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Prediabetic Screening Tool in Primary Care

Ashley Koon
University of Missouri-St. Louis, anbhf8@umsystem.edu

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Ashley N. Koon

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Vanessa Loyd, Ph.D., DNP

Chairperson

Roxanne Reid, DNP, MSN-Ed

Kristen Massey, FNP-BC

Abstract

Problem: Diabetes mellitus is a chronic health condition that affects millions of individuals each year. In addition, it is known as the seventh leading cause of death. While guidelines recommend using evidence-based screening tools, many primary care practices do not implement them. Therefore, potentially resulting in delayed identification and implementation of primary and secondary prevention strategies.

Methods: This quality improvement (QI) pilot project utilized a descriptive, observational study design. The American Diabetes Association Risk Tool (ADART) was administered to a convenience sample of patients aged 18 to 44 years old without a previous diagnosis of prediabetes or diabetes mellitus, seeking care in a primary care setting. Data were collected from January – April 2023, including the number of patients seen daily, screenings administered, and the ADART scores identifying those at risk for prediabetes and type 2 diabetes mellitus. Also, data specifying the number of referrals the primary care provider offered for further diagnostics.

Results: The ADART was utilized to screen (N = 131) participants. Of those screened, 22% (n = 29) had an ADART score of five or greater, indicating they were at risk for prediabetes and diabetes mellitus. The primary care provider provided 100% (n = 29) further diagnostics.

Implications for Practice: Widespread utilization of the ADART in other primary care clinics can assist in identifying individuals at risk for prediabetes and diabetes mellitus. Providing earlier identification and intervention, such as further diagnostic testing.

Prediabetic Screening Tool in Primary Care

In the United States, the number of individuals diagnosed with diabetes mellitus (DM) continues to rise at an alarming rate, affecting millions each year (Centers for Disease Control and Prevention [CDC], 2021). The CDC (2022) reports that within the past 20 years, the number of Americans diagnosed with DM has more than doubled. DM is a chronic health condition resulting in the body's inability to regulate blood glucose levels appropriately (Sapra & Bhandari, 2022). Type 2 diabetes is the most common category of DM for adults 18 years or older, and it is caused by an imbalance between the level and sensitivity of insulin within the body, contributing to approximately 90-95% of all diagnosed cases (CDC, 2020; CDC, 2021; Sapra & Bhandari, 2022). In addition, 7.3 million adults 18 years or older who met the diagnostic criteria for type 2 diabetes were unaware of their diagnosis (CDC, 2022). Thus, accounting for more than 200,000 deaths each year due to complications of type 2 diabetes (CDC, 2020). Unfortunately, patients with type 2 diabetes are at increased risk for many other comorbidities, including kidney failure, retinopathy, neuropathy, peripheral vascular disease, myocardial infarction, and stroke (Sapra & Bhandari, 2022; Zand et al., 2018).

Prior to a diagnosis of type 2 diabetes, many individuals are diagnosed with prediabetes. Generally, individuals with prediabetes are asymptomatic, experiencing no signs or symptoms of disease (Kandula et al., 2018). Prediabetes is classified as elevated blood glucose levels considered higher than usual but not dramatically elevated to meet the criteria for type 2 diabetes (American Diabetes Association [ADA], 2022; CDC, 2021). To meet the prediabetes criteria, an individual must have a fasting glucose of 100 to 125 mg/dL and/or a hemoglobin A1C of 5.7-6.4% (ADA, 2022). In 2018,

approximately 88 million Americans aged 18 and older were found to have prediabetes (CDC, 2020). Of these individuals, 88.4% were unaware of their diagnosis (CDC, 2020). In addition, only 15.3% reported notification by a healthcare professional of their diagnosis (ADA, 2021). Several risk factors are associated with the development of prediabetes and the progression to type 2 diabetes. These include hypertension, obesity, and dyslipidemia (ADA, 2021). In turn, they are increasing the risk of cardiovascular events (ADA, 2021). Unfortunately, an estimated 70% of individuals will progress to type 2 diabetes if no interventions are established (Kandula et al., 2018). Therefore, indicating the significance of earlier identification and the implementation of primary prevention strategies (Zand et al., 2018).

In the primary care setting, diabetes remains one of the most common chronic diseases. However, many primary care providers must utilize recommended, evidence-based risk screening tools. The United States Preventative Services Task Force (USPSTF) recommends diagnostic screening for prediabetes and type 2 diabetes in asymptomatic adults aged 35 to 70 who are overweight or obese (USPSTF, 2021). In comparison, the ADA recommends diagnostic screening for all adults 45 years or older, regardless of risk factors (USPSTF, 2021). In addition, the ADA recommends screening adults who are considered overweight or obese and have one or more risk factors, including a family history of diabetes, physical inactivity, or an at-risk ethnicity (Grant et al., 2021). The ADA also suggests incorporating informal screening for risk factors or utilizing an assessment tool.

An example is the American Diabetes Association Risk Tool (ADART), which assists healthcare professionals in identifying those at risk for prediabetes or type 2

diabetes (ADA, 2021). However, these recommendations do not recognize patients between 18 and 44 years of age, which provides an opportunity for primary care settings to implement a screening tool. In addition, Grant et al. (2021) stated that diabetes is no longer a chronic condition restricted to middle-aged and older adults. Thus, indicating the need for a standard diabetes risk assessment tool, such as the ADART, to screen asymptomatic individuals aged 18 to 44.

This project was designed to implement and evaluate the ADART 's effectiveness in identifying those aged 18 to 44 years, at risk for prediabetes or DM, in a primary care setting. The Iowa Model of Evidence-Based Practice served as the framework for guiding this quality improvement (QI) pilot project. This project aimed to increase the number of patients identified at risk for prediabetes or diabetes mellitus by 20% in three months. The primary outcome of interest was the number of patients identified at risk for diabetes using the ADART. The secondary outcome of interest was the number of patients at risk provided further diagnostics by the primary care provider. The project was designed to answer the following study question: In adults aged 18 to 44 years without a prior diagnosis of prediabetes or diabetes mellitus, what is the effect of the American Diabetes Association Risk Tool (ADART) on identifying those at risk for diabetes?

Literature Review

A literature review was conducted to increase the understanding regarding implementing diabetic risk screening in primary care. The following search engines were utilized: CINAHL, Medline, and Academic Search Complete. The key search terms, including Boolean operators, consisted of “prediabetes” OR “impaired fasting glucose” AND “risk assessment,” yielding 4,504 results. “Prediabetes” OR “impaired fasting

glucose" AND "primary care" yielded 4,442 results. "Prediabetes" OR "type 2 diabetes" AND "risk factors" delivered 5,435 results. "Prediabetes" AND "medical complications" yielded 5,027 results. "Prediabetes" OR "type 2 diabetes" AND "economic impact" produced 3,252 results. Lastly, "prediabetes" AND "prevention" delivered 1,229 results. To further refine the search, inclusion criteria consisted of research studies published between 2017 and 2022, focused on adult patients over the age of 18 years old, and considered academic journals. The exclusion criteria consisted of research studies published before 2017, focused on participants younger than 18 years old, written in a language other than English, and those considered non-academic journals. After applying the inclusion and exclusion criteria, ten publications were selected and included in this literature review. These publications included three systematic reviews, three cross-sectional studies, one qualitative recall study, one quantitative survey, one mixed method, and one retrospective cohort study.

Prediabetes screening is critical for early identification and treatment among patients in the primary care setting. The ADA and the CDC formulated a diabetes risk tool that was further investigated by Aldayel et al. (2021) to examine the sensitivity and specificity among 180 patients. Aldayel et al. (2021) found that patients with elevated ADA scores were likelier to have higher hemoglobin A1C levels. In addition, a 78.9% prediabetes sensitivity rate was established among the patient population. Therefore, suggesting the ADA/CDC assessment tool is a valid and reliable test for identifying patients at risk for prediabetes within the primary care setting (Adayel et al., 2021).

Unfortunately, not all patients are screened by their primary healthcare provider. Hafez et al. (2017) explored factors influencing a provider's decision to screen. Their

study consisted of 20 primary care physicians and 134 non-diabetic patients who met the ADA screening criteria. Patients with a higher BMI were more likely to be screened (p = 0.012) and prediabetic (p = 0.002). In addition, providers were more likely to screen patients during a health maintenance visit ($p < 0.001$). The study also found that patient results of the screening tests were conveyed by 95% of providers (Hafez et al., 2017). However, a lack of communication regarding evidence-based treatment recommendations was identified. Of the 24 participants with prediabetes, only 58% received education from the provider regarding the importance of weight loss and increasing physical activity. Comparably, none of the providers recommended the use of metformin or participation in a Diabetes Prevention Program (Hafez et al., 2017). A similar study by Nhim et al. (2018) sought to identify primary care providers' perceptions regarding prediabetes screening, testing, and referral. Of the 1,256 primary care providers included in the study, only 27% utilized the CDC/ADA Risk Tool (Nhim et al., 2018).

Furthermore, only 23% of providers made appropriate referrals to evidence-based lifestyle change programs (Nhim et al., 2018). Tseng et al. (2017) examined primary care providers' knowledge regarding risk factors, laboratory criteria, and management guidelines for prediabetes. Of the 140 providers included in the study, only 6% identified all the correct risk factors, prompting a prediabetes screening. In addition, only 17% of providers could identify the lab parameters for diagnosing prediabetes. Therefore, indicating the need for additional education related to prediabetes screening and management in the primary care setting (Hafez et al., 2017; Nhim et al., 2018; Tseng et al., 2017).

Increasing patient awareness, education, and communication with the healthcare provider have been identified as a need to prevent and manage prediabetes. Mainous et al. (2019) explored the perception of diabetes risk in adult patients with undiagnosed prediabetes. The study comprised 974 adults between the ages of 20 and 64 who had completed the National Health and Nutrition Examination Survey (Mainous et al., 2019). Among the participants, 25% were found to have prediabetes, according to the ADA guidelines (Mainous et al., 2019). However, 75.4% reported they were unaware of their diagnosis. In addition, only 12.8% stated that a healthcare provider had informed them of their increased risk for diabetes (Mainous et al., 2019). Another study identified patients expressing concerns regarding provider education (Roper et al., 2019). Roper et al. (2019) found that many patients wanted additional lifestyle modification education to prevent diabetes. Many reported that they felt providers were not upfront regarding the health risks associated with prediabetes (Roper et al., 2019). Similarly, a study by Messina et al. (2017) examined the lack of knowledge and its impact on diabetes prevention. Many participants felt they could benefit from written education tools to help them understand the risk factors associated with prediabetes (Messina et al., 2017). Also, to better understand the condition, prevention methods, and the effect of prediabetes on the body (Messina et al., 2017). As for mention, there is a need for primary healthcare providers and patients to be educated on the diagnosis, management, and treatment of prediabetes and type 2 DM (Mainous et al., 2019; Messina et al., 2017; Roper et al., 2019).

Tseng et al. (2022) performed a retrospective cohort study of 3.888 patients diagnosed with prediabetes. The electronic medical record (EHR) was utilized to assess

treatment measures, orders, and referrals initiated by the primary care provider. Key findings revealed that only 1% of patients were referred to a nutritionist, and 5.4% were prescribed metformin (Tseng et al., 2022). In addition, within 12 months of the study, 6% of patients progressed to a diagnosis of type 2 diabetes (Tseng et al., 2022). A meta-analysis performed by Schlesinger et al. (2022) further addressed the importance of prediabetic management and treatment in preventing associated complications. Patients with prediabetes were at increased risk for cardiac death, dementia, and stomach, colorectal, and pancreatic cancer (Schlesinger et al., 2022). However, Glechner et al. (2018) conducted a systematic review, suggesting lifestyle interventions effectively delay the progression of prediabetes to type 2 DM. Their analysis concluded that patients receiving lifestyle interventions had a 54% lower risk of progressing to type 2 DM than those receiving usual treatment (Glechner et al., 2018). Thus, displaying a crucial necessity for improved management and treatment of prediabetes in primary care settings by adapting a standard risk assessment tool (Glechner et al., 2018; Schlesinger et al., 2022; Tseng et al., 2022).

The Iowa Evidence-Based Practice Model provided a systematic framework to incorporate evidence into clinical practice change (Iowa Model Collaborative, 2017). The model's first step is determining a *Problem-Focused Trigger*, indicating a need for change within a primary care clinic. Within this community, diabetes is a leading chronic health condition affecting many. However, the primary care clinic does not utilize a standard risk assessment tool to screen those between 18 to 44 years old for prediabetes and type 2 DM. A research question was formulated in the next step, and a literature review was conducted (Iowa Model Collaborative, 2017). The body of evidence was

analyzed, and it was determined that sufficient data was established to implement a change in practice.

Prediabetes is among the most prevalent, underdiagnosed health conditions in the United States. However, it can be prevented with proper risk assessment, patient awareness, and lifestyle modifications. As displayed within the literature review, evidence-based screening tools and treatment recommendations exist regarding the diagnosis of prediabetes. Unfortunately, many primary care providers fail to incorporate these recommendations into their practice (Hafez et al., 2017). Consequently, delaying the recognition of prediabetes and increasing individuals' risk of acquiring adverse health outcomes. In the primary care setting, providers must utilize evidence-based risk screening tools as a standard of care to recognize those at risk for prediabetes. This study implemented and evaluated the use of ADART in identifying those at risk for prediabetes.

Methods

Design

A descriptive, observational study design was utilized to implement this QI pilot project. Data was collected from the implementation of an evidence-based screening tool regarding the identification of prediabetes. The data collected included the number of patients seen daily, screenings administered, and the ADART scores identifying those at risk for prediabetes and type 2 DM. In addition, data was collected specifying the number of referrals the primary care provider offers for further diagnostic.

Setting

This project was implemented in a rural Midwest family primary care clinic with approximately 3,000 patients. The estimated population of the rural community is about 4,006 persons (United States Census Bureau, 2020). In addition, this primary care clinic accounts for the only healthcare facility in the immediate area. Also, this clinic is part of a large healthcare organization medical group located throughout a Metropolitan area.

Sample

A convenience sample of adult patients seeking care at the primary care clinic was utilized for this project. Patients 18-44 years of age with no previous prediabetes or DM diagnosis were included in the sample. However, patients younger than 18 years or older than 44 and those with a prior diagnosis of prediabetes or DM were excluded. All patients seen at the primary care clinic between January – April 2023, and meeting the inclusion criteria were included in the analysis.

Procedures

This QI pilot project involved the transition of the primary care clinic from current practice without diabetes screening to implementing the ADART (see Appendix A). The Doctor of Nursing Practice (DNP) candidate led the project over a 12-week period, from January—April 2023. Before project implementation, the two primary care providers, two registered nurses, and one medical assistant were provided training on the screening tool. The registered nurses and one medical assistant verbally offered the ADART while the patient was in the examination room before seeing the primary care provider. This included seven questions regarding age, gender, history of gestational diabetes, if applicable, family history of diabetes, previous diagnosis of hypertension,

presence of physical activity, and weight category based on the provided chart. The total score was then calculated by the primary care provider seeing the patient. According to the screening tool, a score of five or greater indicates a patient is at increased risk for having prediabetes and at high risk for type two diabetes. Based on their discretion, the primary care provider could provide referrals for further diagnostics to those at risk. Data collection occurred at predetermined timeframes throughout the implementation of the QI pilot project. At these times, the primary investigator transferred all data into an Excel spreadsheet and analyzed using descriptive statistics.

Data Collection/Analysis

The daily record of all patients seen and those screened during the implementation was collected and transferred to an Excel spreadsheet (see Appendix B and C). The list and completed ADART screening tools were kept in a locked file cabinet within the provider's office and only shared with the primary investigator. Participant data included the ADART screening responses, ADART score, and referral for additional diagnostics if applicable. To further assess the ADART screening tool's effect on identifying those at risk for prediabetes, Microsoft Excel and descriptive statistics were analyzed using Intellectus Statistics software.

Approval Process

Prior to the implementation of this QI pilot project, written approval was sought and obtained from the participating clinic's healthcare organization Vice President, Chief Nurse Officer, the graduate student institution, and the graduate student committee. The primary clinic's healthcare organization does not have its own IRB and is not affiliated with any IRB at other institutions. Therefore, this QI pilot project was assessed by the

UMSL IRB and determined not to be human-subject research. The implementation of the ADART poses minimal to no risk to the patients involved.

Results

The sample included (*N* = 131) patients, predominantly female (*n* = 85, 65%) and adults younger than 40 (*n* = 91, 69%). Also, the sample included males (*n* = 46, 35%) and those aged 40-49 (*n* = 40, 31%). In the primary care clinic, no screening took place for prediabetes or DM preceding the QI project implementation. During the implementation period from January – April, the primary care provider saw (*N* = 131) patients, who met the inclusion criteria, and the ADART was administered. Of the screened patients (*n* = 29, 22%) scored five or greater and were considered at risk. Those considered at risk included (*n* = 19, 66%) males and (*n* = 10, 34%) females. In addition, 100% of the patients identified as at risk were provided further diagnostics. A bar graph was utilized to display the results of participants screened, scored as at risk, and provided further diagnostics (see Figure 2). Out of the (*N* = 131) screened patients, the total ADART scores had an *M*=3.06 and a *SD*=1.72, with a minimum score of zero and a maximum score of seven.

A previous family history of diabetes was identified in (*n* = 41; 31%) of participants. This included (*n* = 27; 66%) females and (*n* = 14; 34%) males. In addition, (*n* = 27; 66%) patients were recognized within the age group younger than 40, and (*n* = 14; 34%) patients aged between 40 and 49. Next, patients screened were questioned regarding the presence of high blood pressure. Of the (*N* = 131) screened, (*n* = 25; 19%) indicated a positive history. Furthermore, (*n* = 10; 40%) were within the younger than 40 age group, and (*n* = 15; 60%) were within the 40 and 49 age group.

When discussing physical activity, (*n* = 66; 50%) patients screened identified as being physically active. Of these, (*n* = 48; 73%) were female, and (*n* = 18; 27%) were male. Out of the (*n* = 66) patients who reported physical activity, (*n* = 2; 3%) were found to be at risk. However, (*n* = 65; 50%) of the other patients screened reported no physical activity. Of these patients, (*n* = 42; 65%) were female, (*n* = 23; 35%) were male, and (*n* = 27) identified as at-risk.

Discussion

The QI project utilized the Iowa Model Evidence-Based Practice Framework to assess further the effect of the ADART on identifying patients in the primary care setting at risk for prediabetes and DM. Of the patients seen during the QI implementation period, (*N*=131) patients who met the inclusion criteria were screened. Ultimately, identifying (*n* = 29; 22%) of the patients as at risk. Therefore, achieving the goal of increasing the number of patients identified as at risk for prediabetes and DM by 20% in three months. The descriptive analyses demonstrated a positive correlation between being identified as at-risk and indicating a previous history of high blood pressure, a family history of diabetes, and a lack of physical activity. While the sample was comprised predominantly of females (*n* = 85, 65%), males (*n* = 19; 66%) compared to females (*n* = 10; 34%) were identified as at risk.

A limitation of this QI pilot project was the sample size, due to one primary care provider being on maternity leave. Therefore, decreasing the number of potential patients to be screened utilizing the ADART. Another limitation was the ADART could not be incorporated into the Epic Software system, utilized by the primary care practice, before the QI implementation period. Potentially creating a decrease in accessibility for the

primary care clinic staff and the possibility of missing patients who met the inclusion criteria to be screened.

A recommendation for further data collection would be the widespread utilization of the ADART in other primary care clinics within the healthcare organization and pursuing the implementation of the ADART into the Epic computer system. Increasing the time period would allow a more significant number of patients screened.

Conclusion

From this QI pilot project, implementing the ADART in patients aged 18 to 44 years without a previous diagnosis of prediabetes or diabetes mellitus assisted in identifying those at risk in the primary care clinic setting. More referrals for further diagnostics were provided to the patients recognized as at risk by the primary care provider. However, further QI analysis and data collection should occur due to the identified limitations, such as a small sample size.

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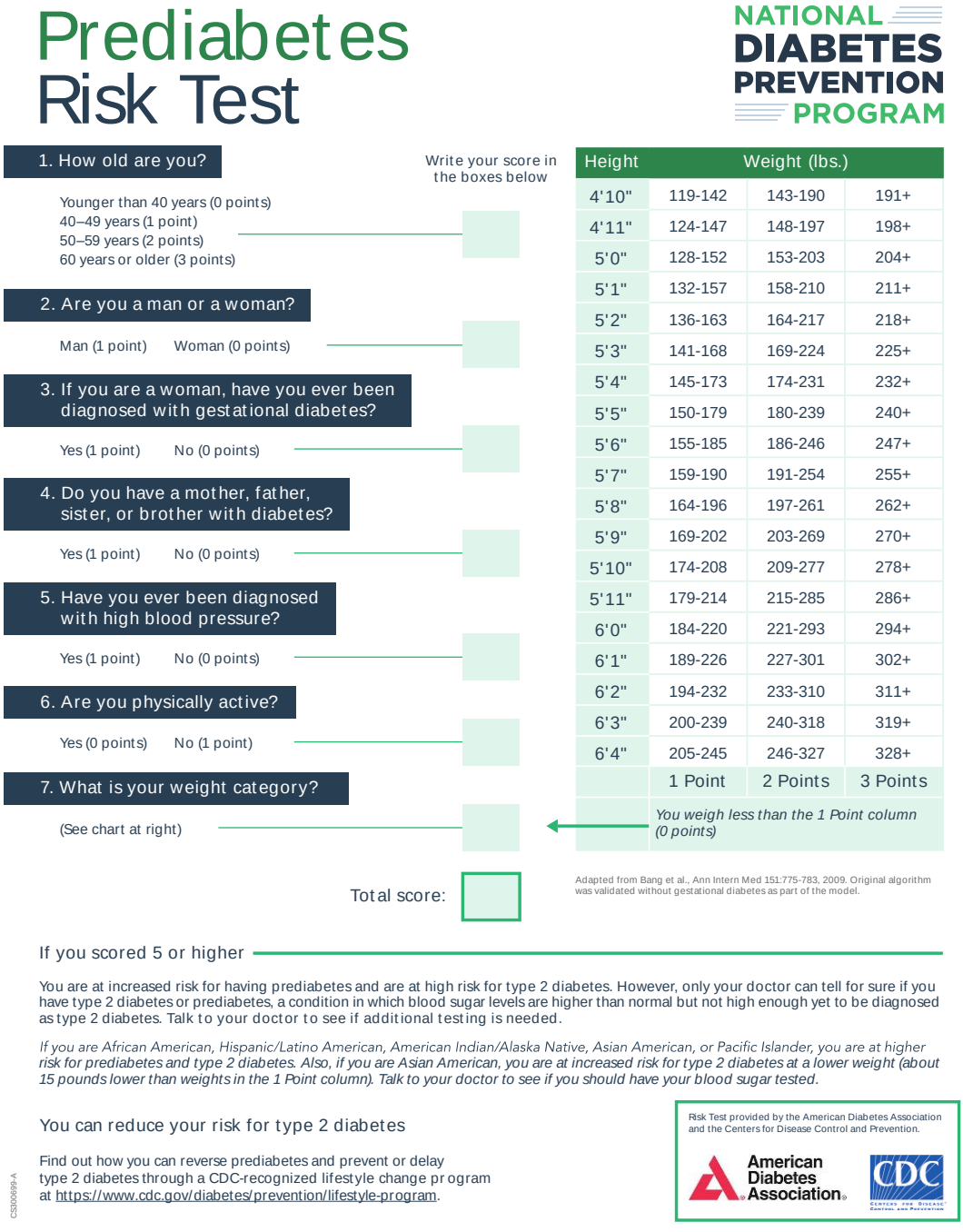
Appendix A

Figure 1
American Diabetes Association Risk Tool



Note. From the American Diabetes Association and the Centers for Disease Control and Prevention. (2021). *Prediabetes Risk Tool*. https://www.cdc.gov/prediabetes/pdf/Prediabetes-Risk-Test-Final.pdf

Appendix B

Data Collection Tool (January 30, 2023- April 24, 2023)

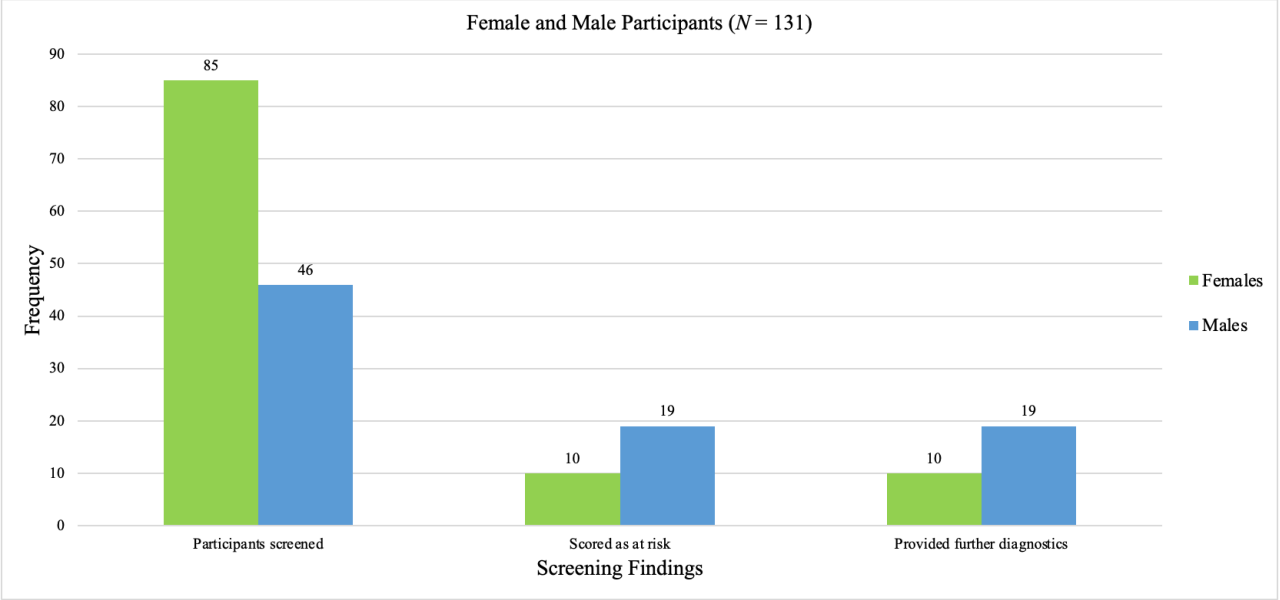
Date	# of patient visits	# of patients screened
Feb. 1	8	1
Feb. 2	18	3
Feb. 3	8	4
Feb. 6	18	1
Feb. 7	12	4
Feb. 8	15	1
Feb. 9	16	2
Feb. 10	0	0
Feb. 13	13	1

Appendix C

Data Collection Excel Spreadsheet: Participant ADART Responses

Identifier	Example: D0117P01
Age	2
Gender	1
History of Gestational Diabetes (Y=1/N=0)	0
Family history of diabetes (Y=1/N=0)	0
Previous diagnosis of high blood pressure (Y=1/N=0)	1
Physical activity (N=1/Y=0)	0
Weight category (Height/Weight= 1 to 3)	2
Total Score	6
Identified as high risk? (5 points or greater)	Yes
Referral for further intervention if applicable	Yes

Figure 2. *Bar Graph of Female and Male Participants ADART results from January 2023 – April 2023*



Note. The bar graph depicts the frequency of participants screened, scored as at risk, and provided further diagnostics. *N*=131