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Implementing a diabetes risk screening protocol in the primary care setting.

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Implementing a Diabetes Risk Screening Protocol in the Primary Care Setting

by

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Abstract

Background: Over one-third of the United States population, approximately 86 million individuals, are estimated to have prediabetes (CDC, 2021a). If left untreated, prediabetes will progress to type II diabetes mellitus (T2DM) in approximately 25% of subjects within 3–5 years, and as many as 70% of individuals with prediabetes will develop T2DM within their lifetime (Hostalek, 2019).

Purpose: The purpose of this quality improvement project was to implement and evaluate the American Diabetes Association MyChart Diabetes Risk Assessment tool in a primary care clinic to optimize the early identification of prediabetes and T2DM in non-pregnant adults ages 18 to 70 years.

Methods: Non-pregnant patients aged 18-70 years without a diagnosis of prediabetes or diabetes mellitus Type I or II were sent a web-based diabetes risk questionnaire. Data was collected via the electronic health record throughout implementation and analyzed using SPSS software by assessing five categories: (1) number of patients screened with the Diabetes Risk Assessment; (2) number of patients with a score ≥ 5 indicating a high risk for diabetes (3) age, sex, race, and BMI of all patients (4) number of patients referred for FPG or HbA1c if score ≥ 5 (5) number of patients with an abnormal FPG or HbA1c.

Intervention: This project's intervention was to send a Diabetes Risk Assessment via the electronic health record to all non-pregnant adults aged 18-70 years who do not have a diagnosis of prediabetes or diabetes mellitus Type I or II and have a routine medical appointment scheduled in February or March of 2022.

Results: During the five-week implementation period, 183 participants met inclusion criteria. Of the 183 participants included, 120 (66%) participants had an active MyChart account and were

sent the American Diabetes Association MyChart Diabetes Risk Assessment questionnaire electronically. Of the 120 participants who were sent the questionnaire, 61 (51%) participants responded. Of the participants that responded, 37 (61%) were identified to be high-risk and 24 (39%) were found to be low-risk. Of the high-risk participants, 12 (32%) had an A1c, fasting plasma glucose, or both ordered. Of the 12 high-risk particpants with labs ordered, 7 had lab results in the prediabetic range (58%).

Discussion: The number of individuals unknowingly living with prediabetes or T2DM is substantial, and the risk of failing to treat the disease early is significant. Screening and educating patients regarding their risk for diabetes encourages self-efficacy in prevention and treatment. This project affirmed that using a researched and validated tool, like the ADA Diabetes Risk Assessment tool, was feasible and effective in identifying patients at risk for diabetes.

Keywords: screening; prevention; prediabetes; type 2 diabetes; risk assessment; obesity; evidence-based practice; screening protocols

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Implementing a Diabetes Risk Screening Protocol in the Primary Care Setting

The rising rate of Type 2 diabetes mellitus (T2DM) is a public health epidemic that should be a cause for concern for providers, especially primary care providers (PCPs) (Zimmet, 2017). Over one-third of the United States population, approximately 88 million adults, had prediabetes in 2018, and more than 84% do not know they have it (Centers for Disease Control and Prevention [CDC], 2020). T2DM, formally known as non-insulin-dependent diabetes, is a chronic metabolic disorder in which hyperglycemia occurs due to insulin resistance and a progressive loss of insulin secretion (American Diabetes Association [ADA], 2021). Currently, T2DM is diagnosed if fasting plasma glucose (FPG) is equal to or greater than 126 mg/dL, a two-hour plasma glucose (2hrPG) is equal to or greater than 200 mg/dL during an oral glucose tolerance test (OGTT), or a hemoglobin A1c (A1c) level of 6.5% or greater (ADA, 2021a). Prediabetes is an intermediate stage between normal glucose regulation and T2DM (ADA, 2021a). Prediabetes is diagnosed if FPG is between 100–125 mg/dL, a 2hrPG is between 140–199 mg/dL during an OGTT, or an HbA1c level of 5.7–6.4% (ADA, 2021a). Prediabetes is a condition that can lead to a diagnosis of T2DM if left unaddressed (ADA, 2021a).

Problem Statement

The American Diabetes Association (ADA) recommends screening for prediabetes and T2DM with an informal assessment of risk factors in asymptomatic adults (ADA, 2020). Screening for prediabetes and T2DM risk with an assessment tool can guide providers on whether performing a diagnostic test for prediabetes and type 2 diabetes is appropriate (ADA, 2021b). Before implementation, there was no diabetes risk screening process used at the project site for non-pregnant adult patients between 18 and 70 years old. Therefore, the intervention was

to implement an electronic health record (EHR) ADA MyChart Diabetes Risk Assessment screening tool into standard clinical practice.

Population Affected

From 2000 to 2018, diabetes in Kentucky adults doubled from 6.5% (198,052) to 13.7% (474,456 or 1 in 7) (Kentucky Department for Public Health & Centers for Disease Control and Prevention, 2018). Every year an estimated 34,000 people in Kentucky are diagnosed with diabetes (ADA, 2020). Diabetes has generally been equally prevalent among males and females in Kentucky (Clark et al., 2019). Nationally, diabetes is more prevalent among African Americans than Caucasians and other racial groups; however, there is little difference in the prevalence of diabetes among African Americans and Caucasians in Kentucky (Clark et al., 2019). In Kentucky, 34.1% of adults are diagnosed with prediabetes (ADA, 2020). Nationally, 24.3% of adults ages 18 to 44 have prediabetes (CDC, 2020).

Significance of the Problem

An additional 812,000 Kentucky adults are estimated to have prediabetes but are undiagnosed (Kentucky Cabinet for Health and Family Services [KCHFS], 2020). Low provider knowledge about risk factors and diagnostic criteria may contribute to underdiagnosed prediabetics (Tseng et al., 2017). Another barrier is major organizations' inconsistent prediabetes and diabetes screening recommendations (Mainous et al., 2016). Only 60.4% of Kentucky adults in the past three years were screened for prediabetes (KCHFS, 2019). Among the 50 states, Kentucky ranks seventh for adult diabetes prevalence (KCHFS, 2019). In 2016, Kentucky had the fourth highest mortality rate due to diabetes (KCHFS, 2019).

Consequences of T2DM

People with diabetes experience significantly higher rates of other common chronic diseases, which can complicate self-management and medical care (CDC, 2020). Diabetes complications are responsible for significant morbidity and mortality (Papatheodorou et al., 2018). T2DM chronic complications are typically divided into microvascular and macrovascular issues. Microvascular complications include neuropathy, nephropathy, and retinopathy, while macrovascular complications include cardiovascular disease, stroke, and peripheral artery disease (Papatheodorou et al., 2018). Hypertension is a risk factor in almost 80% of those with diabetes (KCHFS, 2019). Hypertension with or without uncontrolled diabetes can lead to blindness, kidney disease, heart disease, peripheral artery disease, and lower extremity amputations (Papatheodorou et al., 2018). The combination of diabetes with high blood pressure and high cholesterol is tied to increased rates of cardiovascular disease such as heart attacks and stroke (CDC, 2021b). People with diabetes are twice as likely to have heart disease or a stroke than people without diabetes (CDC, 2021b). The asymptomatic prediabetes phase is the optimal time to begin preventive measures for T2DM and reduce the risk of macrovascular and microvascular compliations.

The societal burden of T2DM has increased in the past decades due to population aging and the increasing prevalence of underlying risk factors, such as obesity, unhealthy diet, and increased sedentary activity (Khan et al., 2020). Diabetes is not only a health burden but poses a financial burden to the patient and society. Individuals with diabetes generally have significantly higher health care expenditures than the rest of the population due to higher use of prescription medications, higher use of hospital inpatient services, supplies to treat diabetes directly, and more office visits to primary care and other health providers (ADA, 2018). In 2019 the estimated cost of diabetes in Kentucky was $5.16 billion, with the cost of healthcare for adults with

diabetes being 2.3x higher than those without diabetes (Kentucky Diabetes Report, 2019). The ADA estimates that those with diabetes incur $5,000 to $12,300 per year in additional health care costs relative to those without diabetes (ADA, 2018). As the disease progresses indivials may find it more difficult to work which leads to reduced employment, productivity, wages, and tax revenue (Clark et al., 2019). In Kentucky, diabetes reduces employment by approximately 15,700 workers, representing a loss of $551.3 million in earnings and $33.1 million in state tax revenue annually (Clark et al., 2019).

Reducing the impact of T2DM through early recognition and treatment of prediabetes can reduce the overall cost to the healthcare system and improve patient outcomes (Clark et al., 2019). In 2017 diabetes cost $327 billion nationally, including $237 billion in direct medical costs and $90 billion in reduced productivity (ADA, 2018). It is expected that by 2030, that T2DM treatment will cost more than 465 billion dollars per year (Debussche et al., 2018).

Root Causes

The risk of developing T2DM increases with age, obesity, and lack of physical activity (ADA, 2021a). Most, but not all, patients with type 2 diabetes are overweight or obese (ADA, 2021a). From 2013 to 2016, 89% of patients with diagnosed diabetes were overweight or obese (CDC, 2020). Overweight is defined as a body mass index (BMI) of 25 to 29.9 kg/m2 and obesity as a BMI of ≥30 kg/m2. In Kentucky, 70.1% of adults are overweight or obese (Trust for America's Health, 2021). Over half of diabetic adults in Kentucky are obese (56.1%), and nearly half are physically inactive (49.2.%) (KCHSF, 2019). The time spent being overweight or obese is a critical predictor of diabetes (Ley et al., 2016).

Environment

This evidence-based practice project was implemented at an adult primary care and specialized geriatric medicine clinic in downtown Louisville, KY. This office has a complete adult patient panel of approximately 3,700 patients and had 8,713 appointments in 2020 (Faul et al., 2020). Patients seen in this primary care clinic range from ages 18 to 102. Of the patients seen in 2020, 29% were age 18-49, 23% were age 50-64, and 48% were age 65+ (Faul et al., 2020). More women than men are seen in the clinic (Faul et al., 2020). In the past eight months at the clinic, there have been 8,882 visits by 2,645 patients. The medical clinic staff includes four medical doctors, one nurse practitioner, and three medical assistants.

Culture

Successfully implementing lasting organizational change entails overcoming barriers and obstacles. Facilitators for project implementation include approval for project implementation at the clinical site and support from my Doctor of Nursing Practice (DNP) project chair. Barriers to project implementation include time constraints in the clinic, assumptions about a patient's health status, and simply forgetting to utilize the MyChart Diabetes Risk Assessment results. It is possible that there could be barriers and resistance to change or that the change in practices could be short-lived.

Literature Review

Despite the population health implications of T2DM screening, little is known about how PCPs decide which patients to screen for T2DM, what screening tests they choose, how they interpret screening test results, and what they communicate to patients about these results (Hafez et al., 2017). In the articles reviewed, the overall theme was diabetes screening practices in the primary care setting. In the qualitative study by Nhim et al. (2018), 1,256 PCPs completed a survey in which the authors aimed to assess the association between the provider's behaviors and

their knowledge of the CDC Prevent Diabetes STAT: Screen, Test, Act, Today screening tool. The researchers found that of the 1,256 providers in the study, only 27% screened patients for diabetes using the CDC risk test (Nhim et al., 2018). The authors found that PCPs who screened for diabetes risk using the CDC screening tool were more likely to order blood tests and refer patients to a lifestyle change program (Nhim et al., 2018).

Mainous et al. (2016) conducted an electronic survey of a national sample of family physicians (n =1248). Their study aimed to evaluate the screening behaviors for diabetes prevention. Of the respondents, only 52.4% reported following national guidelines, and another third were uncertain whether the screening they provided was consistent with guidelines (Mainous et al., 2016). The authors concluded that female physicians and younger physicians have a more positive attitude toward prediabetes as a diagnostic construct (Mainous et al., 2016).

In the study by Tseng et al. (2017), the authors surveyed 140 PCPs to evaluate their knowledge of risk factors that should prompt prediabetes screening and their knowledge of laboratory criteria for diagnosing prediabetes. Providers were given a list of potential risk factors for prediabetes defined by the ADA and asked to select which might prompt them to screen for prediabetes (Tseng et al., 2017). Six percent of providers could identify all 11 risk factors for prediabetes screening; on average, providers selected 8 out of 11 correct risk factors (Tseng et al., 2017). The most identified risk factors were family history of diabetes (94%), overweight (89%), history of gestational diabetes (87%), dyslipidemia (86%), hypertension (77%), and history of heart disease (75%) (Tseng et al., 2017). The least-commonly identified risk factors were Hispanic ethnicity (52%) and Asian race (38%) (Tseng et al., 2017).

The authors also asked providers to circle the numerical values corresponding to the upper and lower limits of the laboratory criteria for diagnosing prediabetes based on HbA1c and fasting

glucose (Tseng et al., 2017). Only 17% of providers correctly identified the laboratory parameters for diagnosing prediabetes (Tseng et al., 2017).

It is essential to identify why a PCP is screening or not screening for diabetes and to evaluate what can be done to improve screening practices. In the study by Hafez et al. (2017), 20 PCPs participated in a chart-stimulated recall, in which the aim was to identify facts that influence their decisions to screen for T2DM. PCPs were asked about their recent decisions to screen or not screen purposively sampled non-diabetic patients who met the ADA criteria for screening for T2DM (Hafez et al., 2017). The results show that the most common reason for not screening was the knowledge of a previously normal screening test (49%) and the visit being for something other than a health maintenance assessment (48%) (Hafez et al., 2017). The most common reasons PCPs gave for screening patients for T2DM were knowledge of a previously abnormal screening test (49%), patient's weight (42%), and age (38%) (Hafez et al., 2017).

Problem

In 2018, 34.1 million US adults (about 1 in 10) had diabetes (CDC, 2020). Every year 1.5 million new cases of diabetes are diagnosed in the United States, and T2DM accounts for 95% of all diabetes cases (ADA, 2018). Prediabetes, if left untreated, leads to T2DM due to worsening beta-cell dysfunction and insulin resistance (Saisho, 2015). If left untreated, prediabetes will progress to type 2 diabetes in approximately 25% of subjects within 3–5 years, and as many as 70% of individuals with prediabetes will develop T2DM within their lifetime (Hostalek, 2019).

Screening Recommendations

Screening asymptomatic adults for prediabetes and type 2 diabetes with an informal assessment of risk factors or validated tools should be considered (ADA, 2021b). Testing for prediabetes or T2DM in asymptomatic people should be considered in adults of any age with

overweight or obesity (BMI ≥25 kg/m^2) and who have one or more additional risk factors for diabetes (ADA, 2021a). Risk factors include first-degree relative with diabetes, high-risk race/ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander), history of cardiovascular disease, hypertension (≥140/90 mmHg or on therapy for hypertension), high-density lipoprotein cholesterol level <35 mg/dL (0.90 mmol/L) or a triglyceride level >250 mg/dL (2.82 mmol/L), women with polycystic ovary syndrome, or physical inactivity (ADA, 2021a). Testing should begin for patients over 45 years (ADA, 2021a). Patients with prediabetes should have a FPG or A1c tested yearly (ADA, 2021a). If results are normal, testing should be carried out at a minimum of 3-year intervals or sooner with symptoms (ADA, 2021a).

Intervention

Prediabetes and T2DM have a long pre-symptomatic phase, making early detection difficult (ADA, 2021a). According to Abid et al. (2016), "Despite these guidelines for earlier screening, there are individuals who are not clinically diagnosed until at least a decade after subclinical disease" (p.19). Lack of diagnosis is likely due to ineffective screening guidelines, inadequate implementation of the guidelines, and late presentation of disease (Abid et al., 2016). Decisions PCPs make about whom to screen for prediabetes, interpretation of screening test results, and communication of these results to patients can have important implications for increasing the rates of diagnosed prediabetes (Hafez et al., 2017). If PCPs do not accurately perceive risk factors for T2DM or if they incorrectly interpret screening test results, they may fail to identify at-risk patients (Hafez et al., 2017). A risk assessment test is an appropriate approach to aid in the early detection of prediabetes and T2DM in primary care (Bell et al., 2020). This project's intervention is to send a Diabetes Risk Assessment via the EHR to all qualifying

patients. The intervention will be more thoroughly explained in the methods section of this proposal.

Summary

A synthesis of current literature showed support for more consistent diabetes risk screening and testing. The CDC suggests that 84.1 million Americans 18 years or older have prediabetes, but 88.4% of the 84.1 million are undiagnosed (CDC, 2020). Low provider knowledge about risk factors and diagnostic criteria may contribute to the number of patients with undiagnosed prediabetes (Tseng et al., 2017). Detection of prediabetes is a fundamental approach to preventing people from transitioning to diabetes (Mainous et al., 2016).

More research is needed to enhance current guidelines that include the younger adult population with risk factors. It is suggested that PCPs should be more attentive to prediabetes screening and have a more influential role in preventing T2DM (Mainous et al., 2016). T2DM and its complications can often be prevented through early detection and treatment of T2DM and prediabetes (Hafez et al., 2017). Testing high-risk patients for prediabetes is warranted because the laboratory assessment is safe and reasonable in cost (ADA, 2021b). Opportunities to be gained from this project include improved patient care, opening dialogue with patients regarding the risk for diabetes, prevention of disease, and patient empowerment and education.

Purpose and Specific Aims

The purpose of this quality improvement project was to implement and evaluate the MyChart Diabetes Risk Assessment tool in a primary care clinic to optimize the early identification of prediabetes and T2DM in asymptomatic, non-pregnant adults aged 18 to 70. This was accomplished by sending out the MyChart Diabetes Risk assessment via the EHR to qualifying patients with a routine medical appointment scheduled during the five-week

implementation period in February and March of 2022. This project aimed to improve the early screening and diagnosis of prediabetes and T2DM. A specific outcome of this project was to increase the number of patients screened for diabetes risk factors by utilizing the Diabetes Risk Assessment. This project had five specific aims: (1) report the number of qualifying patients who were sent the Diabetes Risk Assessment during the specified timeframe; (2) report the number of patients who completed the Diabetes Risk Assessment (3) report the number of patients with a score ≥ 5 indicating a high risk for prediabetes (4) assess provider referral for FPG or HbA1c for patients who score ≥ 5 (5) assess whether gender, age, race, and BMI significantly predict the Diabetes Risk Assessment score.

Conceptual Framework

The conceptual framework guiding this quality improvement project was The Model for Improvement (MFI) theoretical framework. Implanted within the framework is a rapid cycle process developed by W. Edwards Deming entitled Plan-Do-Study-Act (PDSA) (Deming, 1993). The PDSA cycle allows for analysis and calculation of the results of small changes implemented in clinical practice. The core structure of the MFI is built upon three questions: What do I want to improve, and by how much? How will I know if this change equals an improvement? What changes can I make that will lead to improvement? (Langley et al., 2009).

After these questions are answered, and an improvement goal is identified, the intervention is implemented and tested utilizing sequential PDSA cycles; plan the test, do the test, study the test results, and act based on those results. The change being tested is then adjusted based on what is learned through the process, and these progressive changes are placed into practice as the PDSA cycle repeats. Measurements made through the PDSA cycle will indicate how changes can be adapted, permanently instituted, or abandoned (Deming, 1993).

Application to Project

Plan

The planning phase consisted of a completed literature review, ongoing communication with stakeholders/project chair, and completing all project development course assignments. The planning stage is the "who, what, when, where, and why." The proposal manuscript was written and submitted to the DNP Committee at the University of Louisville School of Nursing for recommendations, revisions, and approval during the planning phase. The project proposal was presented to faculty and administrators at the University of Louisville School of Nursing, seeking approval and successful project defense.

Do

The "do" phase of the project includes the implementation of the intervention. The do portion of the cycle began in February of 2022, and the project was implemented at the clinic site. The project application and data collection began in the do cycle. During this cycle, patients were sent the Diabetes Risk Assessment via MyChart.

Study

Data analysis was finalized using Statistical Package for Social Sciences (SPSS) programming. Once data was collected and sorted, conclusions were drawn about the findings.

Act

Once the project implementation period was completed, a final manuscript was written, and a poster was prepped for presentation.

Methods

Design

This quality improvement project was designed to implement a standardized diabetes risk screening protocol for adults ages 18 to 70 years by sending out a screening questionnaire via MyChart to patients with upcoming routine appointments during the five-week implementation period in February and March of 2022. The ADA recommends that testing for T2DM should begin at age 45 for all adults (ADA, 2021a). A retrospective chart review evaluated the number of completed questionnaires and the prevalence of patients at risk for prediabetes and T2DM in a primary care practice in Louisville, Kentucky.

Setting

The project site was an urban family medicine practice providing adults with primary care services. Services include chronic disease management, preventative care, acute care visits, and annual physical exams. A letter of support was obtained by the clinic's medical director (Appendix A).

Sample

Any non-pregnant new or existing patients aged 18-70 years without a diagnosis of prediabetes or diabetes were sent the Diabetes Risk Assessment via MyChart. The sample was drawn from qualifying patients scheduled for a routine medical visit at the clinical study site during the five-week implementation period in February and March of 2022.

Inclusion and Exclusion Criteria

Inclusion criteria refers to qualifying characteristics for participation. Qualifying characteristics include non-pregnant adults aged 18-70 years without a diagnosis of prediabetes,

type one diabetes, or T2DM. Only patients who are active on the EHR MyChart system were sent the questionnaire. From March 2021 to November 2021, 2,645 patients had appointments at the study site. Of those 2,645 patients, 1,364 patients are activated on MyChart, with 815 pending activations.

Exclusion criteria refers to disqualifying characteristics for participation in the QI project. Disqualifying characteristics included current pregnancy, age less than 18 or greater than 70 years, symptoms suggestive of diabetes, and previous diagnosis of prediabetes, type one diabetes, or T2DM. Patients who did not complete the MyChart Diabetes Risk Assessment were excluded. There was no consent needed for this intervention. Participation was strictly voluntary.

Intervention Implementation

This project was implemented by the student investigator beginning on February 25th, 2022, and ending on April 1st, 2022. Providers were informed of the project during a formal PowerPoint presentation educational session. The PowerPoint presentation included current ADA diabetes screening guidelines and an explanation of the ADA MyChart Diabetes Risk Assessment. Educational material was sent via email if a provider could not attend the session. The intervention was to send a Diabetes Risk Assessment to all qualifying patients via MyChart. This project will evaluate the use of the Diabetes Risk Assessment via the EHR and evaluate if there was an increase in the diagnosis of prediabetes due to preventative screening.

Data was collected from the EHR and entered into an Excel document stored on a locked computer. Variables collected included age, gender, race, BMI, Diabetes Risk Assessment score, referral for FPG or A1c, FPG value, and A1c value. A codebook was developed to aid in data collection, and data was stored on a locked computer (Appendix E).

Implementation Timeline

Appendix F depicts the timeline for this project from development to completion and dissemination.

Privacy, Data Storage & Confidentiality

All data were de-identified and presented at the aggregate level. All electronic media was kept on a password-protected laptop. No identifiable or personal health information was stored. Only the DNP student had access to the Excel data spreadsheet.

Financial Needs

The implementation process did not require financial needs since the questionnaire was sent out electronically through the EHR.

Measures

Retrospective data from the EHR was collected and evaluated to determine the number of patients who completed the MyChart Diabetes Risk Assessment and the number of patients whose scores indicate a high risk for developing diabetes. The outcome measures for this QI project focused on improving early screening and diagnosis of prediabetes and T2DM. Primary outcome measures included: (a) patient adherence (completion of the MyChart Diabetes Risk Assessment), (b) percentage of patients who scored ≥5, indicating a high risk for prediabetes, and (c) provider referral for FPG or HbA1c laboratory testing for patients who score ≥5 on the Diabetes Risk Assessment.

The MyChart Diabetes Risk Assessment (Appendix B and Appendix C) is embedded in the Epic Systems cloud-based EHR. The MyChart Diabetes Risk Assessment was chosen as this project's tool because it was already established in the Epic EHR and mimicked the American

Diabetes Association and Centers for Disease Control and Prevention's (ADA/CDC) Prediabetes Risk Test. The ADA/CDC Prediabetes Risk Test has been validated in the literature, and Bang et al. (2009) reported the tool has a sensitivity of 79% and a specificity of 67%. The ADA/CDC Prediabetes Risk Test asks the same seven questions as the MyChart Diabetes Risk Assessment. A score of ≥5 on both questionnaires indicates a high risk for prediabetes.

The MyChart Diabetes Risk Assessment includes seven questions (Appendix B): How old are you? Are you male or female? Have you ever been diagnosed with gestational diabetes? Do you have a mother, father, sister, or brother with diabetes? Have you ever been diagnosed with high blood pressure? Are you physically active? What race or ethnicity best describes you? Being physically active equates to 150 minutes of moderate to vigorous physical activity per week (Hamasaki, 2016).

After all questions are answered, the patient will score their height and weight based on the chart provided (See Appendix C). Scores of the assessment range from 0 to 11. A score of ≤4 indicates low risk for prediabetes. A score ≥5 indicates a high risk for prediabetes. The results will immediately be displayed to the patient. The clinic's medical assistants (MAs) received a notification in the Family Medicine Clinical Support pool when a patient submitted their questionnaire. The MAs then forwarded the results to the patient's primary care provider.

Data Analysis

Data analysis included both qualitative and quantitative data. The DNP student assigned participants who completed the Diabetes Risk Assessment a corresponding identification (ID) number. All patients were unique/individual and were not duplicated. Data was collected and organized using an electronic Excel worksheet developed by the DNP student (Appendix D). All data were collected and recorded by the corresponding ID number.

The Statistical Package for Social Sciences (SPSS) Version 25.0 was used to analyze the data. Univariate descriptive statistics were used for all demographic data. Demographic variables were reported with frequencies and measures of central tendency. Descriptive statistics were used to evaluate each interval or ratio variable. A linear regression analysis was conducted to assess whether gender, age, race, and BMI significantly predict the Diabetes Risk Assessment score.

Data was collected after the five-week implementation period and was analyzed by assessing six categories: (1) number of patients screened with the MyChart Diabetes Risk Assessment during the specified timeframe; (2) number of patients who completed the Diabetes Risk Assessment (3) number of patients with a score ≥ 5 indicating a high risk for diabetes (4) age, sex, race, and BMI of all patients who completed the questionnaire (5) number of patients referred for FPG or A1c if score ≥ 5 (6) number of patients with an abnormal FPG or A1c.

Additionally, providers were asked to complete a feasibility and satisfaction survey to assess their perspective on using this tool in their busy primary care practice. The student investigator developed the post-intervention survey (Appendix G). The post-implementation questionnaire included five questions on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. The survey also asked about the number of years in practice and for any additional questions or concerns. This survey evaluated the provider's opinion of the MyChart Diabetes Risk Assessment.

Ethical Considerations

The University of Louisville Institutional Review Board (IRB) received this project proposal for approval prior to its implementation. The Medical Director at the clinic provided a letter stating a commitment to support this quality improvement project (Appendix A).

Results

Information of interest included the total number of patients with active MyChart accounts, the total number of questionnaires completed, the number of high-risk scores, the number of participants screened with laboratory tests, and the number of new prediabetes diagnoses.

Demographic Characteristics

One hundred eighty-three participants were identified as eligible during the intervention period. Of the 183 eligible participants, 120 participants had active MyChart accounts. Of the 120 participants with active MyChart accounts, 61 responded, which showed a 50.8% response rate. The majority of participants, 37 (61%), earned a Diabetes Risk Assessment score of ≥ 5, indicating a high risk, and 24 (39%) earned a Diabetes Risk Assessment ≤5, indicating a low risk.

Analysis of the participant's demographics in the high risk group revealed a gender breakdown of females 26 (70.2%) to males 11 (29.7%). The most frequently observed race was white 29 (78.3%). The participants had a mean age of 52.58 years. The participant's BMI was predominantly obese. The mean BMI of the participants was 32.84. One participant who completed the questionnaire was excluded from the project because that participant had never been seen in the clinic; thus, a BMI could not be calculated.

Table 1

Demographic Characteristics of High-Risk Participants

Characteristic	n	%
Gender		
Female	26	70.2
Male	11	29.7
Age Range		
18-29	1	2.7

30-39	5	13.5
40-49	4	10.8
50-59	15	40.5
60-70	12	32.4
Race		
White	29	78.3
Black	8	21.6
Body Mass Index		
Healthy (18.5-24.9)	1	2.8
Overweight (25.0-29.9)	6	17.1
Obese Class I (30.0-34.9)	11	31.4
Obese Class II (35.0-39.9)	7	20
Obese Class III (≥40.0)	10	28.6

Note. N=37

Laboratory Results

Of the 37 high-risk participants, 12 (32.4%) had laboratory tests ordered by the provider. Of the 12 participants with laboratory tests ordered, 7 (58.3%) of the laboratory test results were in the prediabetes range.

Table 2

Patients Eligible for Prediabetes Screening by Laboratory Test

Participants with risk-test scores ≥5	% Eligible for screening by A1c, FPG	% Screened by A1c, FPG	% Test results in the prediabetic range
37	100	32.4	58.3

A trend in the referral of FPG and A1c laboratory testing for prediabetes was evident based on the data analysis. Of the 12 participants with laboratory tests ordered, 5 (41.6%) were referred for A1c and FPG testing, 4 (33.3%) were referred for FPG testing, and 3 (25%) were

referred for A1c testing. The laboratory tests showed that 7 participants had lab results in the prediabetic range. The range of FPG results was 101 mg/dl to 118 mg/dl, and the range of A1c results was 5.8% to 6.4%. Of the 7 participants with laboratory test results in the diabetic range, 5 were female, and 2 were male with a mean BMI of 38.3 and a mean age of 47.5 years.

Multiple Linear Regression

Multiple linear regression was used to test if age, gender, race, and BMI significantly predicted the Diabetes Risk Assessment score. Age was coded in years. Gender was coded as 1=Male, 2=Female, 3=Other/prefer not to disclose. Participant's race was coded as 1=White/Caucasian, 2=American Indian or Alaska Native, 3=Asian American, 4= Black or African American, 5=Hispanic or Latino, 6=Native Hawaiian or Other Pacific Islander, 7=Other, 8=Don't want to say. BMI was coded as a value of the participant's weight in kilograms divided by their height in meters squared. Age, sex, and BMI were significant predictors of the Diabetes Risk Assessment score, while race was not a significant predictor. It was found that age significantly predicted Diabetes Risk Assessment score (β =.628, $p<.001$,) as did sex (β = -1.75, p=0.48), and BMI (β = .694, $p<.001$). The participant's race did not significantly predict the Diabetes Risk Assessment score (β =0.91, p=.306). A significant regression was found ($F(4,55) = 21.842$, $p<.001$), with an R^2 of .614, indicating that approximately 61.4 % of the variance in the Diabetes Risk Assessment score was explainable by gender, age, race, and BMI.

Post-intervention Feedback

Of the six providers invited to participate in this project, five completed the DNP Project Post Evaluation survey. Provider's years of experience ranged from 14 years to 40 years. On the survey, one provider commented that it would be helpful if the Diabetes Risk Assessment could be a template for annual wellness visits. When asked from their clinical perspective if the

MyChart Diabetes Risk Assessment tool helps patients easily understand if they are at risk for diabetes, two providers strongly agreed, two providers somewhat agreed, and one was neutral. Four of the five providers strongly agreed that the tool initiates more patient-to-provider conversation regarding diabetes, and the remaining provider somewhat agreed. Two providers strongly agreed that the tool saves time in tailoring the discussion with patients with identified risk factors, two providers somewhat agreed, and one was neutral. Three providers strongly agreed that they would continue using the MyChart Diabetes Risk Assessment tool, one provider somewhat agreed, and one was neutral.

Discussion

The purpose of this quality improvement project was to implement and evaluate the American Diabetes Association MyChart Diabetes Risk Assessment tool in a primary care clinic to optimize the early identification of prediabetes and T2DM in non-pregnant adults ages 18 to 70 years, and this project was ultimately successful as evidenced by the 51.8% questionnaire response rate and the seven new prediabetes diagnoses. As hypothesized, implementing the MyChart Diabetes Risk Assessment as a risk screening tool combined with A1c or FPG laboratory testing of individuals resulted in the discovery of undiagnosed prediabetes. The post-intervention provider feasibility surveys indicated a favorable view of the value of the MyChart Diabetes Risk Assessment screening tool.

Limitations

Limitations of this project include implementation in a single-site clinical setting, the limited sample size of providers, and the small convenient sample size of participants. Due to the small sample size of providers and participants, replication of the project may not yield similar results. The schedule of the providers also limited this project. Most of the providers in this office

only practice 1-2 days/week and see a low volume of patients, making it difficult for them to incorporate new practices into their care and subsequently reduce the sample size. It should also be noted that during implementation, one provider was out of town for an entire week.

Conclusions

Sustainability of this project are dependent upon the implementation of successful diabetes screening practices long-term. Identifying individuals at risk for disease through screening measures is a cost-effective approach to disease prevention. Integrating the ADA Diabetes Screening Test into the EHR and workflow can seamlessly alert providers of high-risk individuals without paper forms or the use of additional clinical staff.

The results of this project suggest that providers may easily incorporate this screening tool into their practice to address patient risk status. The 51% response rate suggests that patients are willing to complete questionnaires sent via MyChart. In the future, providers can utilize the EHR to send out various questionnaires. In the future, an analysis to determine a relationship between the variables in a larger sample size and among multiple populations and regions of the country may be beneficial.

The number of individuals unknowingly living with prediabetes or T2DM is substantial, and the risk of failing to treat the disease early is significant. Screening and educating patients regarding their risk for diabetes encourages self-efficacy in prevention and treatment. Consistent screening opens a conversational window between provider and patient even if a patient is not found to be high risk or chooses to forgo further testing. The scope of the problem indicates that many patients would benefit from appropriate screening techniques and prompt action to curb the impact of their disease. Many clinical arenas could benefit from establishing testing protocols given the low cost of prevention and intervention compared to the staggering cost and

consequences of T2DM nationwide. In conclusion, this quality improvement project contributed to the current literature supporting a practice change for diabetes risk assessment screening in primary care. This project affirmed that using a researched and validated tool, like the ADA Diabetes Risk Assessment tool, was feasible and effective in identifying patients at risk for diabetes.

References

Abid, A., Ahmad, S., & Waheed, A. (2016). Screening for type II diabetes mellitus in the united states: The present and the future. *Clinical Medicine Insights: Endocrinology and Diabetes*, *9*, 19–22. https://doi.org/10.4137/cmed.s38247

American Diabetes Association. (2018). Economic costs of diabetes in the u.s. in 2017. *Diabetes Care*, *41*(5), 1–12. https://doi.org/10.2337/dci18-0007

American Diabetes Association. (2020a). Introduction: Standards of medical care in diabetes 2020. *Diabetes Care*, *43*(1), 14–31. https://doi.org/10.2337/dc20-S002

American Diabetes Association. (2020b). *The burden of diabetes in kentucky*. http://main.diabetes.org/dorg/docs/state-fact-sheets/ADV_2020_State_Fact_sheets_KY.pdf

American Diabetes Association. (2021a). Classification and diagnosis of diabetes: Standards of medical care in diabetes. *Diabetes Care*, *44*(1), S15–S33. https://doi.org/10.2337/dc21-S002

American Diabetes Association. (2021b). Prevention or delay of type 2 diabetes: Standards of medical care in diabetes. *Diabetes Care*, *44*(1), S34–S39. https://doi.org/10.2337/dc21-s003

Bang, H., Edwards, A. M., Bomback, A. S., Ballantyne, C. M., Brillon, D., Callahan, M. A., Teutsch, S. M., Mushlin, A. I., & Kern, L. M. (2009). Development and validation of a patient self-assessment score for diabetes risk. *Annals of internal medicine*, *151*(11), 775–783. https://doi.org/10.7326/0003-4819-151-11-200912010-00005

Bell, K., Shaw, J. E., Maple-Brown, L., Ferris, W., Gray, S., Murfet, G., Flavel, R., Maynard, B., Ryrie, H., Pritchard, B., Freeman, R., & Gordon, B. A. (2020). A position statement on

screening and management of prediabetes in adults in primary care in australia. *Diabetes Research and Clinical Practice*, *164*, 1–12. https://doi.org/10.1016/j.diabres.2020.108188

Centers for Disease Control and Prevention. (2020). *National diabetes statistics report 2020: Estimates of diabetes and its burden in the united states.* https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf

Centers for Disease Control and Prevention. (2021a). *About prediabetes and type 2 diabetes*. https://www.cdc.gov/diabetes/prevention/about-prediabetes.html

Centers for Disease Control and Prevention. (2021b). *Diabetes and your heart*. https://www.cdc.gov/diabetes/library/features/diabetes-and-heart.html

Centers for Disease Control and Prevention. (2021c). *Type 2 diabetes*. https://www.cdc.gov/diabetes/basics/type2.html

Clark, M. W., Minier, J., Courtemanche, C., Paris, B., & Childress, M. (2019). *The economic impact of diabetes in kentucky* [Doctoral dissertation, University of Kentucky]. Center for Business and Economic Research. https://cber.uky.edu/sites/cber/files/publications/UK%20CBER%20The%20Economic%20Impact%20of%20Diabetes%20in%20Kentucky.pdf

Debussche, X., Besançon, S., Balcou-Debussche, M., Ferdynus, C., Delisle, H., Huiart, L., & Sidibe, A. T. (2018). Structured peer-led diabetes self-management and support in a low-income country: The step randomized controlled trial in mali. *PLOS ONE*, *13*(1), 1–13. https://doi.org/10.1371/journal.pone.0191262

Deming, W. E. (1993). *The new economics for industry, government, education*. Massachusetts Institute of Technology.

Faul, A., Furman, C., D'Ambrosio, J., & Yankeelov, P. (2020). *UofL trager institute annual report*. https://www.dropbox.com/s/dezskutqkpaq3t7/Trager%20Annual%20Report%20Dec.%202020.pdf?dl=0

Hafez, D., Nelson, D. B., Martin, E. G., Cohen, A. J., Northway, R., & Kullgren, J. T. (2017). Understanding type 2 diabetes mellitus screening practices among primary care physicians: A qualitative chart-stimulated recall study. *BMC Family Practice*, *18*(1). https://doi.org/10.1186/s12875-017-0623-3

Hamasaki, H. (2016). Daily physical activity and type 2 diabetes: A review. *World Journal of Diabetes*, *7*(12), 243–251. https://doi.org/10.4239/wjd.v7.i12.243

Hostalek, U. (2019). Global epidemiology of prediabetes - present and future perspectives. *Clinical Diabetes and Endocrinology*, *5*(1). https://doi.org/10.1186/s40842-019-0080-0

Langley, G. L., Moen, R., Nolan, K. M., Nolan, T.W., Norman, C.L., & Provost, L. P. (2009). The improvement guide: a practical approach to enhancing organizational performance (2nd ed.). Jossey-Bass.

Kentucky Cabinet for Health and Family Services. (2019). *The 2019 kentucky diabetes report*. Kentucky Medical Association. https://kyma.org/shared/content/uploads/2019/06/2019-Diabetes-Report-latest11610.pdf

Kentucky Cabinet for Health and Family Services. (2020). *2020 kentucky diabetes fact sheet*. https://chfs.ky.gov/agencies/dph/dpqi/cdpb/dpcp/DiabetesFactSheet.pdf

Kentucky Department for Public Health & Centers for Disease Control and Prevention. (2018). *Kentucky behavioral risk factor survey 2018 annual report*. https://doi.org/https://chfs.ky.gov/agencies/dph/dpqi/cdpb/Kentucky%20BRFSS%20Data%20Reports/2018%20KyBRFS%20Annual%20Report.pdf

Khan, M., Hashim, M., King, J., Govender, R., Mustafa, H., & Al Kaabi, J. (2020). Epidemiology of type 2 diabetes: Global burden of disease and forecasted trends. *Journal of Epidemiology and Global Health*, *10*(1), 107–111. https://doi.org/10.2991/jegh.k.191028.001

Ley, S. H., Pan, A., Li, Y., Manson, J. E., Willett, W. C., Sun, Q., & Hu, F. G. (2016). Changes in overall diet quality and subsequent type 2 diabetes risk: Three u.s. prospective cohorts. *Diabetes Care*, *39*(11), 1–8. https://doi.org/10.2337/dc16-0574

Mainous, A. G., Tanner, R. J., & Baker, R. (2016). Prediabetes diagnosis and treatment in primary care. *The Journal of the American Board of Family Medicine*, *29*(2), 283–285. https://doi.org/10.3122/jabfm.2016.02.150252

Mainous, A. G., Tanner, R. J., Scuderi, C. B., Porter, M., & Carek, P. J. (2016). Prediabetes screening and treatment in diabetes prevention: The impact of physician attitudes. *The Journal of the American Board of Family Medicine*, *29*(6), 663–671. https://doi.org/10.3122/jabfm.2016.06.160138

Nhim, K., Khan, T., Gruss, S. M., Wozniak, G., Kirley, K., Schumacher, P., Luman, E. T., & Albright, A. (2018). Primary care providers' prediabetes screening, testing, and referral behaviors. *American Journal of Preventive Medicine*, *55*(2), 39–47. https://doi.org/10.1016/j.amepre.2018.04.017

Papatheodorou, K., Banach, M., Bekiari, E., Rizzo, M., & Edmonds, M. (2018). Complications of diabetes. *Journal of Diabetes Research*, *2018*, 1–4. https://doi.org/10.1155/2018/3086167

Saisho, Y. (2015). B-cell dysfunction: Its critical role in prevention and management of type 2 diabetes. *World Journal of Diabetes*, *6*(1), 109–124. https://doi.org/10.4239/wjd.v6.i1.109

Sherwani, S. I., Khan, H. A., Ekhzaimy, A., Masood, A., & Sakharkar, M. K. (2016). Significance of hba1c test in diagnosis and prognosis of diabetic patients. *Biomarker Insights*, *11*, 95–104. https://doi.org/10.4137/bmi.s38440

Sohler, N., Matti-Orozco, B., Young, E., Li, X., Gregg, E. W., Ali, M. K., Bullard, K., & Albu, J. B. (2016). Opportunistic screening for diabetes and prediabetes using hemoglobin a1c in an urban primary care setting. *Endocrine Practice*, *22*(2), 143–150. https://doi.org/10.4158/ep15866.or

Trust for America's Health. (2021). *The state of obesity: Better policies for a healthier america*. https://doi.org/https://www.tfah.org/wp-content/uploads/2021/09/2021ObesityReport_Fnl.pdf

Tseng, E., Greer, R. C., O'Rourke, P., Yeh, H.-C., McGuire, M. M., Clark, J. M., & Maruthur, N. M. (2017). Survey of primary care providers' knowledge of screening for, diagnosing and managing prediabetes. *Journal of General Internal Medicine*, *32*(11), 1172–1178. https://doi.org/10.1007/s11606-017-4103-1

United States Preventive Services Task Force. (2021). *Screening for prediabetes and type 2 diabetes*. U.S. Preventive Services Task Force. https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/screening-for-prediabetes-and-type-2-diabetes

Zimmet, P. Z. (2017). Diabetes and its drivers: The largest epidemic in human history? *Clinical Diabetes and Endocrinology*, *3*(1), 1–8. https://doi.org/10.1186/s40842-016-0039-3

Appendix A

Clinical Site Letter of Support

To whom it may concern:

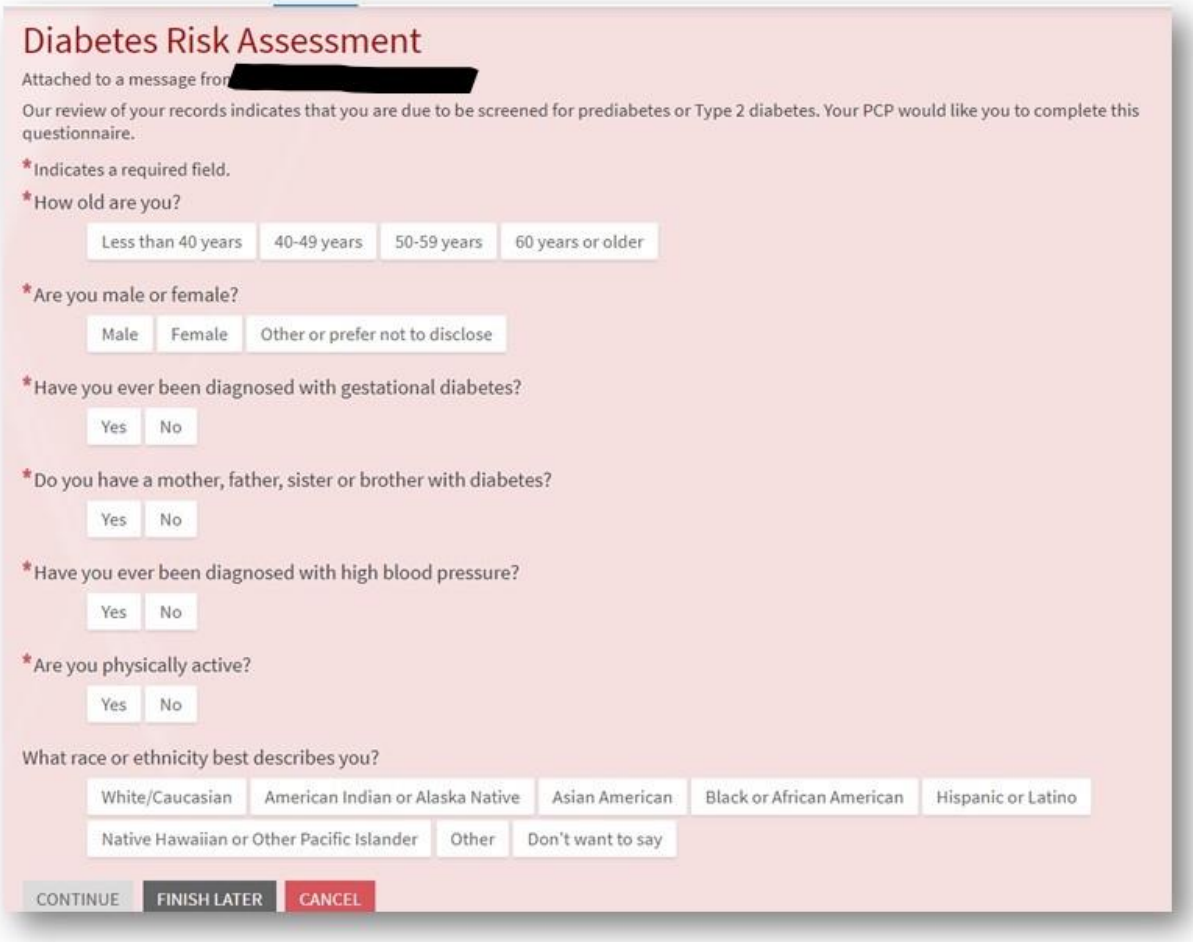
[redacted] is in full support of the Doctor of Nursing Practice (DNP) project entitled *Implementing a Diabetes Screening Protocol* that will be completed at the [redacted] by University of Louisville School of Nursing DNP student Anna Marks, RN, BSN under the supervision of Dr. Elisabeth Volpert. This letter is to provide permission for Ms. Marks to complete her DNP project, analyze the data, and present the findings using deidentified data. I understand that the DNP project proposal will be reviewed as a quality improvement project by the University of Louisville Institutional Review Board (IRB) prior to data collection.

Sincerely,

Christian D. Furman, M.D., MSPH, AGSF

Appendix B

MyChart Diabetes Risk Assessment Questions



Appendix C

MyChart Diabetes Risk Assessment Height and Weight Chart

Diabetes Risk Assessment

Attached to a message from [redacted]

*Indicates a required field.

*Using the height and weight chart below, what is your score?

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)		

0 points 1 point 2 points 3 points

This is required

BACK CONTINUE FINISH LATER CANCEL

Appendix D

Data Collection Tool

Participant Identification Number	Age	Gender	Race	BMI	Diabetes Risk Assessment Score	Score ≥5 and Referred for FPG or A1c Yes/No	FPG Value	A1c Value	FPG or A1c Prediabetes Range Yes/No	FPG or A1c T2DM Range Yes/No

Appendix E

Codebook

SPSS Variable Name	Variable Explanation	Coding (Value Labels)	Level of Measurement
ID	Identification number		
AGE	Age at time of assessment		Scale
GENDER	Gender of participant	1-Male 2-Female 3-Other/prefer not to disclose	Nominal
RACE	Race of participant	1-White/Caucasian 2-American Indian or Alaska Native 3-Asian American 4- Black or African American 5-Hispanic or Latino 6- Native Hawaiian or Other Pacific Islander 7-Other 8-Don't want to say	Nominal
BMI	Body Mass Index of participant		Scale
DRAS	Diabetes Risk Assessment Score		Scale
REF	Diabetes Risk Assessment Score ≥5 and referred for FPG or HbA1c	1-Yes 2-No	Nominal
FPG	Fasting Plasma Glucose level		Scale
HbA1c	Hemoglobin A1c percentage		Scale
PREDM	FPG or A1c in prediabetes range	1-Yes 2-No	Nominal
T2DM	FPG or A1c in T2DM range	1-Yes 2-No	Nominal

Appendix F

Project Timeline

Activity	Sept 2021	Oct 2021	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022	Apr 2022	May 2022	June 2022	July 2022	August 2022
Proposal development												
Final proposal submission												
Committee proposal approval												
Proposal defense												
IRB submission, approval												
Retrospective chart review												
Implement Diabetes Risk Assessment												
Analyze data												
Develop final report												
Develop poster												
Disseminate, poster session												

Appendix G

Post Evaluation Survey

Please answer the following questions below by circling your response.

From my clinical perspective, the MyChart Diabetes Risk Assessment:

1. Helps patients easily understand if they are at risk for diabetes
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
2. Initiates more patient-to-provider conversation regarding diabetes
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
3. Saves time in tailoring the discussion with patients with identified risk factors
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
4. Will you continue to use the MyChart Diabetes Risk Assessment?
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
5. Number of years in practice?
6. Questions or concerns?