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Implementation of the Center for Disease Control (CDC) Prediabetes Risk Test in the Medical Weight Loss Setting

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Abstract

Background: Prediabetes is a serious health condition where blood sugars are higher than normal which increases risk of developing type 2 diabetes mellitus (T2DM), heart disease and stroke. One in three US adults have prediabetes and 90% of them do not know. Losing 5-7% of body weight and regular physical activity can lower the risk of developing T2DM by more than half.

Methods: Screening patients for prediabetes at a medical weight loss clinic using the evidence-based Centers for Disease Control (CDC) Prediabetes Risk Test. A score of five or higher on the screening tool indicates the patient is at risk of having prediabetes. The patients who were considered at risk were referred to the CDC Diabetes Prevention Program (DPP) to learn about ways to decrease risk of developing T2DM.

Evaluation/ Results: Four months after implementation, forty-one patients at the medical weight loss clinic were screened. Of those that were screened, 34.1% had a score of five or greater, and of those whose screening showed they were at increased risk for prediabetes, 100% were referred to the DPP.

Implications for Practice: Implementation of the CDC Prediabetes Risk Test increased patient's knowledge of their risk for prediabetes and future risk of developing T2DM. The medical weight loss clinic will continue to screen all patients using the CDC Prediabetes Risk Test as well as monitor at risk patients and set goals to reduce risk.

Keywords: Prediabetes, obesity, screening, diabetes screening, prediabetes screening, risk factors for diabetes, diabetes prevention.

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Problem Identification

In the United States, approximately two out of three adults are overweight or obese (Harvard School of Public Health, 2016). Body mass index (BMI) is an indicator used to determine if an individual is overweight or obese (Centers for Disease Control and Prevention [CDC], 2016). According to the CDC (2017), a BMI of 25 to 29 is considered overweight and a BMI of 30 or higher is considered obese. Any increase in BMI above the normal range is associated with an increased risk in developing T2DM. Insulin is a hormone made in the pancreas that allows blood sugar into cells to use as energy (CDC, 2019). In T2DM, the cells do not respond to insulin normally, this is called insulin resistance. The pancreas tries to make more insulin to compensate, until eventually it cannot keep up. Blood sugars then rise, which leads to prediabetes and eventually T2DM. T2DM can affect all parts of the body and cause serious complications including atherosclerosis, retinopathy, neuropathy, and nephropathy (Harvard Health Publishing, 2018).

Problem Clarification

Prediabetes is defined as a fasting blood glucose of 100-125 and a hemoglobin A1C (HbA1c) of 5.7-6.4% (Mayo Clinic, 2019). HbA1c is an average of blood sugar levels from the last 3 months. The diagnosis cannot be made for T2DM until the fasting blood sugar level rises to 126 or higher on two separate occasions or the A1c is 6.5% or higher. The name "Prediabetes" can be misleading, as it is also a serious health condition where blood sugars are higher than normal which increases risk of T2DM, heart disease, and stroke (CDC, 2018). According to the CDC, over 84 million US adults, one in three, have prediabetes. Even more alarming, 90% of them do

not even know they have it (CDC, 2018). The first step is being able to identify individuals who have prediabetes and target this group in order to stop the progression to T2DM. The CDC Prediabetes Risk Test is a simple screening tool that can be used to identify individuals at risk for prediabetes. The screening looks for risk factors that an individual would know of such as age, gender, history of gestational diabetes, history of first-degree relatives with diabetes, hypertension diagnosis, physical activity, and weight. With a score of five or higher, they are at increased risk for having prediabetes and developing T2DM. After screening high, the patient can then either be diagnosed with prediabetes or T2DM through a blood test or decrease risk through lifestyle changes.

Description of Project, Facilitators, Barriers and Resistors

The Doctor of Nursing Practice (DNP) student implemented use of the CDC Prediabetes Risk Test at a small, private medical weight loss clinic over a four-month period. The aim of this evidence-based project (EBP) was to increase identification of patients at risk for prediabetes in order to educate them on ways to decrease their risk for developing T2DM. The facilitators of this project included the provider who owns the clinic and the nurse practitioners, medical assistants, receptionists, and patients. Barriers included a system-wide change from paper charting to an electronic medical record (EMR) during the implementation period. Originally, the screening was to be implemented into the EMR, however, with the staff undergoing a large transition from paper to EMR, printing the screening and education was deemed more practical. In addition, during the COVID-19 pandemic there were less patients willing to come into a medical weight loss clinic due to potential for exposure to the virus. Because of this, a smaller number of patients were screened than initially planned.

Evidence Based Practice Model

The conceptual framework used was the Iowa model as it serves as a guide for nurses and other providers to use research-based findings for improvement of patient care (Titler et al., 2001). This model uses a step-by-step approach that guided the implementation and evaluation of the project. The steps include: Selection of topic, forming a team, evidence retrieval, grading the evidence, developing an EBP standard, implementation of the EBP, and Evaluation.

Proposed Evidence-based Solutions

In order to identify benefits of screening for prediabetes, risk factors to screen for, and diabetes prevention methods, a literature review was performed using the following search engines: CINAHL, PubMed, and Science Direct. The evidence was graded using the Melnyk Model (Melnyk & Fineout-Overholt, 2019). There was a total of 11 articles that were used: one level one study, three level two studies, two level three studies, three level four studies, and two level five studies.

The American Diabetes Association (ADA) recommendation states "screening for prediabetes and T2DM with an informal assessment of risk factors or validated tools should be considered in asymptomatic adults" (ADA, 2020, p. S18). In a randomized controlled trial that compared the effectiveness of two DPPs, Ferrera et al. (2020) used the CDC Prediabetes Risk Test to determine those that were eligible for the intervention. If the individual scored at a high-risk level, they were included and randomly assigned to one of two DPP. Both programs yielded a weight loss at 6 months that was sustained at 12 months by one of the programs (Ferrera et al., 2020).

The CDC Prediabetes Risk Test was adapted from the ADA by a published study and validated using data from the CDC (CDC, n.d.). In the cross-sectional study by Heikes et al.

(2007), data for six years was used from the Third National Health and Nutrition Examination Survey (NHANES) to build and internally validate the CDC Prediabetes Risk Test. For prediabetes or undiagnosed T2DM, the sensitivity of the tool was 75% and the specificity 65% (Heikes et al., 2007). The objective of the study by Heikes et al. (2007) was to develop a simple, paper-based, validated screening tool that could be used to determine risk of having prediabetes or undiagnosed T2DM. To further simplify the risk test, only health traits that people would know about themselves were included such as age, height, and weight but not blood sugar and cholesterol levels. In a retrospective analysis done to compare the ADA and CDC prediabetes risk calculators, both scores performed well and robustly in detecting those with prediabetes or undiagnosed diabetes (Poltavskiv et al., 2016).

In the CDC Prediabetes Risk Test (2019), points are awarded for different risk factors a patient has. For age, zero points are awarded for those younger than 40, one point for those 40-49 years of age, two points for those 50-59 years of age, and three points for those 60 years old or greater. One point is awarded for male gender, one point for having a history of gestational diabetes, one point for having been diagnosed with hypertension, one point for having a first degree relative with diabetes, and one point for not being physically active. Points awarded for BMI categories include zero points for a BMI less than 24.9, one point for a BMI of 24.9-29.7, two points for a BMI of 29.9-39.7, and three points for a BMI of 39.9 or higher. After a patient has filled out the risk test, points are added up. Patients who score greater than or equal to five are considered at risk for prediabetes.

A meta-analysis where Galaviz et al. (2018) analyzed controlled studies where those with prediabetes or diabetes risk factors were either assigned to a control group or an intervention

group. It was found that lifestyle modification strategies can reduce incidence of diabetes in those with risk factors, even with small weight reductions.

The DPP is the largest efficacy trial that showed that diabetes can be prevented or delayed in those that are at high risk (Knowler et al., 2002). If patients with insulin resistance decrease their body weight by 5-7% and exercise 150 minutes per week through a lifestyle change program they reduce risk of developing T2DM by 58% (Knowler et al., 2002). In the study, Knowler et al., randomly assigned 3,234 nondiabetic persons to either a placebo group, metformin twice daily group, or lifestyle-modification group. Results showed that the lifestyle intervention was more effective than metformin. A 10-year follow-up of the diabetes incidence and weight loss of the DPP was also conducted and showed that the cumulative incidence of diabetes remained lowest in the lifestyle-modification group (Knowler et al., 2009). This shows that the DPP is an evidence-based and simple option for referral when a patient screens high risk for prediabetes and that results of the program can persist for at least 10 years.

Project Development and Implementation Timelines

The project was presented to and approved by the providers and owner of the medical weight loss clinic at the end of October 2019. IRB approval was then received through the University of San Diego on May 27, 2020. After receiving IRB approval, the practice providers received education from the student on the background, significance, purpose, aims, and timeline of the project along with information on how to use the risk test. Ongoing in-person education was also given to providers and clinic staff throughout the project. Implementation began at the end of June 2020. Due to a recent transition from paper-charting to EMR, it was not possible to add the risk-test to the EMR. Therefore, paper was used for the CDC Prediabetes Risk Test, education on prediabetes, and for the link to the DPP. The screening packets were kept at the

front desk and were handed to the patient in the waiting room. During the appointment, the nurse

practitioner reviewed the score with the patient and handed them an informational packet on the

significance of prediabetes along with a referral to the DPP. Completed screenings were set aside

for the student to collect and review. In order to maintain confidentiality, patient identifiers were

not attached to the screening. Data collection continued until the end of October 2020.

Project Outcomes

Four months after the implementation of the CDC Prediabetes Risk Test at the medical

weight loss clinic, forty-one total patients had been screened. Of those, all were female, 36.6%

were younger than 40 years old, 24.3% were aged 40-49, 34.1% were aged 50-59, and 4.8%

were 60 years or older. *Figure 1* shows the amount that screened high risk in each age category.

Over 50% of those between the ages of 50-59 and 100% of those greater than 60 years old

screened greater than or equal to five.

Five of the women reported having a history of gestational diabetes, four have been

diagnosed with hypertension, and sixteen have a first degree relative with T2DM.

For BMI category, 7.3% were in category 0, 39% were in category 1, 46% were in

category 2, and 7.3% were in category 3. *Figure 2* shows the quantity of patients in each BMI

category that screened at risk. The percentage of patients in each BMI category that screened

high increased as BMI increased. Of those in category 0 there were 0% at risk, 18% of those in

category 1 were at risk, 47% of those in category 2 were at risk, and 100% of those in category 3

were at risk.

Of all the patients screened, 46% reported not being physically active and 53% reported

being physically active. As shown in *figure 3*, of those who were not physically active, 53%

screened at risk and of those who were physically active, only 18% screened at risk.

In total, 36.6% of patients scored at a five or higher and were considered at risk for prediabetes (see *figure 4*). Of those that scored at a five or higher, 100% of them were given information on the DPP and a link to an online program. They were also educated about the two main goals of the program which are to lose 5-7% of their weight and to exercise at least 150 minutes per week in order to decrease risk of developing T2DM by more than half. The patient received additional close follow-up. As per routine clinical management, and apart from the project, the provider could also then suggest testing the patient's HbA1c to officially diagnose them with prediabetes or diabetes.

Cost/ Benefit Analysis

Diabetes is a major health issue in the US with 34.2 million Americans, roughly 1 in 10 who have diabetes and 88 million Americans, about 1 in 3 who have prediabetes (CDC, 2020). People with diagnosed diabetes incur an average medical expenditure of $16,750 per year, of which $9,600 is attributed to diabetes. This is on average 2.3 times higher than what expenditures would be of those without diabetes (ADA, 2018). In contrast, the cost of the program is roughly $40 for paper to print the screening and education handouts, $24 for a 30-minute training for three medical assistants, and $60 for a 30-minute training for two nurse practitioners. This would mean that for every dollar spent, there is a $76 cost savings. Non-financial benefits to the clinic include client loyalty and patient satisfaction. Once a patient was referred to the DPP they were closely monitored by the medical weight loss clinic which potentially increased visits and kept patients committed to treatment. Additionally, the risk test offers a non-invasive approach for assessing risk and initiating personalized discussions with patients targeted toward decreasing their own risk of developing T2DM. This personalized

education also has the potential to increase patient satisfaction. Early recognition and intervention are key in prevention of diabetes and the associated medical costs.

Conclusions & Summary

Screening asymptomatic individuals using a simple, non-invasive method is an inexpensive way to educate patients about their risk for prediabetes, which can lead to T2DM. The ADA guideline supports screening in this way and provides a widely available risk calculator along with the CDC. Implementing the screening allows providers to personalize their education to each individual based on their existing risk factors and ability to eliminate the modifiable risk factors that may be present. Once an individual screens high on the risk test, it is important to have information and guidance for them on how to decrease their risk. Referral to a DPP for those that screen high provides specific evidence-based goals that are easily attainable and can substantially decrease the risk of developing T2DM. Limits to the project were small sample size and the need to implement the screening into the EMR. Future projects could assess long term weight loss, HbA1c before and after intervention for individuals that screen high, and implementation of the screening in other settings.

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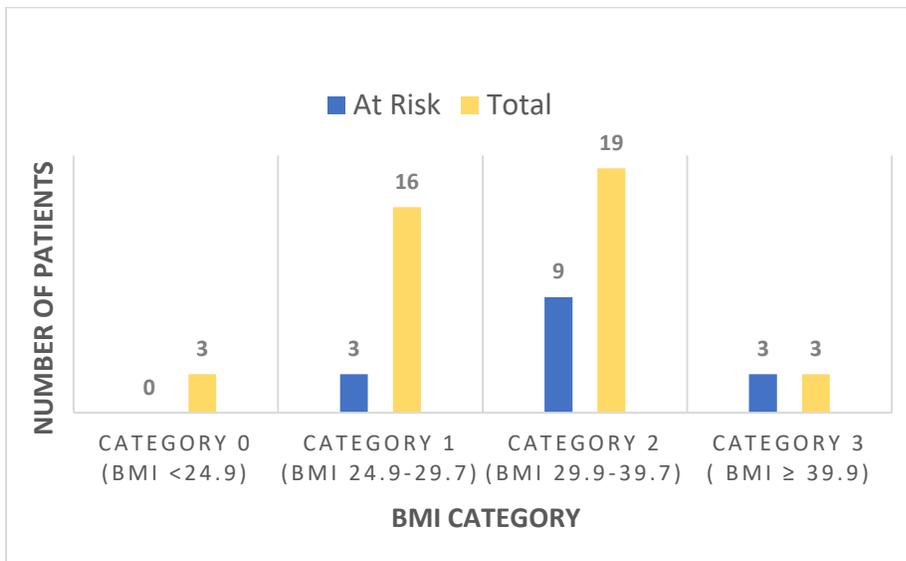
Figures

Figure 1

Number of Patients at Risk for Prediabetes by Age Category
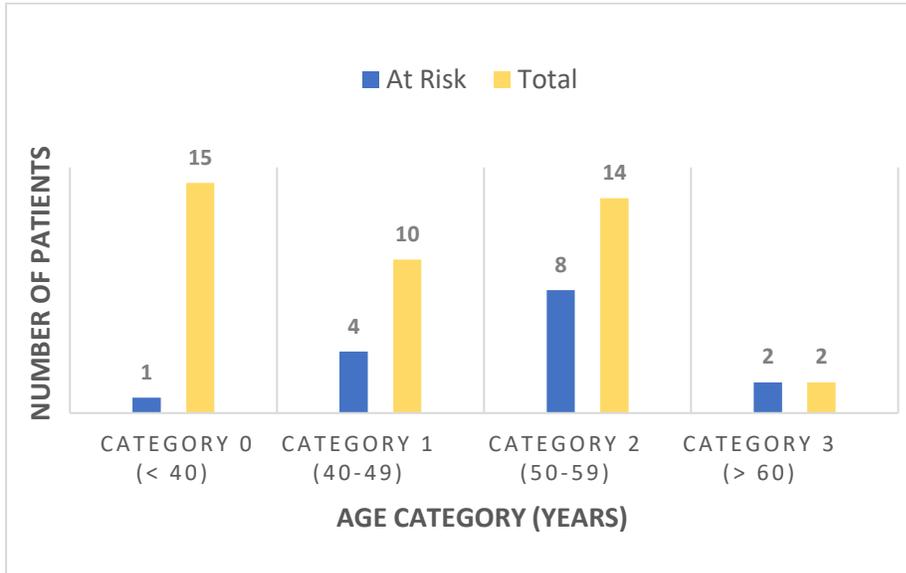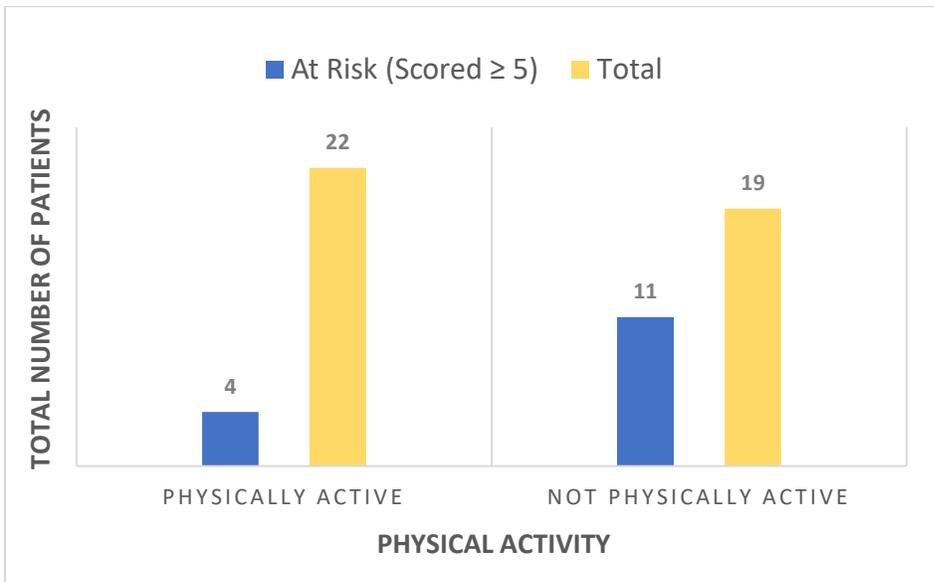

Figure 2

Number of Patients at Risk for Prediabetes by BMI Category

Figure 3

Number of Patients at Risk for Prediabetes by Physical Activity

Figure 4

Total Percentage of Patients at Risk for Prediabetes