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Improving prediabetes screening, diagnosis, and referral to a diabetes prevention program in the primary care setting.

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Improving Prediabetes Screening, Diagnosis, and Referral to a Diabetes Prevention

Program in the Primary Care Setting

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Improving Prediabetes Screening, Diagnosis, and Referral to a Diabetes Prevention

Program in the Primary Care Setting

Table of Contents

Abstract

Background: Prediabetes is a term used to identify an abnormal metabolic state of impaired glucose regulation and blood glucose levels above normal range, but not high enough to meet the criteria for Type 2 Diabetes Mellitus (T2DM) (American Diabetes Association [ADA], 2019). According to the ADA (2019), the progression of prediabetes to T2DM can take anywhere from five to ten years, which leaves a window to refer individuals to evidence-based lifestyle change programs, such as the National Diabetes Prevention Program (N-DPP).

Purpose: The purposes of this project were to increase electronic health record referrals to the organization's diabetes educator, N-DPP, and optimize early identification and treatment of prediabetes in asymptomatic, non-pregnant adults ages 18-89 years old via primary care provider (PCP) education.

Setting: This project occurred at an Internal Medicine clinic in downtown Louisville, KY.

Methods/Procedures: An educational session for PCPs in the clinic occurred during a monthly staff meeting on February 9, 2023. The session involved a 15-minute PowerPoint presentation which outlined the national and state prevalence of prediabetes, described patient's risk factors for developing prediabetes, the efficacy for screening and referral for prediabetes, and provided standardized instructions on how to refer prediabetic patients to the department's N-DPP through the clinic's EHR (Epic).

Measures: Outcomes measures included the total number of patients with a diagnosis of prediabetes in the problem list, total number of prediabetes screening HbA1c orders for prediabetic patients, the number of patients referred to the diabetes educator by EHR, and the total number of patients with a documented HbA1c of 5.7%-6.4%.

Results: Two retrospective queries were made to the clinical site's EHR (Epic™) and revealed 190 patients presented to the clinic between December 8, 2022, through February 8, 2023, and 295 patients visited the clinic from February 9, 2023-May 9, 2023, with a documented prediabetes diagnosis or elevated blood glucose (ICD-10 R73.03 or R73.0) in the problem list. The results of descriptive analysis were categorized in Figure 3; 35% (*n* = 102) of the 295 patients in the post-implementation phase with R73.03 or R73.0 in the problem list were identified as newly diagnosed with prediabetes. Prior to PCP education, PCPs placed orders for 245 HbA1c prediabetes screenings compared to 428 prediabetes HbA1cs screenings in the post-implementation phase. Initially, PCPs placed zero EHR referrals to the N-DPP, but after education 15 EHR referrals were initiated to the N-DPP. A standardized N-DPP EHR referral process was established.

Conclusion: More efforts are needed to improve PCP prediabetes screening, diagnosis, and referral to diabetes prevention programs.

     Keywords: prediabetes, primary care, education, diabetes prevention

Improving Prediabetes Screening, Diagnosis, and Referral to a Diabetes Prevention

Program in the Primary Care Setting

Prediabetes is a term used to identify an abnormal metabolic state of impaired glucose

regulation and blood glucose levels above normal range, but not high enough to meet the criteria

for Type 2 Diabetes Mellitus (T2DM) (American Diabetes Association [ADA], 2019). Patients

with fasting plasma glucose (FPG) values of 100 to 125 mg/dL, oral glucose tolerance test

(OGTT) 140 mg/dL – 199 mg/dL, and/or hemoglobin A1c (HbA1c) values of 5.7% to 6.4% meet

the diagnostic criteria for prediabetes (ADA, 2019; Centers for Disease Control and Prevention

[CDC], 2020). In a clinical study of 150 primary care providers (PCP), only 17% could correctly

identify the laboratory parameters for diagnosing prediabetes based on fasting glucose and

HbA1c (Tseng et al., 2017). PCPs' lack of awareness of prediabetic guidelines and risk factors

limits the number of properly diagnosed patients (Thomas et al., 2019).

According to the CDC (2020), in 2018, 88 million Americans 18 years of age or older

met the diagnostic criteria for prediabetes, and 88.4% of those individuals were unaware of their

diagnosis (CDC, 2020). Only 15.3% of those who meet the criteria for prediabetes reported that

their PCP informed them of their diagnosis (CDC, 2020). An emphasis on early identification of

patients at risk for prediabetes and T2DM provides an opportunity for PCPs to become familiar

with evidence-based treatment options that can prevent or deter progression to T2DM (ADA,

2019; Weber et al., 2016).

Nationally, an estimated 84.1 million American adults (1 in 3) have prediabetes (ADA,

2019 & CDC, 2020). It is estimated that 70% of individuals with prediabetes will develop T2DM

during their lifetimes (Bennesar-Veny et al., 2020). A PCP's ability to identify individuals with

prediabetes presents an opportunity to connect patients with resources, retain them in care, and meet treatment goals (Nhim et al., 2018).

According to the ADA (2019), the progression of prediabetes to T2DM can take anywhere from five to ten years, which leaves a window to refer individuals to evidence-based lifestyle change programs, such as the National Diabetes Prevention Program (N-DPP). The N-DPP is a year-long course which involves weekly meetings for the first six months and monthly meetings, thereafter, guided by a certified lifestyle coach, a CDC approved curriculum, and group support (CDC, 2021a). The N-DPP is modeled after research by the National Institutes for Health and is proven to reduce T2DM in those at risk by 58% for adults aged 25 and older, and 71% for those 60 years and older (CDC, 2021a; Roper et al., 2019). The United States Preventive Task Force (USPSTF) prediabetes guidelines suggest that individuals with a HbA1c between 5.7% and 6.4% be referred to a N-DPP to reduce cardiometabolic risk factors and conversion to T2DM (USPSTF, 2021). Lifestyle management (i.e., diet, exercise, weight loss) is the first step in management of prediabetes; however, utilization of the N-DPP by PCPs remains inadequate (Roper et al., 2019). Underutilization of PCP-initiated N-DPP referral is associated with higher medical expenditures (Roper et al., 2019).

Health care costs for those with T2DM are 2.3 times more than those without diabetes (ADA, 2019). Over $327 billion a year is spent on medical expenditures of those diagnosed with T2DM in the United States (ADA, 2019). Individuals with T2DM spend around $9,601 each year to manage their T2DM (CDC, 2020). Early identification and management of prediabetes can significantly reduce the long-term medical costs associated with T2DM (Chaudhari et al., 2016; Khan et al., 2017). Accurate diagnosis of prediabetic patients by their PCP and referral to

the N-DPP can reduce the economic burden, progression of T2DM, and significantly reduce medical costs (ADA, 2019).

Individuals with prediabetes oftentimes have no clear symptoms, which can lead to a lack of detection until the person begins having serious health challenges, such as T2DM (CDC, 2022). Risk factors for prediabetes include being physically active less than three times a week, having a parent or sibling with T2DM, individuals 45 years or older, having a body mass index (BMI) > 25% and 23% for Asians, polycystic ovarian syndrome, or gestational diabetes/having a baby > nine pounds (CDC, 2021a). Race and ethnicity are also a factor: African Americans, Hispanic/Latino Americans, American Indians, Pacific Islanders, and Asian Americans are at higher risk of prediabetes (CDC, 2021a).

The USPSTF determined with certainty that screening for prediabetes in adults, who are overweight or obese, and PCPs offering or referring patients with prediabetes to effective preventive interventions have a moderate net benefit in reducing the persons' risk of developing T2DM (Davison et al., 2021; USPSTF, 2021). This recommendation applies to nonpregnant adults aged 35 to 70 years who are overweight or obese and have no symptoms of diabetes (Davidson et al., 2021). Improving PCP awareness of prediabetes risk factors, screening, and referral practices can assist PCPs to promptly identify and treat these conditions earlier, rather than later, to prevent progression to T2DM and adverse outcomes such as heart attack, kidney disease, impaired vision, and death (Davidson et al., 2021).

Problem Statement

A formal discussion with an internal medicine clinic's diabetes educator revealed that the ability for PCPs to initiate a referral, within the electronic health record (EHR), to the diabetic educator was implemented in January 2022. From January 1 to October 1, 2022, the diabetes

educator received no EHR patient referrals for the organization's N-DPP. The diabetic educator

disclosed that less than 10% of the eligible patient population with prediabetes were referred to

the diabetes educator for N-DPP in 2021, as measured by chart audit. According to the clinic's

medical director, PCPs practicing in this clinic use their clinical judgment when identifying

which individuals have prediabetes risk factors and which patients, they choose to screen using

hgbA1c levels. Currently, PCPs refer to the diabetic educator by calling the diabetic educator

directly or by placing a message in the EHR (Epic). Discussions were had with the clinic's

medical director and diabetes educator, which revealed gaps in PCP awareness of the

department's N-DPPs, no standardized referral process to the N-DPP through the EHR, and gap

in knowledge of how to screen for prediabetes. The PI implemented a quality improvement (QI)

project that involved a formal educational session for PCPs within the clinic detailing patient's

risk factors for prediabetes, evidence-based screening guidelines for prediabetes, and how to

refer prediabetic patients to the N-DPP program through EHR referral.

Significance of the Problem/Project

The goal of this QI project was to raise PCPs' awareness of prediabetes screening and N-

DPP effectiveness through a formal educational session with the aim of increasing EHR referrals

to the department's N-DPP and prediabetes screening. In 2021, the Kentucky Cabinet for Health

and Family Services and the Kentucky Personnel Cabinet (2021) identified the state as having

the fourth highest mortality of T2DM in the United States and ranked Kentucky seventh in the

nation for T2DM prevalence in adults. The 2021 Kentucky Diabetes Report documented that in

2019, 13.3% (464,000 individuals over 18 years old) Kentuckians had T2DM, which is nearly

double the 6.5% of Kentuckians in 2000; another 11% of Kentuckian adults have prediabetes and

are at risk for developing T2DM (Kentucky Cabinet for Health, Family Services, and Kentucky

Personnel Cabinet, 2021). Due to the alarming prevalence of prediabetes and T2DM in

Kentucky, preventative clinical initiatives are imperative.

Keys to prevention of T2DM and diabetes complications are for PCPs to abide by the

USPSTF (2021) screening guidelines and promote patient access to participation in the N-DPP

(CDC, 2021). The CDC (2020) reported only 15.3% of adults with prediabetes were told by their

PCP of meeting prediabetes diagnostic criteria. A study by Venkataramani et al. (2019) found

more than one-quarter of adults with prediabetes expressed interest in participating in N-DPP,

but 4.2% reported being referred by their PCP to a 12-month prevention program. There is a

clinical need to further assess existing prediabetes screening and N-DPP referral practices,

enhance PCP-initiated prediabetes screenings, and improve patient/PCP access to N-DPP to

decrease T2DM prevalence (Nhim et al., 2018 & Venkataramani et al., 2019).

Purpose and Specific Aims

The purposes of this QI project were to increase electronic health record referrals made

by PCPs using Epic to the organization's diabetes educator and N-DPP, and to optimize early

identification and treatment of prediabetes in asymptomatic, non-pregnant adults ages 18-89

years old. The three aims of this project were to: determine if prediabetes screening and

diagnoses increased after the provider education session; evaluate whether the number of patients

with a diagnosis of prediabetes referred to N-DPP increased post-educational intervention; and

increase provider utilization of Epic to refer identified patients to N-DPP.

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Literature Review

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Kentucky ranks 8th highest in the U.S. for prediabetes and T2DM prevalence (nationwide

median: 10.5%) (Kentucky Department for Public Health [KDPH], 2018; CDC, 2018). From

2000 to 2018, the number of adults living in Kentucky with T2DM doubled from 6.5% (198,052)

to 13.7% (474,456 or 1 in 7) (KDPH & CDC, 2018). Reducing the incidence of T2DM through

early detection and treatment of prediabetes can reducethe prevalence and healthcare expenditure for T2DM (CDC, 2020). As the burden of diabetes in Kentucky continues to grow, PCPs can achieve a beneficial impact on communities, healthcare institutions, and personal practice initiatives by enhancing prediabetes screening, management, and referral to diabetes prevention programs to halt the growing diabetes epidemic (KDPH, 2018; CDC, 2018).

Despite evidence regarding the efficacy of lifestyle change programs (N-DPP), PCP-initiated referrals to N-DPPs are underutilized, and gaps remain surrounding PCPs' awareness and referral of individuals with prediabetes (Ackermann et al., 2011). A pivotal randomized, controlled clinical trial, conducted at 27 clinical centers in the United States from 1996 to 2001, evaluated the effectiveness of a structured year-long lifestyle modification program, known as the Diabetes Prevention Program [DPP] (Diabetes Prevention Program Research Group [DPPRG], 2002). DPP participants were randomly assigned to one of the following groups: lifestyle change group, metformin group (participants took 850 mg of metformin twice a day and were provided standard advice about diet and physical activity), or the placebo group (participants took a placebo twice a day instead of metformin and were provided standard advice about diet and physical activity) (DPPRG, 2002). Participants in the lifestyle change group met with researchers individually s16 times in the first 24 weeks, and then every two months plus at least one phone call in between visits (DPPRG, 2002). A goal ofe the program was for participants to lose 7% of their body weight and maintain that weight loss with improved dietary habits and exercise of 150 minutes per week (DPPRG, 2002). Researchers found the incidence of T2DM was reduced by 58% with the lifestyle intervention and by 31% with metformin, compared with placebo group (DPPRG, 2002). Also, participants 60 years and older decreased the incidence of developing T2DM by 71% (CDC, 2020 & DPPRG, 2002). This DPP clinical

trial is a noteworthy study that changed the way PCPs approach prediabetes treatment and T2DM prevention worldwide (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2022).

Following the conclusion of this DPP, a subsequent 10-year study, the DPP Outcomes Study (DPPOS), was initiated to gather long-term outcome data (DPPRG, 2009). The DPPOS follow-up study started in 2002, and all 3,149 surviving participants of the DPP clinical trial groups were eligible for the DPPOS (DPPRG, 2009). Out of the 3,149 eligible DPP participants, 2,776 (88 percent) joined the DPPOS, and remained in their original groups (lifestyle, placebo, vs metformin) (DPPRG, 2009). During DPPOS intervention, the original lifestyle intervention group was offered lifestyle reinforcement semi-annually to reinforce self-management behaviors for weight loss and the metformin group received unmasked metformin (DPPRG, 2009; NIDDK, 2022). The DPPOS study showed that the cumulative incidence of T2DM, in the 10 years since DPP randomization was reduced by 34% in the lifestyle group and 18% in the metformin group compared with placebo (DPPRG, 2009). The DPPOS findings demonstrated prevention or delay of T2DM with lifestyle intervention or metformin can persist for at least 10 years (DPPRG, 2009).

A systematic review of the literature was completed to examine the evidence concerning PCPs' awareness of N-DPP effectiveness, PCP barriers to referral to N-DPP, and utilization of EHRs to increase referrals to the N-DPP. A cross-sectional web-based survey by Nhim et al. (2018) used the 2016 DocStyles survey to analyze patterns of PCP rates of screening, testing, and referring patients with prediabetes to N-DPPs. Overall, 97% of the 1,256 PCPs surveyed tested patients for prediabetes using one of the three recommended blood tests (HbA1c, oral glucose tolerance test, or fasting plasma glucose). Only 23% of PCPs made referrals to N-DPPs,

and 38% of survey participants were aware of the CDC-recognized lifestyle change programs (Nhim et al., 2018). PCP referral habits were found to be associated with the PCPs' practice being in an area with a high ratio of CDC-recognized N-DPP classes to PCPs (Nhim et al, 2018).

A study by Tseng et al. (2017) involved 155 written surveys evaluating PCPs's knowledge of prediabetes risk factors/diagnostic laboratory criteria, and prediabetes management practices. Tseng et al. (2017) found that only 11% of PCPs selected referral to N-DPP as the recommended initial approach to prediabetes treatment. Tseng et al. (2017) identified a lack of N-DPP accessibility, PCP's limited awareness of N-DPP as a treatment option and navigating patient's insurance coverage for N-DPP as the top reasons for not referring (Tseng et al., 2017). Multiple studies surveying PCPs have found PCPs awareness of N-DPP to be positively associated with screening for prediabetes and referral of patients to N-DPP (Keck et al., 2019; Nhim et la., 2018; & Roper et al., 2019). Findings from Nhim et al. (2018) and Tseng et al. (2017) highlight a substantial gap between the evidence supporting PCPs current practice patterns and N-DPPs as first-line treatment to prevent T2DM.

Identifying clinical referral barriers to N-DPPs is important to create sustainable referral solutions (Roper et al., 2019). Lamoureux et al. (2022) administered an online survey to 20 PCPs and asked them to describe current referral practices and barriers preventing referrals to N-DPPs. Responses demonstrated a willingness to refer patients to dieticians for lifestyle management (90%) or for physical activity promotion through personal trainers in fitness centers (65%); however, only 10% reported referring patients to evidence-based lifestyle change programs (N-DPPs) (Lamoureux et al., 2022). Lamoureux et al. (2022) reported barriers, to referral to N-DPP, to include perceived time required for referral to be placed (65%), concerns about patient access (60%), and a lack of familiarity with N-DPPs. PCPs supported the value of enhancing access to

information about N-DPPs and patient enrollment through educational sessions and support

through call-center or web resources (85%) (Lamoureux et al., 2022). PCPs indicated that

simplifying the referral process through integration of the EHR or a centralized referral hub

(75%) would make them more likely to refer patients (Lamoureux et al., 2022).

     An implementation study by Chambers et al. (2015) identified an opportunity to

facilitate and sustain YMCA Diabetes Prevention Program (Y-DPP) referrals through

modification of the EHR referral process and implementation of a prediabetes educational

intervention for PCPs in six federally qualified health centers in the Bronx, New York. The clinic

population included approximately 33% of patients who met the criteria for prediabetes

(Chambers et al., 2015).

     Chambers et al. (2015) described EHR modification as the PCP selecting "YMCA DPP"

referral order in the EHR. The EHR form then auto populated and printed with the patient's

contact and eligibility information, the clinic's referral information and required the patient and

PCP signatures. The next step involved the clinic's staff faxing the form to the YMCA, where

the patient's information was entered and stored in an electronic database, and YMCA staff then

contacted the patient to discuss enrollment. Seven months after implementing the EHR

modification, a formal presentation was made to the medical directors and clinical staff at each

clinic site informing them of this new process and encouraging them to refer eligible patients

using this system. Prior to this EHR modification and the PCP educational session, 0 to 2

patients were referred per month. During the following year, which occurred after the PCP

education intervention, referrals increased from one to nine referrals per month and continued to

increase to five to 11 referrals per month (Chambers et al., 2015).

     Referrals by PCPs are among the more successful strategies for identifying and enrolling

eligible patients in diabetes prevention programs, but for this approach to be effective, innovative ways must be found to facilitate the PCP referral process (Chambers et al., 2015; Vojta et al., 2013). In a study by Nhim et al. (2018), 88% of 1,256 PCPs reported using EHRs at their practice, and 40.4% of the 88% of the PCPs used EHR referral systems to manage prediabetic patients. The PCPs who used EHRs were twice as likely to screen, test, and refer to N-DPP (Nhim et al., 2018). These findings suggest access to EHR referral systems, which include options for prediabetes screening, testing, and N-DPP referrals facilitate prediabetes management (Nhim et al., 2018). Also, EHR integrated PCP referral reminders and feedback from programs on patient initiation and completion (i.e., bi-directional referral programs) were also noted to increase referrals (Lamoureux et al., 2022). Overall, data suggests PCPs who utilized EHRs and were aware of diabetes prevention programs were more likely to screen for prediabetes and refer identified patients to the N-DPP (Nhim et al., 2018).

Offering patient-centered care to prevent diabetes will require collaborative decision-making between patients with prediabetes and their PCPs (Kandula et al., 2018). Addressing gaps in PCP awareness of prediabetes guidelines and underutilization of EHR referrals to the N-DPP are crucial areas where PCPs could take initiative in slowing the diabetes epidemic (Tseng et al., 2017; Tseng et al., 2021). PCP's ability to initiate EHR referrals is an important component of enrolling patients in the N-DPP (Tseng et al., 2021). This literature review highlights the importance of PCP awareness of prediabetes guidelines/N-DPP, the effectiveness of the N-DPP, and PCPs unique role in overcoming barriers in referring to the N-DPP.

Conceptual Framework

The major stages of this project were guided by the ACE Star Model of Knowledge Transformation (Stevens, 2004). This model has five stages for systematically putting evidence-

based practice processes into operation. In 2004, Stevens (2004) created the ACE Star Model, using a simple 5-point design, which demonstrated the five major stages of knowledge transformation (Stevens, 2004). The five points of the star are: 1) Discovery of knowledge; 2) Evidence summary; 3) Translation into practice recommendations; 4) Integration into practice; and 5) Evaluation with the focus of QI (Stevens, 2004).

The first stage of knowledge discovery revealed a low number of provider referrals to N-DPPs across the literature and at the project site. The second stage of the model is evidence summary, the evidence provided in the literature summarizes the success of N-DPP in reducing the risk of prediabetic patients converting to T2DM (CDC, 2021). The third stage is to translate research into guidelines and the fourth to implement these guidelines into practice. An education session for providers will integrate guidelines into clinical practice by outlining the benefits and efficacy of prediabetes screening and referral. A standardized N-DPP referral process using Epic was established. The fifth stage of the ACE Star Model is evaluation. A post-implementation chart review will be performed to measure how many patients were diagnosed with prediabetes during the intervention period and how many patients were referred to the N-DPP via the EHR. A standardized EHR referral process was discussed with participating PCPs and the diabetes educator with the hope of sustainably streamlining the referral process.

Methods

Design

This project involved the implementation of a QI project to address the lack of electronic PCP referrals to N-DPP through provider education. The QI project aimed to educate and encourage PCPs to screen for prediabetes and use the EHR to refer identified patients to the diabetic educator/ N-DPP. A retrospective chart review was conducted to generate a report of

aggregate data which included the number of patients with a documented diagnosis of

prediabetes, number of HbA1c orders for prediabetic patients, the number of patients referred to

the N-DPP, and the total number of patients with a prediabetes diagnosis and documented

HbA1c of 5.7%-6.4%.

Setting/Clinical Site

This evidence-based practice project was implemented at an ambulatory internal medicine

clinic located in downtown Louisville. This setting had a complete adult patient panel of

approximately 3,366 patients. More men (52%) than women (48%) were seen at the clinic in the

last year. The largest percentage of patients seen in the clinic are between the ages of 50-70 years

old (40%). Patients seen at this internal medicine clinic ranged from ages 18 to 102 years old. The

clinic provides care for a variety of backgrounds: Black or African American (48.9 %), Caucasian

(45.6%), Asian (0.01%), and other groups. There is a larger percentage of patients with Medicaid

(40%) and Medicare (29%), than commercial/private insurance (30%) and self-pay (<1%). The

largest percentage of patients seen in the clinic live in areas of Louisville, where the mean

household income is $16,669-$25,995, notably less than the Kentucky state average of $55,573.

The Louisville, KY ZIP codes with the largest concentration of patients in this practice are 40212

(6.1%), 40211 (5.2%), 40203 (4.6%), 40206 (3.1%). The ZIP codes of 40212, 40203, and 40211

are in the west end of Louisville, KY, while the 40206 ZIP code is predominantly in the east end

of Louisville, KY. The clinic also sees patients from southern Indiana. The largest percentage of

patients seen from southern Indiana live in areas with a mean household income of $49,107 which

is also notably less than the Indiana state average ($69,144). The ZIP code with the largest clinic

patient population from Indiana is 47130 (1.8%). The clinic is part of a health care organization

that has a diabetes education department, which includes a N-DPP program recognized by the

CDC. The healthcare system's N-DPP is coordinated and lead by the clinic's diabetic educator.

Participants/Sample

This DNP project's participants included three physicians, one of the physicians is the clinic's medical director, and one nurse practitioner. All providers at the clinic screened, managed, and referred prediabetic patients to the organization's N-DPP. A second nurse practitioner was initially educated but was transferred to a different clinic location mid-implementation, this related data was excluded. A total of four PCPs were involved in this evidence-based practice project.

Context

The goal of the project was to address the root cause of insufficient referrals to the N-DPP by increasing PCP's awareness of prediabetes guidelines, effectiveness of the N-DPP, and improving the existing EHR referral process to the N-DPP. A formal discussion with the clinic's medical director and diabetes educator identified a low PCP-initiated referral number. Limited PCP awareness of prediabetes screening, management, referral guidelines, and limited awareness of the department's N-DPP lead by the clinic's diabetes educator were discovered. Although the capability for PCPs to refer by way of EHR was initiated in January 2022, no formal EHR referral process to the N-DPP was established.

Primary stakeholders for this project were the clinic's medical director, the diabetes educator, physicians, and APRNs employed at the clinic. The department's N-DPP was initially established to reduce the incidence of T2DM in the community and decrease conversion rates of patients with prediabetes to T2DM. Stakeholders must be informed regarding the organization's resources and appropriate prediabetes referral process to the N-DPP.

The PI analyzed the project site for facilitators and barriers to the project implementation. Facilitators to project implementation included the ability for PCPs to refer to the department's N-DPP lead by the diabetes educator, capability for PCPs to refer through the clinic's EHR (Epic) to the N-DPP, system wide initiatives to improve awareness of N-DPP effectiveness, and eagerness for change amongst the diabetes educator and medical director to establish a streamlined referral process. Barriers to implementation include the change in routine for PCPs, perception that this project is extra work, time needed to explain the N-DPP program and perform screening for patients, time needed to explain benefits of the N-DPP to patients, and individuals who decline participation in the N-DPP.

Procedure/Intervention Implementation

A timeline of this evidence-based project is shown in Appendix A. The intervention took place in the form of a one-time education session on February 9, 2023. The formal education session was presented to PCPs in the ambulatory internal medicine clinic during a monthly staff meeting. One month prior to the project intervention, PCPs were notified via email of the education session time, date, and location. A reminder email was sent one week prior to the education session and a follow-up reminder email one week and six-weeks after the educational intervention.

Since this is a QI project, informed consent was not required. This QI project was free to the intervention site. No funding or grants were utilized. The evidence-based education session was held in the project's clinic at a mandatory staff meeting on February 9, 2023. One physician, one nurse practitioner, a medical assistant, and one front desk staff person attended the first session. The PI met with the two other physicians on separate occasions.

The sessions lasted approximately 15 minutes and involved a PowerPoint presentation

detailing current American Diabetes Association prediabetes screening, management, and

treatment guidelines including the effectiveness of N-DPP. The PowerPoint was developed by

the PI and outlined the national and state prevalence of prediabetes, described patient's risk

factors for developing prediabetes, the efficacy for screening and referral for N-DPP as well as

provider instructions on how to properly refer prediabetic patients to the N-DPP in Epic.

Following the sessions, the PowerPoint was emailed to all four PCPs and viewable at the

PCPs' discretion. The PI met with the PCPs individually beginning one week after the education

session and encouraged prediabetes screening, referral to diabetes N-DPP, and reviewed the

EHR referral process to the N-DPP. Six weeks after the educational session PCPs were sent a

reminder email. The email contained the initial presentation, a screen shot of the N-DPP referral

order in Epic, risk factors for prediabetes, and when to refer individuals to N-DPP.

Ethical Considerations/Permissions

Agency permission was obtained from UofL Health's Ambulatory Internal Medicine

Medical Director prior to submission of this proposal, Appendix B. This proposal was submitted

to the University of Louisville IRB and received an exemption certification after the PI's oral

defense in November 2022.

Approval was granted by the clinic's Medical Director to present the project's purpose,

implement the practice change, and obtain aggregate data from the clinic's EHR system to assess

the project's impact. The PI followed the agency's HIPAA procedures, collected de-identified

data, and all data was stored in an excel spreadsheet on a passcode protected computer.

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Measures

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A retrospective chart review was conducted generating a report of aggregate data

(number of patients with a diagnosis of prediabetes, number of prediabetes screening HbA1c

orders, the number of patients referred to the N-DPP via EHR, the number of patients referred to the N-DPP not using the EHR, and the total number of patients with a documented prediabetes diagnosis (R73 and R73.03) and documented HbA1c of 5.7%-6.4% or fasting plasma glucose (100-125) three months prior to project implementation date. This data also assessed if the documentation of prediabetes in the problem list differed by ZIP code, insurance status, sex, age, or race/ethnicity. In addition, the total number of PCP-initiated EHR referrals to the N-DPP and total number of patients with a documented diagnosis of prediabetes by their PCP were evaluated. De-identified data were provided to the investigators in an Excel spreadsheet. The following reports were requested:

1. Total number of patients with a documented prediabetes diagnosis presenting to the clinic between December 8, 2022, through February 8, 2023, and total number categorized by:

    a. Race categories (African American/Black, Hispanic, Other)

    b. Zip codes

    c. Sex (male/female)

    d. Age categories (18-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80-89)

    e. Insurance (Private/Public)

2. Total number of PCP-initiated EHR referrals to the N-DPP between December 8, 2022, through February 8, 2023.

3. Total number of patients with a documented diagnosis of prediabetes HbA1c 5.7%-6.4%) or elevated blood glucose (R73.03 or R73) by the PCP between December 8, 2022, through February 8, 2023.

4. Total number of PCP-initiated referrals via phone/paper (not utilizing EHR process) between December 8, 2022, through February 8, 2023.

5. Total number of prediabetes screening A1Cs ordered by PCPs between December 8, 2022, through February 8, 2023.

A retrospective chart review was completed to abstract data from charts three months prior to the intervention date (December 8, 2023-February 8, 2023); a second retrospective chart review was performed to collect the same measures after the education session (February 9, 2023-May 9, 2023). These chart reviews were completed to assess for a referral practice change and to help determine the usefulness of this DNP project's prediabetes PCP education session. The results of the project were shared with the clinic's providers including the clinic's medical director. Results were presented at the University of Louisville School of Nursing DNP poster presentation day.

Data Analysis

The primary outcomes for this project were to increase PCP prediabetes HbA1c screening orders and the number of PCP-initiated EHR referrals of patients diagnosed with prediabetes to the department's N-DPP.

For the evaluation of adherence of provider-initiated EHR referrals to the N-DPP, three variables were analyzed. The variables included the mean number of referrals, PCP prediabetes screening orders using HbA1c or fasting plasma glucose, and documented prediabetes diagnosis completed by the PCPs during the pre-intervention phase and the post-intervention phase. These three variables were analyzed using IBM® SPSS® (version 28) statistics to determine if they were significantly different using a Wilcoxon signed-rank test. The demographics of patients with documented prediabetes in their problem list were analyzed using descriptive analysis. The

demographics were categorized by age range, race, sex, insurance, and zip code. The project's

results were shared with the clinic's medical director and the clinic's providers. The final

manuscript was disseminated through poster presentations.

<div align="center">**Results**</div>

Two retrospective queries were made to the clinical site's EHR (Epic™) by the Senior

Business Intelligence Developer to generate a report of aggregate data addressing each of the

project's evidence-based practice (EBP) questions. De-identified data was provided to the

investigators in the form of an Excel spreadsheet.

1. What were the total number of patients who presented to the clinic between

   December 8, 2022-February 8, 2023, and February 9, 2023-May 9, 2023, with a

   documented prediabetes diagnosis (ICD-10 R73.03 or R73) in the problem list. Total

   number was categorized by:

   a. Race categories (African American/Black, Hispanic, Caucasian, Other)

   b. Zip codes

   c. Sex (male/female)

   d. Age categories (18-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80-89)

   e. Insurance (Private, Public, i.e. Medicare, Medicaid)

The pre-implementation chart audit revealed 24 patients with an ICD-10 code (R73.03) for

prediabetes and 166 patients (R73.0) for elevated blood glucose attached to the patient's EHR

problem list. A total of 190 patients were identified and seen between December 8, 2022, and

February 8, 2023. The post implementation audit revealed 29 patients with a prediabetes

diagnosis (R73.03) and 266 patients (R73) in their problem list. A total of 295 patients were seen

at the clinic between February 9, 2023, and May 9, 2023, with prediabetes or elevated blood glucose in their problem list. The descriptive analysis results were categorized in Figure 3.

The descriptive analysis revealed males (n = 106; 56%) were more likely to have a prediabetes diagnosis and increased blood glucose (R73.03 and R73 or just R73.03) documented than females (n = 84; 44%). The post-implementation phase showed similar findings—males (n = 171; 58%) had a higher rate of prediabetes or increased blood glucose in the EHR problem list, compared to females (n = 124, 42%). Most patients with documented prediabetes in the problem list were between the ages 60-69 (n = 52, 27.37%) in the pre-implementation phase and post-implementation phase (n = 71, 24.06%). There were more documented patients with prediabetes who identified as African American/Black (pre, n = 98, 51.57%; post, n = 141, 47.79%), compared to Caucasian (pre, n=85, 44.74%; post, n = 122, 41.35%), Hispanic (pre, n =5, 2.63%; post, n = 26, 8.81%), or Other (pre, n = 2, 1.06%; post, n = 6, 2.05%).

The pre and post implementation phases demonstrated an increased number of patients with R73.0 or R73.03 in the problem list for individuals who had public insurance (n = 98, 51.5%; n = 180, 61.02%) compared to private insurance *(n = 92, 48.5%; n = 115, 38.98%)*. The largest percentage of patients with a documented prediabetes diagnosis in the problem list pre and post implementation lived in the 40212 ZIP code (pre n = 37, 19.47%; post n = *67,* 22.7 %) and 40211 ZIP code (pre n = 41, 12.5%; post n = *51,* 20.68%) (Figure 3). The median household income for those residing in the 40211 ZIP code is $23,790 and the median household income for those living in 40212 is $27,212 (Table 3) (United States ZIP Codes, 2020).

2. What was the total number of PCP-initiated EHR referrals to the N-DPP between December 8, 2022, through February 8, 2023, and February 9, 2023-May 9, 2023?

The pre-implementation audit showed zero EHR referrals to the N-DPP. The post-implementation audit demonstrated 15 EHR referrals to the N-DPP (Table 1). The Wilcoxon signed-rank test indicated marginal significance of post EHR referrals compared to pre-implementation referrals ($z = -1.841$, $p = .066$).

3. What was the total number of patients with a documented diagnosis of prediabetes (HbA1c 5.7%-6.4%) by the PCP between December 8, 2022, through February 8, 2023, compared to February 9, 2023-May 9, 2023?

Prior to implementation 190 patients had a documented diagnosis of prediabetes (R73.03) (HbA1c 5.7%-6.4%) or elevated blood glucose (R73) compared to 295 patients with a documentation of prediabetes or elevated blood glucose in the post-implementation phase. The Wilcoxon signed-rank test denoted that a prediabetes education session for PCPs did not elicit a statistically significant change in PCP prediabetes documentation, although it could be argued that there was marginal significance of post-implementation PCP documentation of the ICD-10 code for prediabetes (R73.03, R73) in problem lists ($z = -1.826$, $p = .068$). Indeed, about 35% ($n = 102$) of the 295 patients in the post-implementation phase with a prediabetes diagnosis in the problem list were identified as newly diagnosed with prediabetes.

4. What was the total number of PCP-initiated referrals via phone/paper (not using the EHR process) between December 8, 2022, through February 8, 2023, and February 9, 2023-May 9, 2023?

The diabetes educator received two PCP initiated N-DPP referrals via phone and email during the pre-implementation phase and zero non-EHR referrals in the post-implementation phase.

Statistical analysis was unable to be performed for this variable due to the minimal decrease in EHR referrals.

5. Total number of prediabetes screening HbA1c screenings ordered by PCPs between December 8, 2022, through February 8, 2023 and February 9, 2023-May 9, 2023.

The pre-implementation phase revealed 245 prediabetes screening A1cs ordered by PCPs, compared to 428 prediabetes screening A1cs in the post-implementation phase (Figure 2). A Wilcoxon signed-rank test indicated that the post-implementation PCP screening HbA1c orders were marginally significant compared to the pre-implementation screening orders ($z = -1.826$, $p = .068$).

Advantage and Disadvantages of the Project Change

All data were de-identified and presented at the aggregate level. Although no patients had direct benefit from this evidence-based practice project, the practice change, and findings of this project increased clinicians' awareness of the importance of prediabetes screening, diagnosis, and referral to N-DPP.

<div align="center">

Discussion

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Summary

This evidence-based practice project educated PCPs about prediabetes risk factors, the benefit of N-DPP, the efficacy for screening and referral, and created a standardized referral process for referral of prediabetic patients to the department's N-DPP through the clinic's EHR (Epic). EHR capability to refer prediabetic patients to the organization's N-DPP was available in the EHR prior to this project's initiation, but PCPs were unaware of this capability and did not use the correct N-DPP referral order. The diabetes educator received no EHR and two non-EHR (phone/email) referrals to the N-DPP prior to initiation of this project. PCPs were educated on

how to refer patients with a prediabetes diagnosis. A booster reminder email was sent to PCPs

six weeks after the initial presentation to encourage clinicians to assess, diagnose, and refer

identified prediabetic patients. A picture of the organization's N-DPP referral order in Epic was

included in the PowerPoint and follow-up email (see Appendix C). Evaluation of PCP

prediabetes screening, diagnosis of prediabetes or elevated blood glucose, and referral to N-DPP

determined the effectiveness of this evidence-based practice project.

Interpretation

The practice change for this project involved the implementation of a prediabetes

educational session to increase PCP assessment, screening, diagnosis of prediabetes, and referral

to N-DPP, at a primary care practice. To assess practice change, retrospective queries were

compared before and after the educational session. The queries evaluated total number of PCP

prediabetes screening orders, total number of patients with a diagnosis of prediabetes or elevated

blood glucose in problem list, and total number of referrals to N-DPP during three-month time

frames. Outcomes measures included the total number of patients with a diagnosis of prediabetes

or elevated blood glucose in the problem list, total number of prediabetes screening HbA1c

orders for prediabetic patients, the number of patients referred to the diabetes educator by EHR,

and the total number of patients with a documented HbA1c of 5.7%-6.4%. Among the four

PCPs, variables were analyzed, and the findings of this project showed marginal significance

across outcomes.

An Epic business Intelligence Developer obtained queries from the clinic's EHR to assess

for a practice change in prediabetes screening orders, PCP referrals to N-DPP, and diagnosis of

prediabetes or elevated blood glucose in the problem list. Concerted efforts to educate PCPs

about prediabetes, efficacy of prediabetes screening, and the N-DPP is likely necessary. Results

of this project revealed an increase in HbA1c testing from 245 orders during pre-implementation to 428 post-implementation (z = -1.826, p = .068). The updated USPSTF prediabetes screening recommendations were reinforced when the education sessions for PCPs at the clinical site occurred. The PI stressed PCPs should screen for prediabetes in adults 35 to 70 years old who are overweight or obese, and this recommendation was included in the PCPs' follow-up resources (USPSTF, 2021).

The diagnosis of prediabetes or elevated blood glucose in the EHR problem list for individuals seen by PCPs in the clinic were assessed pre (n = 190) and post implementation (n = 295). Results revealed an increase in the number of patients with an ICD-10 R73.0 or R73.03 in the problem list across the four PCPs with marginal significance (z = -1.826, p = .068). Studies have shown PCP awareness of prediabetes screening is high (Nhim et al., 2018), but knowledge about specific guideline recommendations is inadequate (Tseng et al., 2019); clinical decision support tools may help fill this gap. These tools include streamlining orders (e.g., labs) and referrals (e.g., N-DPP), and ensuring the prediabetes diagnosis is documented. ICD-10 diagnosis of prediabetes or elevated blood glucose (R73.03, R73.0) is a quality measure proposed by the American Medical Association (AMA; AMA, 2023). Although the ICD-10 R73.03 is a more specific code that indicates prediabetes, it was discovered that PCPs utilized the more general ICD-10 R73.0 (elevated/impaired blood glucose) when a diagnosis was not yet determined or if further testing is required. Furthermore, in the post-implementation phase 35% (n = 102) of the 295 patients with prediabetes diagnosis or elevated blood glucose in the problem list were identified as newly diagnosed with prediabetes.

The demographic analysis of individuals with a diagnosis of prediabetes or elevated blood glucose seen at the clinic during the three-month time frames were analyzed by age range, race,

sex, income, and zip code. Pre and post implementation analysis of those with a prediabetes

diagnosis (R73, R73.03) was primarily among those ages 60-69 (27.37%, 24%), Black (51.57%,

47.79%), male (56%, ((Portland) (19.47%, 22.7%); 40211(Park DuValle) (12.5%, 20.68%)],

and those who had public insurance (51.5%, 61.02%). Prior studies found an increased

likelihood of prediabetes diagnosis in female patients, older patients, and patients with risk

factors, including non-white race, comorbidities, and higher BMI (Keifer et al., 2015).

In prior studies, health insurance, specifically private insurance coverage, was associated

with higher rates of diabetes screening, diagnosis of prediabetes in problem list, and referral to

N-DPP (Shealy et al., 2019). PCPs involved in this project were educated and received

information regarding public and private insurance coverage of N-DPP and diabetes screening.

For this project, a higher diagnosis of prediabetes was found for individuals ages 60-69, Black,

male, lived in areas of metro Louisville (Portland (40212) and Park DuValle (40211)) that

routinely accept Medicaid/Medicare, and those with public insurance.

The initial demographic analysis of the clinic's total patient panel (n=3,366) revealed

more men (52%), than women were seen at the clinic (48%), 60% were ages 40-70 years old,

48.9% were Black/African American, and a larger percentage had public insurance (40%

Medicaid, 29% Medicare). Existing data on racial/ethnic minorities in prediabetes prevalence

and incidence are scarce, with inconsistent observations.

Collectively, these findings indicate the necessity of close surveillance and prompt

intervention to mitigate the risk of prediabetes and its progression to diabetes among high-risk

subgroups. Identifying prediabetes and offering or referring high-risk people to interventions and

support are consistent with evidence-based guidelines for preventive care and constitute

important ways of assisting patients and families in self-care management—both of which are

necessary for PCPs and practices to seek and receive recognition from National Committee for

Quality Assurance (NCQA) as a Patient-Centered Medical Home (NIDDK, 2022).

A standardized N-DPP referral order and referral process in Epic amongst PCPs at the

clinic were discussed at the educational session and a follow-up-reminder email which contained

a visual of the ambulatory N-DPP order was provided. Similar to Lamoureux et al. (2022), the PI

intended to create a standardized EHR referral process and raise awareness about the capability

for EHR referral and indications for referring prediabetic patients to the N-DPP. The PI

evaluated the number of pre and post education session referrals, which increased from 0 pre-

implementation to fifteen post-implementation. The Wilcoxon signed-rank test demonstrated

marginal significance of referral orders post implementation by PCPs ($z = -1.841$, $p = .066$).

The implementation evaluation revealed that PCP education and simple modifications to

clinical workflows led to increased HbA1c prediabetes screenings, prediabetes diagnosis, and

referrals to N-DPP. Before engaging in this effort, the identified PCPs were not referring

prediabetic patients by way of EHR to evidence-based N-DPP, which is congruent with national

data (Tseng et al., 2019). Despite national surveys and a strong evidence base supporting the

effectiveness of the N-DPP in preventing T2DM, the number of PCP referrals to the program and

prediabetes screening has continued to remain low across the nation (Tseng et al., 2019).

Limitations

There are several limitations to note, which involved the project's retrospective design,

implementation phase, and evaluation phase. This project involved data from a single health

system. There were identified limitations presented by programming or structuring of queries

and the data provided by the Epic Business Intelligence Developer presented potential

inaccuracies.

Threats to internal validity arose from the initial sample size of PCPs at the start of this project ($n = 5$). However, one provider changed clinic locations mid-project; the related data was excluded. Attrition bias is a threat to internal validity and the loss of one of five PCPs potentially skewed results. The Wilcoxon signed-rank test was used, as opposed to a paired t-test, to minimize and adjust for the sample size limitation because the distribution of the differences between the pairs was severely non-normally distributed.

Only two PCPs made the initial presentation due to scheduling conflicts, and the PI met with the two other PCPs individually. An additional limitation was the lack of available data to identify patients who declined prediabetes screening, referral to N-DPP, or the total number of patients assessed by PCPs for prediabetes based on risk factors. It is unclear how frequently providers assessed prediabetes risk, although documentation of diagnosis was captured, if PCPs added the prediabetes diagnosis to the problem list. Another limitation of this practice change was prior to project implementation, the PI of this project did not have prior relationships with PCPs at this clinical site and this may have served as a barrier to PCP engagement.

Conclusion

Implications for PCPs

This evidence-based project was developed to improve PCP prediabetes screening, create a standardized electronic referral process for PCPs to refer patients with prediabetes to the organization's N-DPP, and expand diagnosis of prediabetes in the EHR for patients with a HbA1c 5.7%-6.4%. PCPs can work with colleagues in information technology to develop EHR-based referral processes to support clinicians' documentation. While the initiation of an EHR referral process can provide the means to document N-DPP referral, there is a continued need to

educate PCPs regarding the impact of risk factors of prediabetes and improve PCP awareness of available community-based N-DPPs.

Concerted efforts to educate health care providers about prediabetes and the N-DPP is likely necessary to increase prediabetes screening, diagnosis, and the number of PCP referrals (Keck et al., 2019). Future research focused on PCP prediabetes education, integration of EHR prompts for prediabetes screening/referrals, and updating PCPs on patient N-DPP engagement could improve N-DPP referral and improve accurate diagnosis after screening is complete (National Association of Chronic Disease Directors and Leavitt Partners, 2017). Integration of prediabetes reminder prompts for prediabetes screening and referral to N-DPP should be incorporated within EHR and can be examined in future prospective studies.

For PCPs, framing prediabetes screening and referral to N-DPP as a quality improvement strategy rather than additional supplemental education resulted in greater engagement by busy clinicians. Diabetes prevention is a collaborative effort, and collective buy-in through team-based care is essential. Furthermore, the inclusion of a booster presentation or reminder email is recommended to increase compliance with policy and procedures (Holliday et al., 2019)

PCPs need to stay informed of the increasing body of knowledge related to the prevalence and incidence of prediabetes. PCPs must be aware of available community-based interventions for prediabetes patients to treat and decrease their risk of developing diabetes. Racial and ethnic minority populations have a higher burden of diabetes related complications, PCPs must direct diabetes prevention efforts to be inclusive of vulnerable and medically underserved populations (Haw et al., 2021). As the nation continues to expand its efforts toward diabetes prevention, PCPs will be called to play an ever-growing critical role in prediabetes screening, testing, and referral of identified individuals with prediabetes to N-DPP.

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S301–S306. https://doi.org/10.1016/j.amepre.2012.12.018

Appendix A

Implementation Timeline

Date	Objective
September 2022	Identified Problem
	PICO Question Developed
October 2022	Medical director project approval
November 2022	DNP Proposal Oral Defense
December 2022	IRB submission
January 2023	IRB Approval
	Notify PCPs via email of educational session.
February 2023	Reminder email for PCPs of educational session
	Intervention implementation-PCP Education Session
	Meet with PCPs individually one week after presentation, as needed.
March- May 2023	Follow up/Six-week reminder email sent to PCPs
	Implementation- Chart Audits
June 2023	Data Analysis
	Dissemination of Findings
July/August 2023	Poster Presentation
	Manuscript Completed

Appendix B

IROC QI Leadership Approval Letter

UL Health

Interdisciplinary Research Oversight Committee (IROC)

Leadership Approval for QI, EBP & Research Projects

Project Title: Increasing Electronic Referrals to a Diabetes Educator and Diabetes Prevention Program

Investigator(s): Dr. Elizabeth Volpert, Dr. Lynne Hall, and Brittany Morguelan

Project Dates: February 2023 – May 2023

Unit: UofL Health Ambulatory Internal Medicine Clinic Suite 370

I approve this project to be conducted on the unit I supervise.

Name of Unit Leader (print): BRIDGET HITTEPOLE

Signature of Unit Leader: B. Hittepole, MD.

Date: 12/19/2022

Comments:

Appendix C

PCP Referral Process and Diabetes Prevention Program Referral Order in EHR (Epic)

Note. PCPs at the clinic were instructed to use the above order after evaluation and diagnosis of patients with HbA1c 5.7%-6.4% or FBG 100-125. The PCP placed the ambulatory referral order in Epic to the Diabetes Prevention Program. The clinic's scheduler forwards a list of referrals to the diabetes educator weekly. The diabetes educator calls the patient to discuss N-DPP and engagement. The clinic's diabetes educator leads the organization's N-DPP.

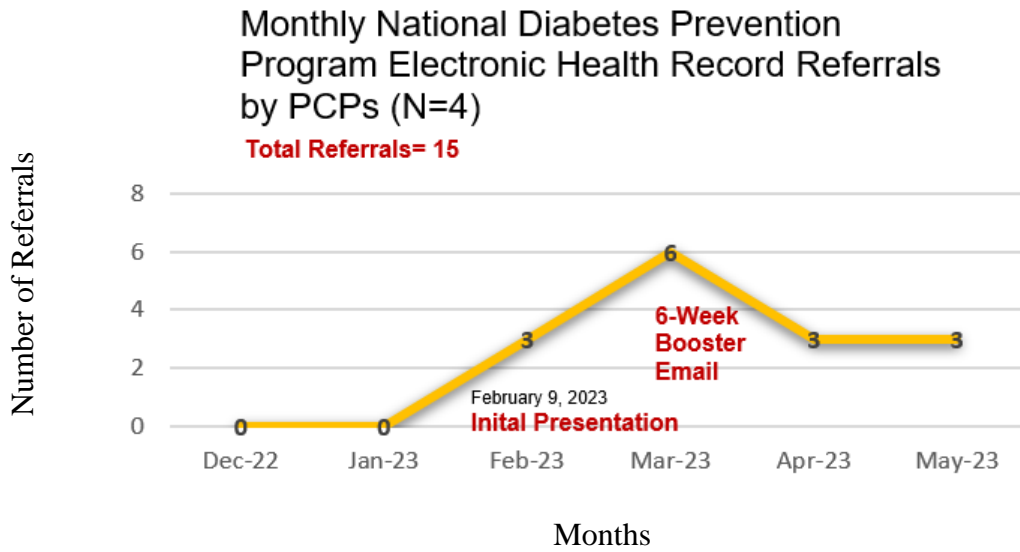**Figure 1**

Monthly Number of N-DPP EHR Referrals by PCPs

Monthly National Diabetes Prevention Program Electronic Health Record Referrals by PCPs (N=4)

Months

Figure 2

Monthly Total PCP Screening HbA1c/FBG Orders vs. Monthly Results HbA1cs 5.7%-6.4% or
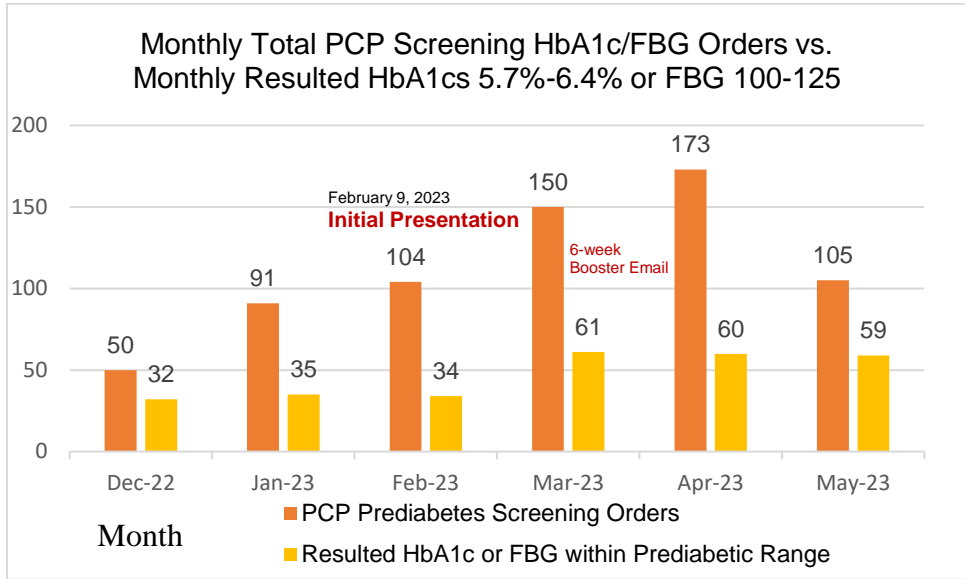
FBG 100-125

Figure 3

Demographic Analysis: Patients with a Documented Prediabetes ICD-10 (R73.03, R73) in the

EHR Problem List

	Pre-Implementation (n=190)	Post-Implementation (n=295)
	n (%)	n (%)
Sex		
Female	84 (44)	124 (42)
Male	106 (56)	171 (58)
Race		
Black	98 (51.57)	141 (47.79)
Hispanic	5 (2.63)	26 (8.81)
White	85 (44.74)	122 (41.35)
Other	2 (1.06)	6 (2.05)
Age Range		
20-29	15 (7.89)	21 (7.12)
30-39	23 (12.10)	49 (16.6)
40-49	47 (24.74)	68 (23.05)
50-59	31 (16.32)	69 (23.39)
60-69	52 (27.37)	71 (24.06)
70-79	12 (6.32)	14 (4.74)
80-89	10 (5.79)	3 (1.02)
Insurance		
Public	98 (51.5)	180 (61.02)
Private	92 (48.5)	115 (38.98)
Zip Code		
40212	37 (19.47)	67 (22.7)
40211	41 (12.5)	51 (20.68)
40203	29 (12.5)	56 (18.98)
40202	23 (12.11)	31 (10.5)
40204	16 (8.42)	18 (6.1)
40215	9 (4.74)	11 (3.73)
40223	7 (3.68)	11 (3.73)
40059	2 (1.05)	40206 11 (3.73)
40205	2 (1.05)	42712 3 (1.02)
40212	4 (2.11)	5 (1.69)
40214	3 (1.58)	7 (2.37)
40219	5 (2.63)	47150 3 (1.02)
40220	2 (1.05)	4 (1.36)
40228	4 (2.11)	40245 3 (1.02)
40241	2 (1.05)	40217 3 (1.02)
40272	1 (0.53)	42701 2 (0.68)

	40291	1 (0.53)		40258 5 (1.69)
47122	1 (0.53)			40014 2 (0.68)
47130	1 (0.53)			40013 2 (0.68)