

## **Introduction:**

The Center for Disease Control and Prevention (CDC) reports that 33.4% of all Americans have prediabetes.<sup>1</sup> Prediabetes is defined by the American Diabetes Association as having a higher than normal blood glucose, but not high enough to be considered for a diagnosis of Type 2 diabetes.<sup>2</sup> Prediabetes is currently affecting almost 84 million people across the United States and has the propensity to continue increasing in the future due to an aging population, poor diets, and physical inactivity.<sup>1</sup> Without appropriate management of prediabetes, patients can develop Type 2 diabetes. Patients with diabetes are at risk for various comorbidities such as neuropathy, nephropathy, lower leg amputations, and cardiovascular disease. Patients with diabetes can also experience financial burden due to increase in hospitalizations, cost of testing supplies, and cost of therapy.

Prediabetes can be reversed through weight loss, physical activity, and eating a healthy diet. Certain medications have also demonstrated efficacy in decreasing the incidence of diabetes in patients with prediabetes. The CDC developed the National Diabetes Prevention Program (NDPP) to use evidence-based lifestyle modifications to prevent or delay Type 2 diabetes in patients with prediabetes.<sup>3</sup> The NDPP is a year-long program taught by a trained lifestyle coach who provides education, encourages, and promotes a healthy diet, increase in physical activity, and stress management.<sup>3</sup> The NDPP is offered at various locations around the country by pharmacists, the YMCA, and other healthcare professionals.

Previous studies have shown the significance of pharmacists engaging patients at community pharmacies by using a Type 2 diabetes risk assessment and referring them to practitioners for a diagnosis of Type 2 diabetes if certain criteria were met.<sup>4,5,6</sup> The purpose of this study is to demonstrate that pharmacist-led screenings in the community and referrals for care empowers patients to make positive health changes in their life to prevent Type 2 diabetes. These changes include incorporating more physical activity into their daily routine, enrolling in a lifestyle management program such as the NDPP, linking to a primary care provider, or starting a medication for prediabetes. Literature has not shown the impact of pharmacists screening for prediabetes in the community with referral to care and this project aims to fill that gap. Screening and linking patients to care for prediabetes brings an opportunity to positively impact patient's lifestyles. These lifestyle changes and referrals to care can help prevent patients with prediabetes from progressing to type 2 diabetes. This project hopes to expand the literature of the impact of pharmacists in prediabetes outreach in the community.

## **Methods:**

Patients were recruited at community outreach events in and around the greater Pittsburgh, Pennsylvania area between January and March 2020. Inclusion and exclusion criteria for the study are listed in Figure 1. Baseline weight, exercise minutes per week, and a fingerstick blood glucose were gathered for eligible patients. Counseling was provided to patients on lifestyle modifications, such as eating a healthy diet and exercising for 150 minutes per week. They were also educated on diabetes prevention programs and encouraged to discuss prediabetes with a

healthcare provider. Pharmacists who provided the education received standardized training prior to attending the outreach screening. A telephonic interview using a script was completed one month after the initial screening and patients were asked to report current weight and exercise minutes per week. Study participants were also asked if they enrolled in a diabetes prevention program. If they did enroll, the following was documented: location of program, sponsoring organization, cost, and any applicable incentives involved with participation. Researchers also asked if participants made an appointment or saw a healthcare professional to discuss prediabetes since the screening, what motivated them to make the appointment, if they have started a medication for prediabetes, and if they had their blood sugar tested since the screening and the result. A maximum of three attempts were made to contact the patients before being deemed lost to follow up. Chi squared and a paired t test was used to analyze change in baseline characteristics and qualitative statements from patients were reviewed to look for common themes behind the motivation to make lifestyle changes.

## **Results and Discussion:**

Screening of participants began January 2020 and continued throughout March 2020. These screening events were held at community outreach events in Pittsburgh, PA. The participant eligibility and enrollment percentage are broken down in Table 1. A total of 22 participants were enrolled across 10 events. Participant baseline demographics are shown in Table 2.

At initial screening participants had an average weight of  $97.04 \pm 20.02$  kg, average minutes of activity of  $70.6 \pm 109.81$  minutes, and an average ADA risk score of  $6.2 \pm 1.3$ . Telephonic follow-up phone call was made to each participant for a total of three attempts. Overall, 18 participants completed the study and 4 were lost to follow up. Participant follow-up data are shown in Table 3. After follow-up participants had an average weight of  $91.43 \pm 18.88$  kg, average minutes of activity  $91.94 \pm 114.01$ , 6 (33.3%) made an appointment to see a healthcare professional, 0 started a medication to treat prediabetes, and 0 enrolled in a NDPP.

When analyzing pre and post-test, there was an average weight loss of  $2.45 \pm 10.59$  kg and average increase in minutes of activity per week of  $32.22 \pm 74.98$  minutes, neither of these were statistically significant (Table 4). Further analysis evaluated the change in weight and minutes of activity per week for participants who made an appointment with a healthcare professional, and those who did not. The results showed that those who made an appointment had an average reduction in weight of  $7.727 \pm 18.089$  kg and increase in minutes of activity per week of  $46.67 \pm 74.207$ . Those who did not make an appointment had an average increase in weight of  $0.185 \pm 1.451$  kg and increase in minutes of activity per week of  $25 \pm 77.5348$ . None of these values were statistically significant (Figures 2 and 3). Results show that education provided by pharmacists at initial screening resulted in improvement in minutes of activity and a decrease in weight. This suggests that pharmacist availability gives an opportunity to provide effective education on lifestyle changes.

The qualitative analysis revealed one dominant theme, pharmacist intervention can empower patients to make positive changes in their health. Patients stated, "I made an appointment with my physician after getting screened. My appointment is actually later this evening.", "I did make an appointment. The screening motivated me to discuss my health and numbers from the screening at my upcoming visit." "The screening was the catalyst to help me begin to improve my health". Of the participants that made an appointment with a healthcare professional, all but one stated the intervention influenced their decision to do so. Qualitative results suggest pharmacist intervention influenced lifestyle changes, increased follow-up care, and empowered patients to do so. Based on previous studies showing significance in pharmacist screening and referrals to health care providers, this finding was to be expected.

Based on the results, NDPP are underutilized. This could be due to the number of programs available or location of the program. Results show that pharmacist education surrounding NDPP can be used to promote awareness of prediabetes and improve referrals to programs. Training pharmacists and other health care professionals to become NDPP trainers could help increase enrollments and availability of programs.

Screening events occurred in underserved areas which presents challenges to follow-up care. A few potential participants were enrolled but lacked telephone access for follow-up. Lack of available resources such as healthcare, healthy food, lifestyle programs, may limit access to care. This shows that screening in underserved communities can provide health education to those who may not have regular access.

A limitation to the study would be the length of time before follow-up. One-month follow-up may be too short to see a significant change in weight, follow-up appointments, and enrollment in NDPP. Several outreach screenings were also canceled due to the COVID-19 pandemic. This may have impacted population size and limited the potential to see a statistically significant change in results. An additional limitation would be patient self-reported weight and minutes of activity. This presents concern for confounding.

### **Conclusions:**

This research project shows that pharmacist screening and education in the community had a positive impact on patients and empowered them to improve their minutes of activity per week, reduce their weight, and increase provider referrals for care. Pharmacist accessibility can provide patients with education and tools to improve their health. Availability of care can be improved by training other health care professionals on NDPP. NDPP trained professionals can provide increased access to NDPP programs and education on positive diet, exercise, and lifestyle practices to patients in their community practice settings. Research interventions can continue to be implemented in the care process in various practice settings. Future studies are warranted to show long-term effects of lifestyle changes.

## References:

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