA Model served as a feedback tool for ensuring proper planning and implementation occurred. The use of the flowchart allowed for ease when determining the need to make changes within the project setting to ensure the objectives were met effectively. Overall, the project was successful as evidenced by the increase in knowledge regarding prediabetes best practices and the use of the referral for improved adherence to the use of the DPP as an intervention for at-risk patients. The duration of the project limited the ability to ascertain further data for analysis of areas that would benefit from further change or adherence in the future. Sustainability of the project can be assumed with the positive feedback received in the survey results and could continue to be evaluated with the use of the IOWA Model in the future. The co-investigator would recommend the use of the IOWA Model to direct further scholarly work on the topic.

A Logic Model (Figure 1) was used to assist in describing the steps in the implementation and evaluation of the project as a whole. Smith et al. (2020), explained that the purpose of a logic model is to show a graphic depiction of the shared relationships between the various elements of the project. Logic models can help to guide resources, development, and implementation of an evidence-based project into practice. The project was also aided by the use of the IOWA model to guide the practice change. The IOWA model proposes three main questions of "is the problem a priority," "is there sufficient evidence," and "is the process change appropriate for use in practice." With the use of the logic model, these questions are better answered and justified.

Project Limitations

The project did have various limitations. Many of the limitations experienced during the planning and implementation of project can be secondarily related to the coronavirus pandemic that began in the spring of 2020. From the start of the pandemic, healthcare facilities big and small felt the weight of educating, testing, treating, and eventually vaccinating the population of their community. Grafton, the site of the project, also felt the effect of the pandemic tremendously, as they are one of the largest health centers in the northeastern region of North Dakota. While much of the staff were working tirelessly to care for patients of the community, the co-investigator found obstacles in adding more for the staff to learn and implement into their daily routine.

Secondary to coronavirus and consultation with the chair of the project, the co-investigator decided to wait to start the education of the staff and delivery of the resources until June 25th – September 25th of 2021, only allowing for a three-month implementation period. With distancing rules in place, the co-investigator was encouraged to complete the education one on one versus in a large group setting. This approach allowed for more conversation to take place,

but in turn forced reduced time spent on the education module. The reduced time led to providing the education on a smaller scale, as well as an inability to demonstrate the referral process for providers, the distribution expectations of the patient education handouts, and the nurses' use of the Prediabetic Risk Assessment resource during the individual teaching sessions.

A second limitation that was experienced was also likely due to the pandemic and a need for consistent co-investigator accessibility. The administration was in favor of the project, but their time and attention were directed elsewhere due to heavy pandemic workload needs, ultimately compromising uptake of the project objectives. Although education was given to each of the physicians, nurse practitioners, and nurses involved, accompanied with a verbal response of understanding, there were still aspects of the project that needed further reinforcement and encouragement for participation. The co-investigator resided in Fargo, ND, which is 109 miles from Grafton. The distance restricted the co-investigator from being present in the clinic for weeks at a time to ensure the resources were being utilized to their fullest extent. Three two-day site visits were made during the implementation process, but more could have been done to reinforce the utilization of the resources.

The PDS Toolkit included many resources, some of which were not used in the implementation phase. Unfortunately, implementing the use of each one of the resources to its fullest extent was not feasible, partially as the resources did not pertain to the goal of the project and for conciseness of implementation. Clinic staff awareness of the risk factors of prediabetes and the utilization of the referral process to the DPP stood as the main purpose of the project, as approved by the clinic administration. Many of the toolkit resources provided for information in educating the staff on coding, billing, and screening processes. This was not feasible to

implement, as instructing and depending on full practice change by the providers and staff was not realistic at the time.

A fourth limitation could be seen in the need for further education of the nursing staff. Though the nursing staff did not place referrals or interpret the screening tool, they were responsible for ensuring all qualified patients over the age of 18 received a Prediabetes Risk Assessment at their annual wellness exam, although the use of the assessment tool was not numerically measured. Increased use of the PRA tool should have increased the number of patients screened and/or referred to the DPP. Now with further understanding, the co-investigator recognizes that ensuring the nurses understand the importance of the project and the role they play in it would increase their buy-in and in turn lead to further patient/provider conversations about prediabetes. Nurses have many responsibilities in the clinic. In order to increase investment in incorporating the resources to their daily routine, it will be necessary to increase education regarding the importance of screening and the role the nurse plays in the detection of prediabetes. Through observation, time restrictions within patient appointments, especially annual wellness exams, was seen to pose a challenge to include information specific to prediabetes.

Lastly, another aspect of the project that required further consideration was regarding the number of participants. The sample size was 14 participants. Although the number of respondents is small, the sample size was 87.5% of the total clinic staff population who met the qualifications of being a primary care provider or nurse at the primary care clinic setting. Therefore, the application of the met objectives and increase in knowledge acquisition could be generalized to the clinic as a whole. Despite high participation in the education, all referrals made to the DPP were initiated by three of the eight total providers. While this proportion does

not show widespread actioned uptake of the proposed interventions, sincere commitment among several clinic primary care providers who are in the position to change practice and clinic norms can be presumed. The pre and post-implementation surveys correlated with high levels of confidence in respondents' understanding of prediabetes and management, as only three of the total participants made a referral.

Recommendations for Future Practice Improvement

Although the project held limitations, the use of the PDS Toolkit resources and placing referrals to the DPP is still supported. Referencing the findings validated in the first and second chapters, the need for increased prediabetes awareness and management will have an impact on future health implications of patients and the development of diabetes for at-risk patients. The CDC (2020) outlines the staggering number of 88 million American adults who currently have prediabetes, both knowingly and unknowingly, and the impact this could have on the healthcare system in the future. Luckily, prevention is possible through provider, clinic staff, and patient awareness. The DPP has been shown to reduce the risk of T2DM by as much as 58% in at-risk patients (CDC, 2020). The increasing prevalence of prediabetes and availability of preventative resources leads to an increased expectation on primary care clinics to have improved awareness of identifying risk factors, patient screening measures, and properly referring at-risk patients to community resources.

Primary care personnel have the unique ability to build a relationship with their patient population over years of care. This being said, primary care providers are also responsible for ensuring that early identification, education, and awareness of the implications of prediabetes occur to prevent further chronic disease. Gregg and Moin (2021) highlight, "more than 40% of the adult population will be eligible for the screening, among whom an estimated one-third most

likely will meet USPSTF criteria for a prevention program" (para. 6). With this large percentage of the population qualifying for a prevention program, action needs to take place to initiate change in the clinic setting to increase screening and appropriate preventative care for patients. Those with prediabetes hold a 5-10% risk for developing diabetes annually and a 70% chance during their lifetime (Halliday et al., 2019). The impact of diabetes continues to be staggering. In 2016, diabetes was estimated to be the third leading cause of years lived with a disability and the seventh leading cause of death in 2017 (Jonas et al., 2021).

The providers were the highlighted population in this practice improvement project. In the future, focusing on nursing staff acceptance, accuracy of identification of patients screened, and being referred to the DPP based on their risk factors and qualifications can be helpful in improving the number of patients aware of their risk for or diagnosis of prediabetes. Provider education is the start of the process; precise and consistent identification, with the eventual use of all of the toolkit resources, will be helpful to future primary care clinics and their patient populations. Implementing change, starting with consistent identification of at-risk individuals with the use of the Prediabetes Risk Assessment tool in full and validated screening at annual wellness exams, will help to identify and promote earlier intervention for patients in the future.

Going forward, the toolkit and the resources associated will be more readily accessible. Since the implementation of the project, the PDS Toolkit moved from a PDF format to now online links that can be accessed at Tools & resources | amapreventdiabetes.org. Clinicians will be able to learn from the online resources and apply them to their practice with more ease than ever before.

Dissemination

In the spring of 2022, a dissemination of the project results was presented as part of an arranged poster presentation for the general public, students, and faculty at North Dakota State University. The developed poster outlined the methodology, objectives, results, and application of the information retrieved and analyzed throughout the planning, implementation, and evaluation of the project. The presentation of posters allowed those in attendance the ability to view the developed research and to ask questions of the co-investigator regarding the evidence-based project. The sections included within the poster are a general overview, problem statement, project objectives, project design, evaluation, timeline of events, and outcomes. The poster was also preliminarily displayed and presented at the North Dakota Nurse Practitioner Association 2021 Pharmacology Conference, a peer reviewed conference for attendees to view and ask questions.

Another form of dissemination was through a written presentation of the pre and post-implementation survey results and themes, which was provided to the clinic manager along with further information regarding the referral process and number of referrals placed to the DPP in a three-month period. An 8x11 size of the poster was also distributed to the staff of UMC that were involved in the project. By disseminating the results, the participants will again be reminded of the impact and the importance of prediabetic awareness and management.

A copy of the completed dissertation was submitted to the North Dakota State graduate school for review and publication to the ProQuest database associated with the NDSU library system. The co-investigator also made preliminary inquiries to various healthcare journals including the Journal of Nurse Practitioners and the American Diabetes Association for

publication. The plan is to submit the article by the year of 2023 to allow for adequate application timelines and correspondence.

Implications for Advanced Practice Nursing

Advanced Practice Nursing has shown and will continue to show a resounding presence in the primary care setting. In 2019, the American Association of Nurse Practitioners reported that the nurse practitioner field has grown to 248,800 clinicians, with 72.6% practicing in the primary care setting. The clinicians in the primary care setting have the unique ability to meet the patient on a relational level and provide comprehensive, preventative care. The setting of rural America encompasses a large number of nurse practitioners. Nurse practitioners make up about 18 % of the practicing provider workforce in the rural setting (American Academy of Nurse Practitioners [AANP], 2013 & 2019). Consistent with much of the United States, the highly rural population of North Dakota is seeing a rise in prediabetes progressing to diabetes. Nearly 200,000 of adult individuals in ND have prediabetes (North Dakota Department of Health, 2018). The family nurse practitioner needs to show a high level of awareness regarding prediabetes recognition and management to address the growing rate of prediabetics to diabetics at the source.

Preventing diabetes through recognition and management of prediabetes has been recognized by the USPTF, ADA, CDC, and the AMA, yet coverage for the preventative service is not well applied and remains a low priority during an annual wellness exam. According to Mainous (2021),

> Both the Medicare Merit-based Incentive Payment System in the Centers for Medicare & Medicaid Services' Quality Payment Program and Healthcare Effectiveness Data and Information Set from the National Committee for Quality Assurance have quality

> measures for diabetes but do not include diabetes prevention in their activities, only management of diabetes after diagnosis. There is no financial incentive for physician behaviors consistent with diabetes prevention, a recommended strategy through the USPSTF and ADA. (para. 24).

This statement outlines a significant barrier to meeting a preventative disease process at the source. Nurse Practitioners in the primary care setting undoubtedly can be inundated with updates, integrations, and practice change. Prediabetes awareness could set the ground work for increased productivity and less need for personal, medication, and chronic disease counseling if made a priority. Prevention of prediabetes and further diabetes can reflect in a reduction in chronic disease proliferation and ultimately morbidity of the present population. The use of the PDS Toolkit resources and improved management of patients at risk for prediabetes is proven to be a useful tool clinic wide and eventually improve patient outcomes.

Conclusion

The overall goal of the project was to increase prediabetes awareness and management best practices amongst primary care providers. As the rate of prediabetes continues to rise, the proactivity of providers becomes more important. With the use of frameworks from the Chronic Care and IOWA models, practice improvement in a clinic setting can be achieved and maintained. The process of planning, developing, implementing, and evaluating proved the need for increased knowledge of prediabetes and the effectiveness of the use of evidence-based project implementation, such as the DPP, in primary care practice.

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APPENDIX A: IRB APPROVAL

NDSU NORTH DAKOTA STATE UNIVERSITY

06/10/2021

Dr. Mykell M Barnacle
Nursing

Re: IRB Determination of Exempt Human Subjects Research:
Protocol #IRB0003697, "Prediabetes: Provider Awareness and the Implementation of the Prevent Diabetes STAT Toolkit Resources"

NDSU Co-investigator(s) and research team:

- Mykell M Barnacle
- Brooke Elizabeth Feltman

Approval Date: 06/10/2021
Expiration Date: 06/09/2024
Study site(s): Unity Medical Center in Grafton, North Dakota
Funding Agency:
The above referenced human subjects research project has been determined exempt (category 2,4) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, *Protection of Human Subjects*).

Please also note the following:

- The study must be conducted as described in the approved protocol.
- Changes to this protocol must be approved prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
- Promptly report adverse events, unanticipated problems involving risks to subjects or others, or protocol deviations related to this project.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.

NDSU has an approved FederalWide Assurance with the Department of Health and Human Services: FWA00002439.

RESEARCH INTEGRITY AND COMPLIANCE
NDSU Dept 4000 | PO Box 6050 | Fargo ND 58108-6050 | ndsu.research@ndsu.edu
Shipping Address: Research 1, 1735 NDSU Research Park Drive, Fargo ND 58102

APPENDIX B: EXECUTIVE SUMMARY

Prediabetes: Provider Awareness and the Implementation of the Prevent Diabetes STAT Toolkit

Co-Investigator: Brooke Feltman, DNP-S
North Dakota State University School of Nursing

PREDIABETES IN NORTH DAKOTA

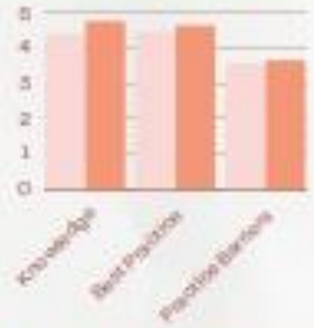
Nearly one third of North Dakotans have prediabetes but only 1 out of 10 people are aware of their diagnosis.

INTERVENTION

- Without lifestyle intervention, 15-30% of individuals will develop type two diabetes within 5 years time.
  - Assess provider + ancillary staffs' prediabetes understanding at a rural ND clinic.
  - Provide education on the PDS Toolkit resources and implement a Diabetes Prevention Program referral in Epic.

Referrals to the Diabetes Prevention Program

- Prior to implementation no referrals were placed directly to the DPP.
- Following implementation, 2 direct DPP referrals and 3 indirect referrals to the registered dietitian for impaired fasting glucose, obesity, and prediabetes.



Pre and Post Implementation Survey

Overall there was an increase in mean average confidence of the respondents in all three areas of prediabetes awareness

Recommendations

- Increasing staff motivation to proactively address prediabetes will improve initial action and proper treatment for at risk patients
- The Diabetes Prevention Program by the CDC and AMA is a proven effective first line treatment for prediabetes

SIGNIFICANT FINDINGS

- The use of a standardized referral source allowed for an increase in the number of referrals place for patients with prediabetic risk factors
- Prior to implementation, providers and ancillary staff showed a high degree of knowledge but a lack of follow up management and robust referral process for their patients at risk for developing prediabetes and further diabetes.

PDS Toolkit and the DPP

- Developed by the CDC and AMA, the DPP is a lifestyle change program based on diet, exercise, and physical activity goal setting
- PDS Toolkit was designed to assist providers screen, diagnose, educate, and refer patients to the DPP

References: American Medical Association (2021). Tools for the team: Diabetes prevention toolkit. https://amapreventdiabetes.org/

Further references can be viewed at the end of the official document.

APPENDIX C: PRE-TEST

Your practice participated in a project with the American Medical Association and to prevent the onset of diabetes. This assessment form is part of the project evaluation and administered at the beginning of the pilot to everyone at the practice.

Thank you in advance for your cooperation. When you are ready to begin, please click on "Continue."

Q1. Please select the designation that best describes your position:

- ○ Health Educator
- ○ Medical Assistant
- ○ Nurse
- ○ Nurse Practitioner
- ○ Nutritionist
- ○ Physician
- ○ Physician Assistant
- ○ Receptionist
- ○ Social Worker
- ○ Other (please specify)

Q2-11. Please indicate your level of agreement with each of the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Does Not Apply
I understand the medical definition of prediabetes						
I know how to screen for prediabetes						
I refer patients with prediabetes to community resources (e.g. smoking cessation, weight loss programs) that help prevent diabetes						

I routinely screen for prediabetes						
Prevention of diabetes is an important issue in my medical practice						
Taking the time to advise a patient about preventing diabetes has an effect on their behavior						
Prevention of diabetes is part of caring for patients						
I am aware of community resources that help patients prevent diabetes						
I feel uncomfortable talking to my patients about lifestyle changes that can help prevent diabetes						
Attending to immediate medical problems prevents me from talking to patients about prediabetes						

Q12. Please state a reason that you may not choose to address prediabetes or a barrier you see in practice:

Thank you for taking the time to complete this assessment.

APPENDIX D: POST TEST

Your practice participated in a project with the American Medical Association and the YMCA to prevent the onset of diabetes. This assessment form is part of the project evaluation and administered at the end of the pilot to everyone at the practice.

Q1. Please select the designation that best describes your position:

- ○ Health Educator
- ○ Medical Assistant
- ○ Nurse
- ○ Nurse Practitioner
- ○ Nutritionist
- ○ Physician
- ○ Physician Assistant
- ○ Receptionist
- ○ Social Worker
- ○ Other (please specify)

Q2-12. Please indicate your level of agreement with each of the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Does Not Apply
I understand the medical definition of prediabetes						
I know how to screen for prediabetes						
I refer patients with prediabetes to community resources (e.g. smoking cessation, weight loss programs) that help prevent diabetes						
I routinely screen for prediabetes						

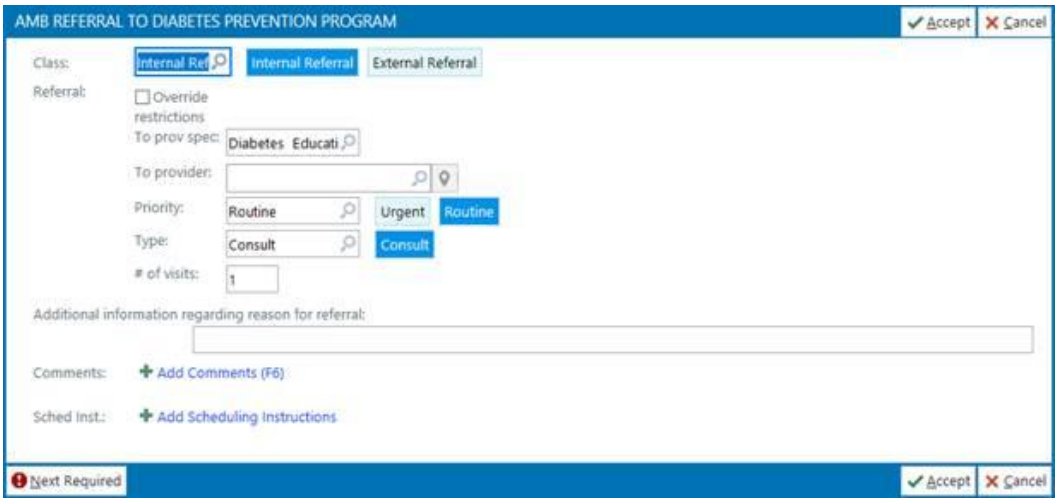
Prevention of diabetes is an important issue in my medical practice						
Taking the time to advise a patient about preventing diabetes has an effect on their behavior						
Prevention of diabetes is part of caring for patients						
I utilize AMA referral tools in my practice, as a result of the AMA DPP Physician Referral Pilot Note: this question is not in the pretest.						
I am aware of community resources that help patients prevent diabetes						
I feel uncomfortable talking to my patients about lifestyle changes that can help prevent diabetes						
Attending to immediate medical problems prevents me from talking to patients about prediabetes						

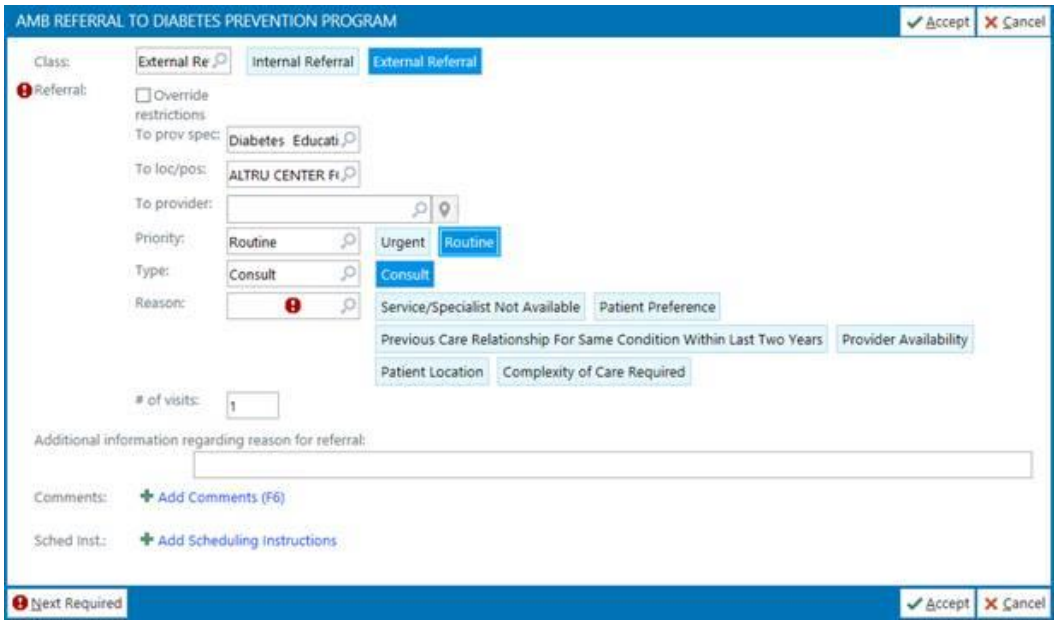
Q13. Please state a reason that you may not choose to address prediabetes or a barrier you see in practice:

Thank you for taking the time to complete this assessment.

Credit given and approval was received from Dr. Halliday, original researcher, for the use of the pre and post intervention questionnaire.

APPENDIX E: REFFERAL TOOLS IN EPIC





APPENDIX F: LETTER

NDSU School of Nursing
1919 N University Dr.
Fargo, N 58102-6050
701.231.5692

Unity Medical Center Staff,

My name is Brooke Feltman and I am a student in the Doctorate of Nursing Practice program at North Dakota State University. As a part of the degree requirements, I have developed a practice improvement project that focuses on increasing awareness of prediabetes and improving referral management process to the the Center for Disease Control and Prevention's Diabetes Prevention Program. I would like to evaluate the effect that providing targeted information materials has on overall healthcare professionals' knowledge and the referral rates of patients to the Diabetes Prevention Program at Unity Medical Center.

I invite you to participate in this study by completing a brief pre and post education questionnaire. You will be asked a series of questions relating your confidence regarding identification and management of prediabetes in your practice. This will be delivered in a paper copy a will take about five minutes to complete. Follow this survey, a brief educational module lasting about 15 minutes, will then be taught by myself regarding the USPFT screening guidelines and the use of the resources provided by the CDC and the American Medical Association in the Prevent Diabetes STAT Toolkit concerning prediabetes identification and management. A second questionnaire will be provided in three-months post intervention to obtain follow up data.

The questionnaire responses will be kept anonymous and confidential. Only job title information will be used in this study. Participation is voluntary and completion in the survey and partaking in the educational module implies consent of participation in the project. Institutional Review Board approval has been obtained from North Dakota State University.

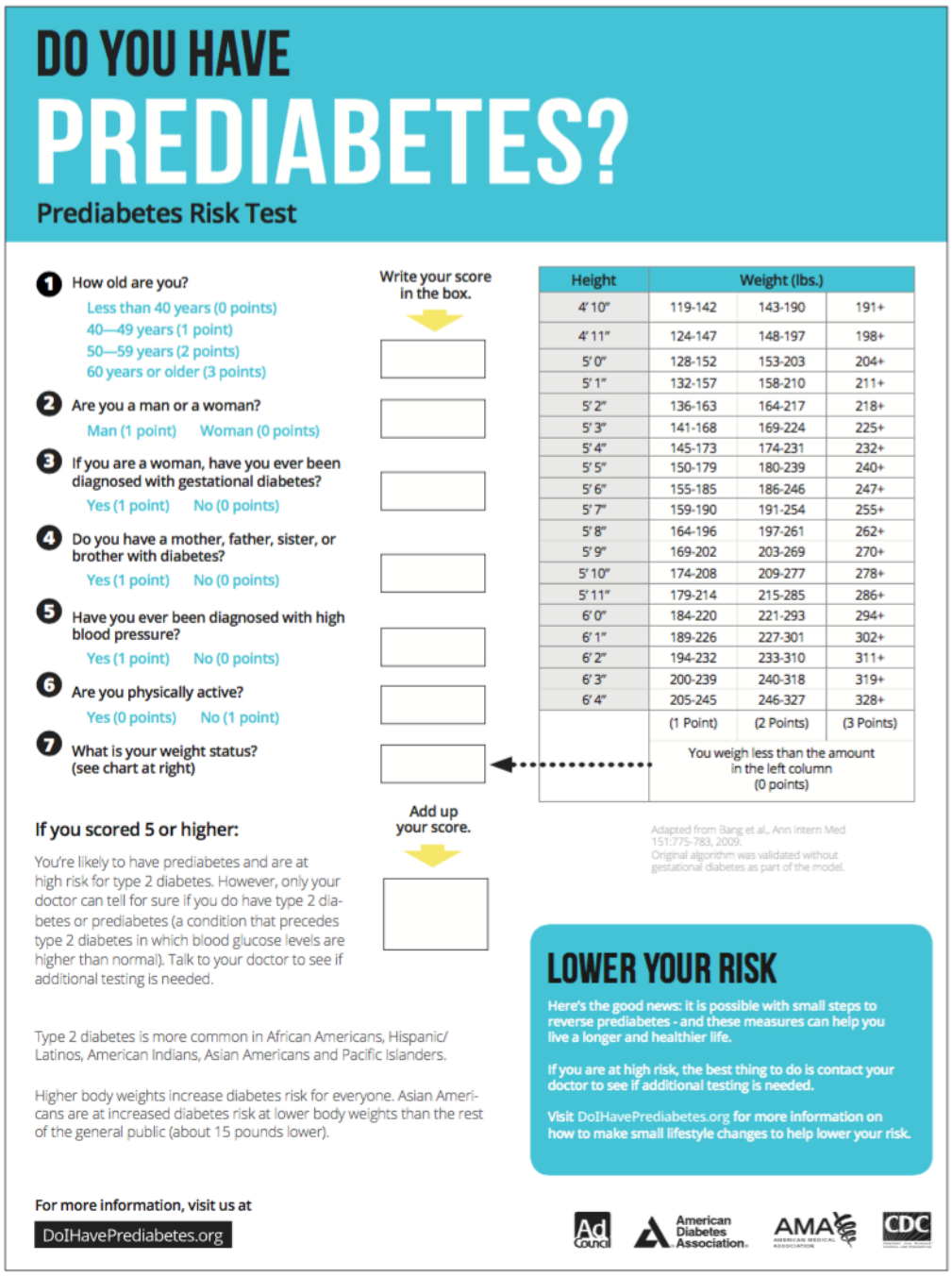
If you have any further questions, feel free to contact me at brooke.feltman@ndus.edu or call 701.520.2671. You may also contact my dissertation chair person, Dr. Mykell Barnacle, by email at mykell.barnacle@ndus.edu. You have rights as a participant. If you have questions about the rights of human participants in research of if you would like to report a problem with the study, you may contact the North Dakota State IRB Office by emailing NDSU.IRB@ndsu.edu or by phone at 701.231.8995 or toll free at 855.800.6717.

Thank you for your time and consideration of participation. Your inclusion in this research and responses that you provide about the utility of the toolkit resources will assist additional efforts to allow for improved identification of patients at risk for prediabetes and subsequently changing patient lifestyles for the better through the continued use of the Diabetes Prevention Program.

Sincerely,
Brooke Feltman, BSN, RN
Doctoral Student in the NDSU Department of Nursing

APPENDIX G: PATIENT RISK ASSESSMENT

Patient risk assessment



DO YOU HAVE
PREDIABETES?
Prediabetes Risk Test

1. How old are you?
   - Less than 40 years (0 points)
   - 40—49 years (1 point)
   - 50—59 years (2 points)
   - 60 years or older (3 points)

2. Are you a man or a woman?
   - Man (1 point)
   - Woman (0 points)

3. If you are a woman, have you ever been diagnosed with gestational diabetes?
   - Yes (1 point)
   - No (0 points)

4. Do you have a mother, father, sister, or brother with diabetes?
   - Yes (1 point)
   - No (0 points)

5. Have you ever been diagnosed with high blood pressure?
   - Yes (1 point)
   - No (0 points)

6. Are you physically active?
   - Yes (0 points)
   - No (1 point)

7. What is your weight status? (see chart at right)

Write your score in the box.

Height	Weight (lbs.)		
4' 10"	119-142	143-190	191+
4' 11"	124-147	148-197	198+
5' 0"	128-152	153-203	204+
5' 1"	132-157	158-210	211+
5' 2"	136-163	164-217	218+
5' 3"	141-168	169-224	225+
5' 4"	145-173	174-231	232+
5' 5"	150-179	180-239	240+
5' 6"	155-185	186-246	247+
5' 7"	159-190	191-254	255+
5' 8"	164-196	197-261	262+
5' 9"	169-202	203-269	270+
5' 10"	174-208	209-277	278+
5' 11"	179-214	215-285	286+
6' 0"	184-220	221-293	294+
6' 1"	189-226	227-301	302+
6' 2"	194-232	233-310	311+
6' 3"	200-239	240-318	319+
6' 4"	205-245	246-327	328+
	(1 Point)	(2 Points)	(3 Points)
	You weigh less than the amount in the left column (0 points)		

Adapted from Bang et al., Ann Intern Med 151:775-783, 2009.
Original algorithm was validated without gestational diabetes as part of the model.

Add up your score.

If you scored 5 or higher:

You're likely to have prediabetes and are at high risk for type 2 diabetes. However, only your doctor can tell for sure if you do have type 2 diabetes or prediabetes (a condition that precedes type 2 diabetes in which blood glucose levels are higher than normal). Talk to your doctor to see if additional testing is needed.

Type 2 diabetes is more common in African Americans, Hispanic/Latinos, American Indians, Asian Americans and Pacific Islanders.

Higher body weights increase diabetes risk for everyone. Asian Americans are at increased diabetes risk at lower body weights than the rest of the general public (about 15 pounds lower).

LOWER YOUR RISK

Here's the good news: it is possible with small steps to reverse prediabetes - and these measures can help you live a longer and healthier life.

If you are at high risk, the best thing to do is contact your doctor to see if additional testing is needed.

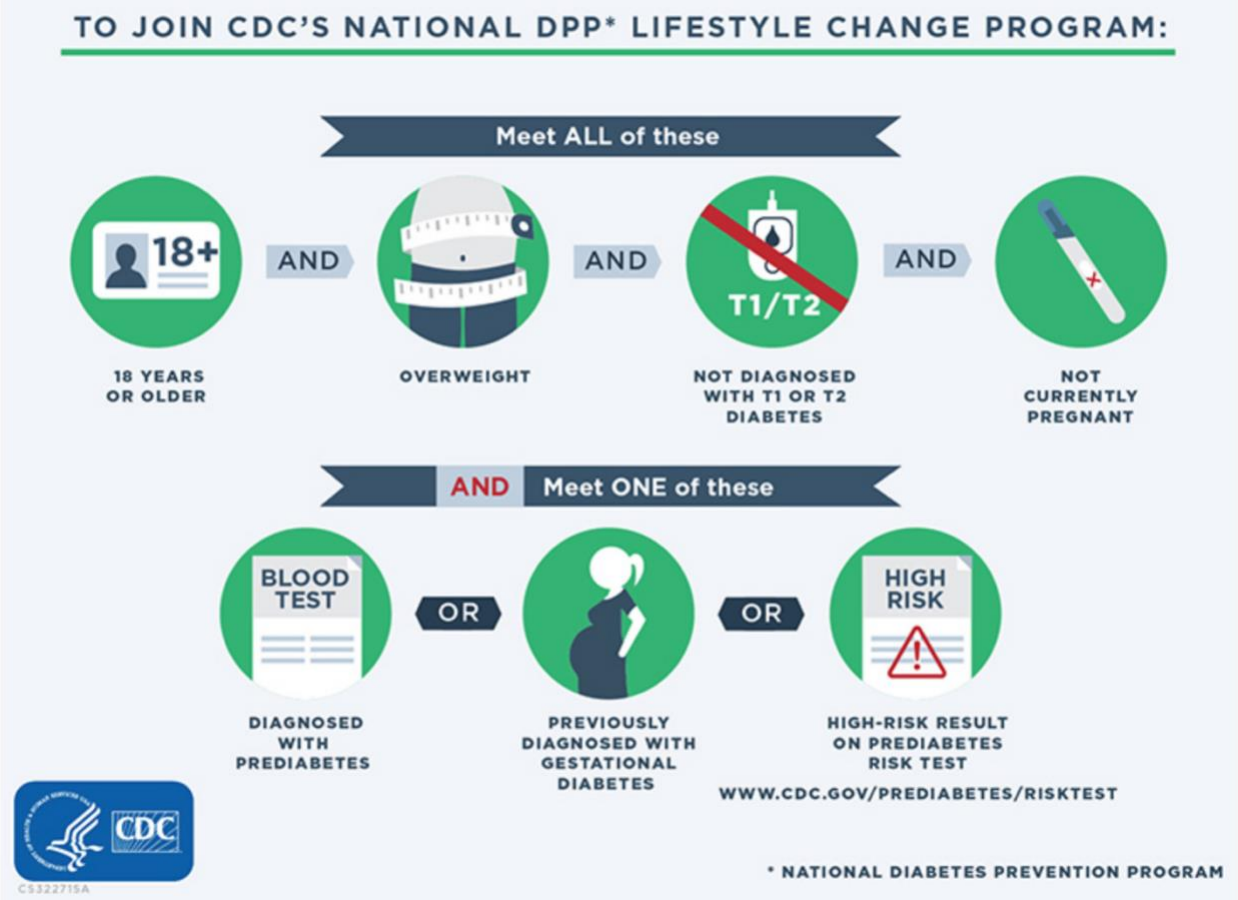
Visit DoIHavePrediabetes.org for more information on how to make small lifestyle changes to help lower your risk.

For more information, visit us at
DoIHavePrediabetes.org

Ad Council · American Diabetes Association. · AMA · CDC

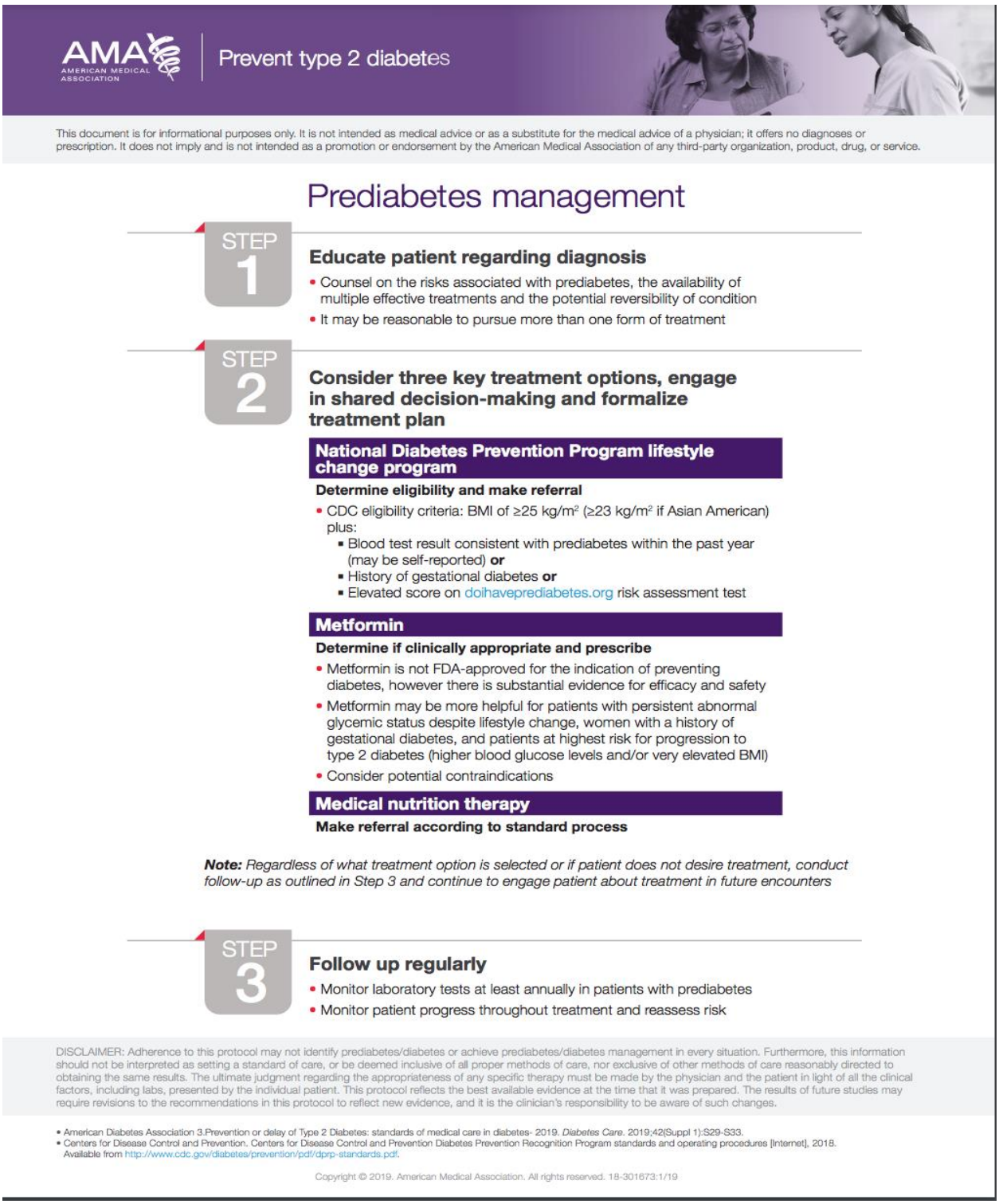
Retrieved from: Centers for Disease Control and Prevention (2021). National Diabetes Prevention Program. https://www.cdc.gov/diabetes/prevention/pdf/Prediabetes-Risk-Test-Final.pdf

APPENDIX H: CDC PREDIABETES GRAPHIC



Retrieved from: Centers for Disease Control and Prevention (2021). National Diabetes Prevention Program. https://www.cdc.gov/diabetes/prevention/program-eligibility.html

APPENDIX I: AMA MANAGEMENT GRAPHIC



Retrieved from: American Medical Association (2018). Tools for the team: Diabetes prevention toolkit. https://amapreventdiabetes.org/tools-resources

APPENDIX J: DIABETES PREVENTION PROGRAM DATES

ATTENDING THE DIABETES PREVENTION PROGRAM:

Grafton (Unity Medical Center):

- Contact: Rondee Boe-Feltman, RD (701)-352-
- **10 week** intensive Diabetes Prevention Program
- Class starts in **August** and includes one visit per week.
- Focuses:
    - Healthy diet choices
    - Physical activity recommendations
    - Stress Management
    - Personal lifestyle coaching
- Cost: $50 per person
- (Resources available in Spanish)

Grand Forks (Altru Health System):

- Contact: Jennifer Haugen
    - jmhaugen@altru.org
    - Phone: 701-732-7635
    - http://www.ndc3.org/
- 1 time per week for 16 weeks, bimonthly for 2 months than monthly for the rest of the year.
- In person class: Next session beginning in **November**.
- Focuses:
    - Healthy diet choices
    - Physical activity recommendations
    - Stress Management
    - Personal lifestyle coaching
- Cost: Free!
- (Resources available in Spanish)

APPENDIX K: WEIGHT LOSS AND DPP CLASS GOALS

Diabetes Prevention Program Class Goals

Class and group discussion

Week 1: Lifestyle change versus diet (Establishing realistic goals and reinforcing accountability).

Week 2: Mindful and Intuitive Eating (Behavioral Modifications)

Week 3: Reading food labels/Portion sizes and My Plate Guidelines

Week 4: Fiber for Satiety (Fruits, vegetables and whole grains)

Week 5: Exercise (will ask PT to be part of this conversation)

Week 6: This in place of that (Alternatives to high calorie foods) (low fat dairy, lean meats, plant based proteins).

Week 7: Planning healthy meals and snack choices (Food preparation techniques with grocery shopping guidance).

Week 8: Trip to the grocery store.

Week 9: How to eat out and still eat healthy (Managing holidays and special events).

Week 10: Where are we and how can we continue this process. (Staying on track).

Month 1- Follow up

Month 2-Follow up

Month 3-Follow up

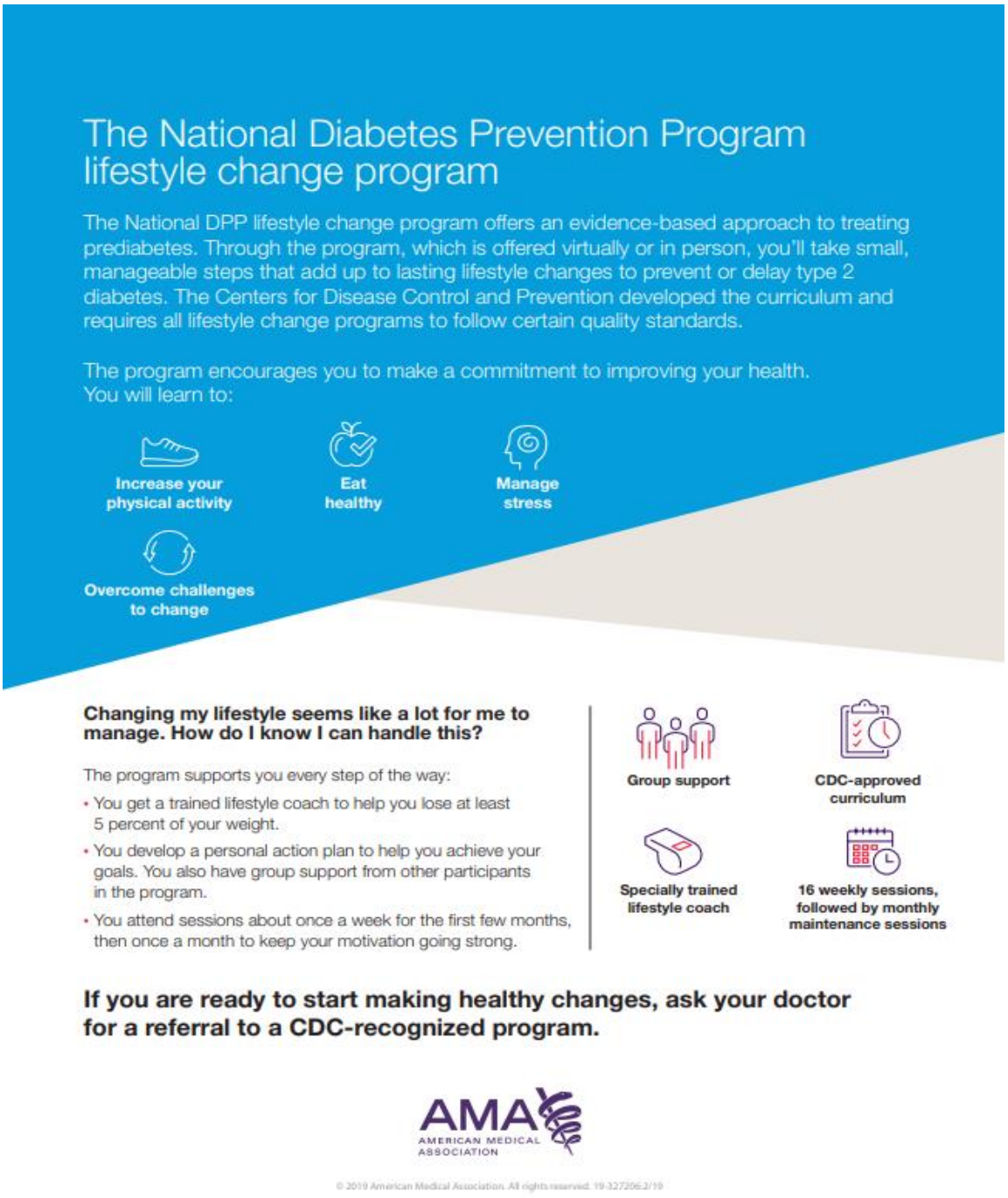
Participants will be required to attend every meeting

Participants will weigh in weekly and plot success on weight loss graph

Participants will be required to maintain food intake journals which will be reviewed by RDN.

Participants must be willing to exercise (be active) 150 minutes per week.

APPENDIX L: PATIENT EDUCATION



Patient education retrieved from downloadable link listed below:

American Medical Association. (2022). *So you have prediabetes- now what?*

amapreventdiabetes Patient-facing - So You Have Prediabetes, Now What.pdf

APPENDIX M: STAFF EDUCATIONAL POWERPOINT

PDF downloadable version of the educational power-point can be viewed at the site below:

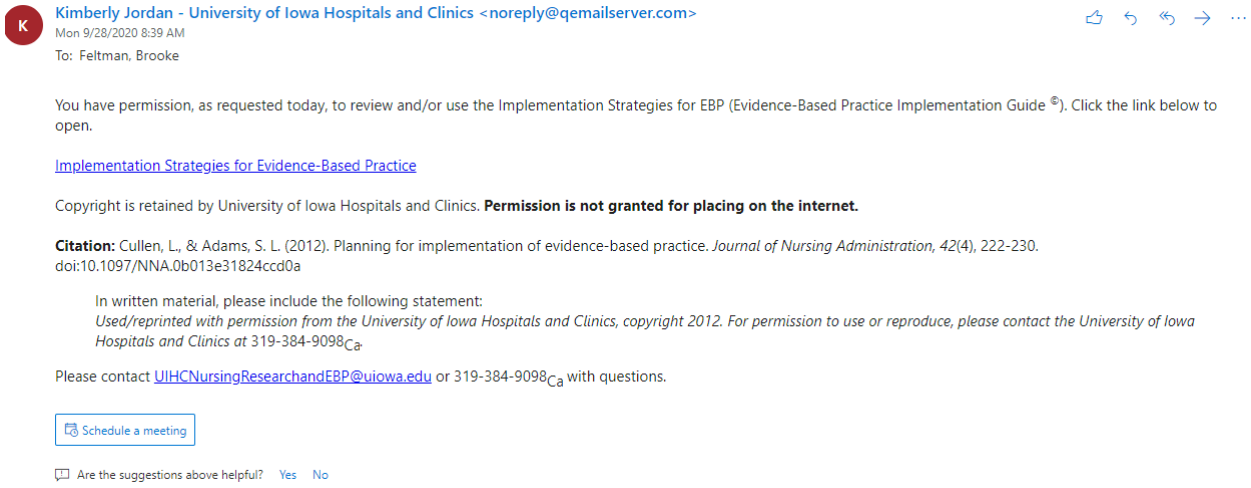
American Medical Association (2022). *Making the business case for diabetes prevention- offer to employees.* https://amapreventdiabetes.org/tools-resources

APPENDIX N: PREVENT DIABETES STAT TOOLKIT

The complete Prevent Diabetes STAT Toolkit can be accessed at this site linked below:

American Medical Association. (2022.) *The AMA can help you prevent type 2 diabetes.* Tools & resources | amapreventdiabetes.org

APPENDIX O: PERMISSION TO USE IOWA MODEL



Kimberly Jordan - University of Iowa Hospitals and Clinics <noreply@qemailserver.com>
Mon 9/28/2020 8:39 AM
To: Feltman, Brooke

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Implementation Strategies for Evidence-Based Practice

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Citation: Cullen, L., & Adams, S. L. (2012). Planning for implementation of evidence-based practice. *Journal of Nursing Administration, 42*(4), 222-230. doi:10.1097/NNA.0b013e31824ccd0a

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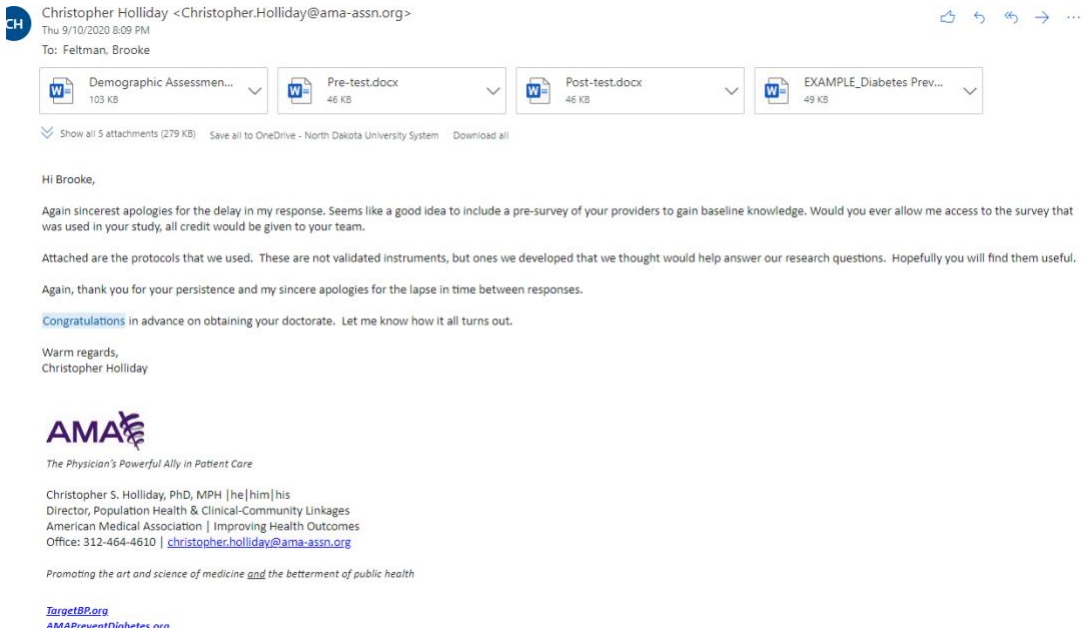
Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098$_{Ca}$ with questions.

Schedule a meeting

Are the suggestions above helpful? Yes No

APPENDIX P: PERMISSION TO USE SURVEYS



Christopher Holliday <Christopher.Holliday@ama-assn.org>
Thu 9/10/2020 8:09 PM
To: Feltman, Brooke

Demographic Assessmen... 103 KB | Pre-test.docx 46 KB | Post-test.docx 46 KB | EXAMPLE_Diabetes Prev... 49 KB

Show all 5 attachments (279 KB) Save all to OneDrive - North Dakota University System Download all

Hi Brooke,

Again sincerest apologies for the delay in my response. Seems like a good idea to include a pre-survey of your providers to gain baseline knowledge. Would you ever allow me access to the survey that was used in your study, all credit would be given to your team.

Attached are the protocols that we used. These are not validated instruments, but ones we developed that we thought would help answer our research questions. Hopefully you will find them useful.

Again, thank you for your persistence and my sincere apologies for the lapse in time between responses.

Congratulations in advance on obtaining your doctorate. Let me know how it all turns out.

Warm regards,
Christopher Holliday

AMA

The Physician's Powerful Ally in Patient Care

Christopher S. Holliday, PhD, MPH |he|him|his
Director, Population Health & Clinical-Community Linkages
American Medical Association | Improving Health Outcomes
Office: 312-464-4610 | christopher.holliday@ama-assn.org

Promoting the art and science of medicine and the betterment of public health

TargetBP.org
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APPENDIX Q: AGENCY LETTER OF SUPPORT

KN

Kari Novak <Knovak@unitymedcenter.com>
Wed 5/12/2021 11:49 AM
To: Feltman, Brooke

Hi Brooke,

We would be more than willing for you to do your dissertation implementation at our facility.

Thanks,
Kari Novak