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Title: Improving Adherence to Annual Retinal Screening Among Adult Diabetics in Rural Midwest

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ABSTRACT

Background: Diabetic retinopathy (DR) affects millions of people worldwide and is a main cause of preventable blindness. Experts recommend annual retinal screenings on all diabetic patients. Studies show continuing trends of nonadherence, as well as significant barriers to screenings. Recommendations to overcome barriers and methods to improve adherence among diabetics are topics of interest among healthcare providers. The purpose of this project was to increase annual retinal screening adherence among adult diabetics at a privately owned primary care practice in the rural Midwest.

Methods: Staff and 59 patients, chosen through convenience sampling were involved. Pre- and post- implementation surveys were administered to staff to assess knowledge, practice, and attitude regarding DR screening. Education and training were provided to staff to reinforce main concepts of DR and use of office owned teleretinal imaging technology. Education was posted for patients on the waiting room whiteboard, and educational flyers were provided to patients upon check-in. Staff was encouraged to provide education to each participant upon rooming. Retinal imaging technology was used by staff to complete in-office exams for patients who met inclusion criteria. Uptake of retinal exams was compared to the pre-implementation office adherence retinal exam rate from the prior year.

Results: The results were statistically insignificant ($p = .248$), however there was a proportional increase in patients who received retinal exams during implementation (pre-implementation adherence = 42%, implementation adherence = 48%).

Conclusions: Staff reported an increase in knowledge and confidence in usability in pre-existing teleretinal imaging technology. A small yet clinically significant increase in adherence to retinal exams among diabetics was noted during implementation. Knowledge

gained could help to guide future similar interventions.

Keywords: Annual retinal screening, adherence, adult diabetics, quality improvement, teleretinal screening.

Introduction

Diabetic retinopathy (DR) affects about 4 million people in the United States (U.S.) and is the top cause of blindness in working aged US adults (Chen et al., 2018; Papadakis et al., 2022). About one in five people over 18 with diabetes in the United States has some degree of DR (Martinez et al., 2019). Unfortunately, many of those living with DR do not know they have it until it is severe, as it is often asymptomatic until the later stages (Eppley et al., 2019; Leeman et al., 2022).

Visual impairment from DR has led not only to significant reduction in quality of life for millions of diabetics worldwide, but also contributes to millions in healthcare costs and economic losses annually (Coney, 2019; Eppley et al., 2019). The prevalence of diabetes in the US is projected to increase from about 35 million people in 2015 to 55 million by 2030; with this increase, diabetes-related healthcare costs will also continue to rise (Coney, 2019). Preventative screenings for DR in the US have been shown to significantly decrease healthcare-related spending (Coney, 2019).

Barriers to Screening

An et al. (2018), Coney (2019), Eppley et al. (2019), and Gange et al. (2020) reported that a major factor negatively impacting adherence, especially in underserved diabetic populations, is lack of access to or transportation to eye doctors. Furthermore, An et al. (2018), Chen et al. (2018), Eppley et al. (2019), Gange et al. (2020), Hatef et al. (2017), and Wu et al. (2022) discussed that lower education levels, lack of awareness of DR, lack of symptoms of DR, or some combination of these negatively impacts adherence.

Additionally, several of the articles discussed the effects of race, ethnicity, age, and mental health on adherence rates. Blacks and Hispanics had lower adherence rates as compared

to White, non-Hispanics (An et al., 2018; Chen et al., 2018; Eppley et al., 2019; & Gange et al., 2020). An et al. (2018), Eppley et al. (2019), and Gange et al. (2020), discovered that younger diabetics were less compliant with annual screening. An et al. (2018) also reported that males were less likely to be compliant.

Teleretinal Imaging

Technology for retinal screening in the primary care setting has been shown to help increase adherence to annual exams for a number of reasons, including lower patient costs and increased accessibility (Liu et al., 2021; Martinez et al., 2019). The process involves the patient undergoing retinal exam during a routine diabetic check-up, the images are sent via cloud technology to an ophthalmologist who interprets the images, and the final report is sent back to the primary provider with recommendations, when appropriate. Adherence rates were improved by 30.2% (Hatef et al., 2017), 40% (Leeman et al., 2022), 36.7% (Liu et al., 2021), and 25.6 - 40.4% (Martinez et al., 2019) by using teleretinal technology.

Clinical Practice Question

In adults (aged 18 and over) with DM, does increasing staff and patient education on DR lead to increased use of teleretinal imaging at primary care visits, thereby increasing adherence to recommended annual retinal exams?

Project Aims

This quality improvement project sought to increase retinal screening adherence in adult diabetics through increasing staff education on DR, retraining staff on the use of available technology, encouraging staff to provide education and reinforcement of annual screening to patients, and increasing the use of in-office teleretinal imaging technology.

Project Objectives

Increasing education to staff and patients has been shown to increase adherence rates for many diabetic measures (Chawla et al., 2019). The main project objective was to increase annual retinal screening adherence among adult diabetic patients by promoting self-efficacy and health promoting behaviors through education. Secondary objectives included increasing staff self-efficacy for providing education to patients, as well as for enacting in-office retinal exams for patients who meet inclusion criteria.

Model to Explore Nonadherence

Pender's Health Promotion Model was used to explore the phenomenon of nonadherence, as it describes methods to increase perceived benefits, encourage self-efficacy, as well as the effects of interpersonal influences on health promoting behaviors (Pender et al., 2011). People seek out and make changes in their own behaviors to affect their health and healthcare providers can influence the health decisions made by people (Pender et al., 2011). By accomplishing the objectives of increasing education to patients and encouragement of exam uptake by staff, patients will hopefully recognize the benefits to retinal screening, thereby encouraging health-promoting behaviors.

Organizational Assessment

An organizational assessment was performed using the McKinsey 7S model. This framework was selected as it focuses more on the inner workings of the organization (such as the staff behaviors and attitudes), and less on external factors (such as setting) (Reflect & Learn, n.d.). As a small, privately owned practice with no affiliations and a strong staff-oriented culture, placing focus on the inner setting seemed most appropriate. 7S model places a great deal of focus on the connections between inner factors and the abilities of these factors to influence each other (Reflect & Learn, n.d; Singh, 2013). Furthermore, a SWOT analysis was completed to help guide

the intervention (Table 1). Key stakeholders included patients and their families, the medical director, staff, providers, and the community. The main issue described by the medical director was that he felt increasing pressure from insurance companies to adhere to the quality measures due to loss of potential reimbursement and constant reminders of patient nonadherence. The office manager also provided reports which demonstrated that the Center for Medicare and Medicaid Services (CMS) goal for annual DR screening the previous year had not been met (Medical Advantage, 2021). An overall medical record report was also obtained, which demonstrated an annual diabetic retinal exam nonadherence rate of 58%.

The organization had the available technology to perform retinal screening during regular office visits. The exams were completed by medical assistants. However, some did not feel confident in their use of the device and reported that they were often unable to achieve acceptable images. Furthermore, high staff turnover resulted in several new medical assistants who were never formally trained on the device. Additionally, many staff members reported minimal to no knowledge of DR.

Methods

The quality improvement project was carried out in three steps. The first step included a pre-implementation staff knowledge, attitudes, and practice (KAP) survey, followed by staff education. Step two, implementation, entailed posting education via whiteboard in the waiting room, as well as distributing educational flyers to all participants who met inclusion criteria. This step also included staff providing education to patients meeting inclusion criteria, encouraging questions, and promoting uptake of a retinal exam during the same appointment. The third step included post-implementation staff KAP surveys and data collection and analysis of patients who were included in flyer distribution, education, and retinal exam uptake or refusal.

Recruitment of participants was done by convenience sampling at the project site. Participants were included if they were adults (18 years or older), had the diagnosis of type-1 or type-2 DM, and were presenting to the clinic for a routine diabetic checkup. Exclusion criteria were if the patient was presenting for a visit unrelated to their diagnosis of DM and patients under the age of 18 years. Potential interventions included education, reinforcement of education, and increased performance of teleretinal exams, so there were no anticipated risks to the participants. Participants who met the inclusion criteria were identified at the time of appointment check-in. A data collection sheet was kept by the front desk staff for documenting participants who received flyers, and medical assistants were given access to the same data collection sheet in order to document their assigned tasks (providing education, allowing questions, encouraging exams, documenting if exam was done and if not, the reason).

Objective data included whether flyers were provided to participants, if medical assistants provided education, allowed for questions, and encouraged testing, and if participants ultimately had a retinal exam during the visit. Additional objective data collected included demographic information, such as gender, age, race, and ethnicity, to analyze with descriptive statistics in identifying possible trends in adherence rates. Subjective data collected included reasons for not having an exam during the visit.

Data was stored via REDCap provided by the university, and informed consent was not required. The university's Institutional Review Board determination was completed in November 2022, and the project was confirmed to not be research, but as quality improvement. No funding was obtained for this project.

Staff Survey

Pre- and post-implementation KAP surveys were developed to assess changes in staff

knowledge and practices based on the education and training (Figure 1). Each survey was anonymous, was available for 1 week, and included grouped data (there was no numbering of surveys or correlation of pre-to post). Answers were tallied and pre-intervention scores were compared to post-intervention scores. A higher average tally after implementation suggested improvement. Hard copies of staff surveys were shredded upon completion of project.

Staff Education

Prior to implementation, a one-hour educational luncheon was held for staff. Topics included diabetic retinopathy, use of the retinal imaging technology, and helpful tips to use for responding to patient questions. During the luncheon, each medical assistant was given the opportunity to relearn how to properly use the retinal imaging device, as well as each staff member was checked off on proper use by the clinic superuser. Furthermore, all staff were educated on the growing deficit in adherence rates among diabetic measures and the need for vigilance when addressing these matters. Feedback from staff during informal interviews after the luncheon included that the information provided was useful, that members felt the information boosted their confidence levels in providing education to patients, and that the majority of staff members felt increased confidence in use of the retinal imaging device.

Patient Education

Patient education flyers were developed, using information adapted from the Centers for Disease Control and Prevention. The flyers were two-sided with one side printed in English (Figure 2a) and the other in Spanish (Figure 2b). A third-party website (www.translated.com) was used for translation purposes, and a Spanish speaking healthcare provider was consulted to verify accuracy of the translation. Abbreviated information from the flyers was placed on the waiting room whiteboard throughout the implementation phase. Medical assistants were

encouraged to reinforce education to patients upon rooming, as well as inquire about questions. After allowing for questions, the medical assistant asked participants if they wished to update their diabetic retinal exam during the visit that day. If the patient wished to have an exam, the exam was completed at the end of the visit.

Data Collection and Management

Throughout implementation, a master data collection list for each day was kept by the front desk staff and medical assistants. See Table 2. These lists were made in the days prior by reviewing the appointment schedules. Study data were collected and managed using REDCap electronic data capture tools hosted at a university in the Midwest (Harris et al., 2009; Harris et al., 2019). Patient names were included on the master list, but this was done only to ensure patients were not counted twice during the implementation phase. The main data points of interest included whether the educational flyers were dispersed, if education was provided, if an exam was completed, and the reason for no exam completed. Hard copies of master lists were shredded at the site upon completion of data entry and analysis.

Charts were reviewed in MEDENT (the electronic health record) throughout implementation to identify the status of last known retinal exams. Additionally, demographic data (gender, age, race, and ethnicity) was extracted on participants to explore trends in adherence rates identified in the literature review. The goal was to analyze each demographic data point using descriptive statistics. However, due to the lack of diversity in age, race, and ethnicity of the sample, this was unable to be completed. An analysis was made on gender; see the results section for details.

As previously mentioned, the data was stored on REDCap, which was password protected and used two-factor authentication. The de-identified data was analyzed using SPSS

version 27. Upon completion of the project, the university faculty member/primary investigator maintained access to the project through REDCap. There is no indication for future use of the collected data.

Results

Pre-implementation Data

A retrospective medical report was run through the electronic health record using the parameters of active adult diabetic patients who have had a retinal exam in the last year. The report indicated that of 499 active adult diabetic patients, 289 (58%) were nonadherent to retinal exams in the year prior (MEDENT, 2021). This data was used for comparison and data analysis after the implementation.

Qualifying Encounters

Fifty-nine participants initially met inclusion criteria, however retrospective chart review revealed that of the 59 total participants, 28 were currently adherent to their annual exam and were subsequently excluded from data analysis. Therefore, the resulting sample size was 31. Of these 31 participants, exam completion was recorded as YES or NO, and if NO a list of reasons was provided. The reasons for NO exam included not enough time, not wanting to, already had appointment scheduled, or other. Fifteen of the 31 patients received exams (48%), and sixteen patients declined exams (52%).

For the 31 qualifying encounters, retinal exam adherence was analyzed through SPSS version 27 using 2 sample Z-proportion test. Adult diabetics who received flyers, education, and were offered exams during implementation did not have statistically higher rates of adherence to retinal exams, as compared to the pre-intervention proportion of patients who were adherent, $Z = .682, p = .248$. While statistically insignificant, the data did show clinical improvement in

adherence, from pre-implementation adherence being at 42% and post-intervention adherence at 48% (MEDENT, 2021). See Figure 3.

Staff Surveys

As previously mentioned, KAP surveys were administered to staff prior to implementation. A total of 9 surveys were completed. The survey sought to understand trends in staff knowledge on diabetic retinopathy, available in-office screening methods, attitudes of ability to provide screenings and education, and current practices. The results can be reviewed in detail in Table 3. Two questions used Likert scales for self-assessed self-efficacy, two questions used YES or NO answers, and the remaining question was multiple choice for self-assessed knowledge and practice habits.

Statistical analysis was not carried out due to a deficit in respondents from pre-implementation to post-implementation. However, it can be noted that out of those who responded in the post-implementation surveys, NONE scored themselves less than 4 for the knowledge of DR question (compared to six or 66% in the pre-implementation survey), and only ONE (16%) scored themselves 3 or less for confidence in using the teleretinal imaging technology (compared to five or 55% in the pre-implementation survey). Furthermore, several staff members verbalized feeling more confident and empowered to offer education and encourage retinal exams after implementation.

Another point to note is that after implementation, only one retinal exam came back with the report of insufficient images and needed to be repeated. Prior to implementation, staff reported this as a common problem. This could correlate with the increased staff confidence in and competence of using technology after retraining occurred.

Providing Patient Flyers/Education

Additional data collected included whether patients were provided flyers upon check-in, whether medical assistants provided/reinforced education about diabetic retinopathy, and whether the medical assistants allowed for patient questions. The responses were recorded as YES or NO. Of the 31 patients included in data analysis, fifteen had retinal exams completed. Of those fifteen, twelve (80%) received flyers, all fifteen (100%) received education from the medical assistants, and fourteen (93%) were allowed time for questions. In those who did not consent for exams ($n = 16$), thirteen (81%) received flyers and fourteen (87%) were allowed time for questions (see Table 4). Statistical analysis was not possible due to small sample sizes for each category (ex: NO for received flyer = 3 for those who did not have exams). However, this would be a topic of interest to consider for future projects.

Demographic Data

Additional demographic data was collected with the goal of exploring trends found during the literature review. An et al. (2018), Chen et al. (2018), Eppley et al. (2019), and Gange et al. (2020) discovered that younger diabetics, Blacks and Hispanics had lower adherence rates as compared to older diabetics, Whites, and non-Hispanics. Furthermore, An et al. (2018) also reported that males were less likely to be adherent. Lack of diversity in the sample limited the trends analyzed.

As previously mentioned, 59 total participants were included in initial data collection, but some were excluded during initial data analysis due to adherence status within the year. Therefore, 43 participants were included in demographic adherence trend analysis, including the 28 patients who were previously adherent and the fifteen who completed a retinal exam during implementation. Of the 43 adherent participants, 27 (63%) identified as males, and 36 (84%) identified as non-Hispanic. This lends support to the literature findings in regard to ethnicity but

contradicts the gender findings.

Barriers to Successful Implementation

Lack of Technical Support

During the pre-implementation phase, collaboration was sought with the corporate technical representative from Welch Allyn. While plans were initially made and agreed upon to hold a formal training course for staff during the educational luncheon, the collaboration abruptly ended when all repeated attempts at communication were left unanswered. Attempts by the clinic staff and owner were also left unanswered, which led to the training being led by the site superuser. While the superuser has several years of experience with the device, formal training by the corporate representative was more desirable as software updates were also a crucial need.

Staff Turnover

Throughout implementation of this quality improvement project, the site experienced a high rate of staff turnover, specifically front desk and medical assistant staff. Frequent updates in workflow had to be made, as well as minor changes to the check-in process of qualifying participants. As discussed by Antony & Gupta (2019), two of the main reasons for quality improvement failure include an incompetent team and inadequate training. Unfortunately, with high staff turnover, it was difficult to develop a team that is highly competent and well trained in the objectives of a quality improvement project, especially when implementation is only for a few weeks.

Semester Break

This project was initiated in mid-December of 2022. Much of the implementation phase was completed during the winter holiday break when the project leader was not in the site. This led to several days of no data collection, as it was often forgotten. It was noted that once the next

semester began, and project leader was back in the site, data collection began again with minimal prompting.

Weather

Since this project was initiated in mid-December, winter weather and snow did lead to several slow days at the clinic where potential participants were not scheduling appointments or were simply not showing up. The initial goal to complete collection was mid-January. However, due to many slower days in clinic, the implementation phase was extended by 2 weeks in order to attempt to collect data on a more robust sample size.

Project Limitations

Lack of Investigator Triangulation

As Moon (2019) describes, triangulation is a method used to ensure the validity and accuracy of data and its analysis. There are four main types of triangulation, however investigator triangulation is when more than one researcher is used to collect and analyze the data during a project (Moon, 2019). This project involved the same investigator as the project leader, educator, data collector, and analyzer. For future project success and to support reliability, consideration of investigator triangulation is a must.

Sample Size

At the start of this project, the clinic had 499 active adult diabetic patients. With most of these patients being seen at three- or six-month intervals, the anticipated sample size during a one-month data collection interval was about 100 patients. However, the barriers previously identified resulted in a much smaller sample size of 31 participants. A sample size that is too small can lead to a statistically insignificant result (Andrade, 2020).

Lack of Diversity

As previously mentioned, the participants were mostly from the same age range and race. Therefore, it is impossible to predict whether a similar QI project would have comparable results in a more diverse sample. Efforts to minimize homogeneity of the sample were made by including ALL diabetics presenting for diabetic related appointments during the data collection period.

Discussion

Project aims included determining whether increasing education to patients would lead to increased retinal exam adherence among adult diabetics, in addition to determining if increasing education to staff would lead to increased usage of available technology, thereby increasing exam adherence. While the first aim was not accomplished in a statistically significant manner, the proportion of patients who received exams during the implementation phase was greater than the pre-implementation proportion. As previously discussed, a major factor in the statistical failure of many quality improvement processes is small sample size (Andrade, 2020).

Furthermore, pre-implementation data was collected over a one-year period, and the data collection period for this quality improvement project was eight weeks. The electronic health record lacked capability of auditing diabetic patients who had been seen during that same eight-week period one year prior which would have been a more accurate pre-implementation proportion to compare to. Therefore, this could have impacted statistical significance.

The secondary aim, determining if increasing education to staff would lead to improved competence and self-efficacy for encouraging uptake of retinal imaging exams, was partially achieved. While adherence rates were not statistically significant, staff continues to offer education and encourage retinal exams to diabetic patients. In the post intervention study period, staff has also verbalized feeling more confident in the use of the available technology (ex:

troubleshooting, positioning), and continue to work towards helping patients become adherent. During a post-implementation informal interview, one staff member said, “I now realize how important these exams are and have gotten four patients to have them this week alone.”

The main expenses for implementation were accrued from staff member time. Potential revenue was explored including average reimbursement for retinal exams. Reimbursement costs were obtained from seven major payors, with the average reimbursement being \$38.76 per patient. If each exam was billed using the CPT code of 2022F/2023F for all 15 patient who had an exam, potential reimbursement was \$581.40. Furthermore, potential additional expenses were explored including start-up and maintenance costs of teleretinal imaging devices. The current price quoted by Welch Allyn for the RetinaVue 700 device is \$11,450 and monthly maintenance costs are \$115. While the start-up costs may seem high, an important fact to consider is the economic burden of diabetic retinopathy.

Implications for Practice

Feedback from staff and lessons learned have led to the formation of a few key implications for practice. The first is the need for a formal protocol describing the entire process, effective ways to provide feedback, and a process for continued reinforcement of process methods. This site does not currently utilize formal, written protocols. Therefore, it would be futile to introduce one at this point. However, there is a central staff core who are in charge of day-to-day operations and have been supportive throughout project implementation. Working together with this core staff would be essential to ensure sustainability.

The second implication is continuing to provide staff education and reinforced training for similar problems. The staff responded to the education and training in such a positive way, ~~that~~ they have continued to verbalize even after project completion how important they felt the

project was. Overall usage of the technology (quality and quantity) has also increased since the project has ended.

One point to note is that in future projects, pre-screening charts for adherence and including only non-adherent patients would be beneficial. This initially led to confusion between front desk staff and medical assistants who were not collecting data on the same patients (front desk staff was including ALL diabetic patients, while medical assistants were initially only including those who were nonadherent). This could have potentially assisted in increasing the actual sample size, as several potential patients may have been missed or incorrectly captured inadvertently.

Conclusion

Diabetic retinopathy causes significant losses for patients that include more than just their vision. Other losses from DR include income, ability to drive, and even ability to live independently (Martinez & Wong, 2019). Experts recommend annual retinal screenings for diabetics, but adherence rates have historically fallen below goal. Significant barriers were identified that affect diabetics' abilities to attain annual exams. However, several solutions have been explored to overcome the barriers, one of which being teleretinal imaging at primary care sites. A quality improvement project was implemented to address the variable aspects of adherence. Statistical significance was not achieved, however useful knowledge was attained which could help guide future project attempts.

Figures

Figure 1. KAP Survey

PRE/POST Implementation Surveys for Staff

1. How comfortable are you with your knowledge of what diabetic retinopathy is? **0-5** (0 is you do not know what it is, 5 is you are very confident in your knowledge)
2. How often should diabetics have retinal exams?
 - a. Every visit
 - b. Every 6 months
 - c. Every year
 - d. Whenever they remember
3. Did you know we are able to do the annual retinal exams for diabetics at this office? **(Yes/No)**
4. How confident are you in the use of the RetinaVue700? **0-5** (0 is you do not know what it is, 5 is you are very confident in your ability).
5. When you see that a diabetic patient has not had their annual exam yet, do you ask them about it/encourage them to have it? **(Yes/No)**

Figure 2a. Patient Education Flyer (English)

DIABETIC EYE HEALTH:

IMPORTANCE OF THE ANNUAL EXAM



How Can Diabetes Harm Your Eyes?

- Diabetes is the main cause of blindness in adults aged 20 to 74. It is also a major cause of blindness for those aged 75 or older.
- Serious eye problems happen more often among people with diabetes.***
- Regular eye exams help your doctor find and treat eye problems early to protect your vision.
- Retinopathy is one of the main blindness causing complications of diabetes.

What is Retinopathy?

- Retinopathy is when small blood vessels in the retina (at the back of the eye) become weak and possibly leak blood.
- This disease can cause blindness if not treated.
- This disease has no symptoms when it starts, so it's important to get your eyes checked regularly.***
- Retinopathy is caused by prolonged high blood sugars, high blood pressure, high cholesterol, and smoking-controlling these factors can help prevent it.

Tips to Keep Your Eyes Healthy

- Get an eye exam at least once a year.***
- A dilated eye exam using special drops to make your pupils large can help your eye doctor find and treat problems to keep you from losing your vision from diabetes.
- However, not all patients require this type of dilated exam; some patients can simply sit in a dark room for a few minutes to let their pupils dilate naturally.
- Your doctor may take pictures of your eyes with a tool called retinal photography which helps the doctor see your retina.
- Did you know this exam can be done during your routine doctor's appointment at Family First Healthcare-Capac?***
- Ask a staff member about getting your annual retinal exam today!**

Adapted from: Centers for Disease Control and Prevention. (n.d.). Take charge of your diabetes: Healthy eyes. <https://www.cdc.gov/diabetes/pdfs/library/Diabetes-Eyes-h.pdf>

Figure 2b. Patient Education Flyer (Spanish)

SALUD OCULAR EN LA DIABETES:



¿Cómo puede dañar la diabetes sus ojos?

- La diabetes es la principal causa de ceguera en adultos de 20 a 74 años. También es una causa importante de ceguera para las personas de 75 años o más.
- Los problemas oculares graves ocurren con más frecuencia entre las personas con diabetes.**
- Los exámenes oculares regulares ayudan a su médico a encontrar y tratar los problemas oculares temprano para proteger su visión.
- La retinopatía** es una de las complicaciones de la diabetes que con más frecuencia causa ceguera.

¿Qué es la retinopatía?

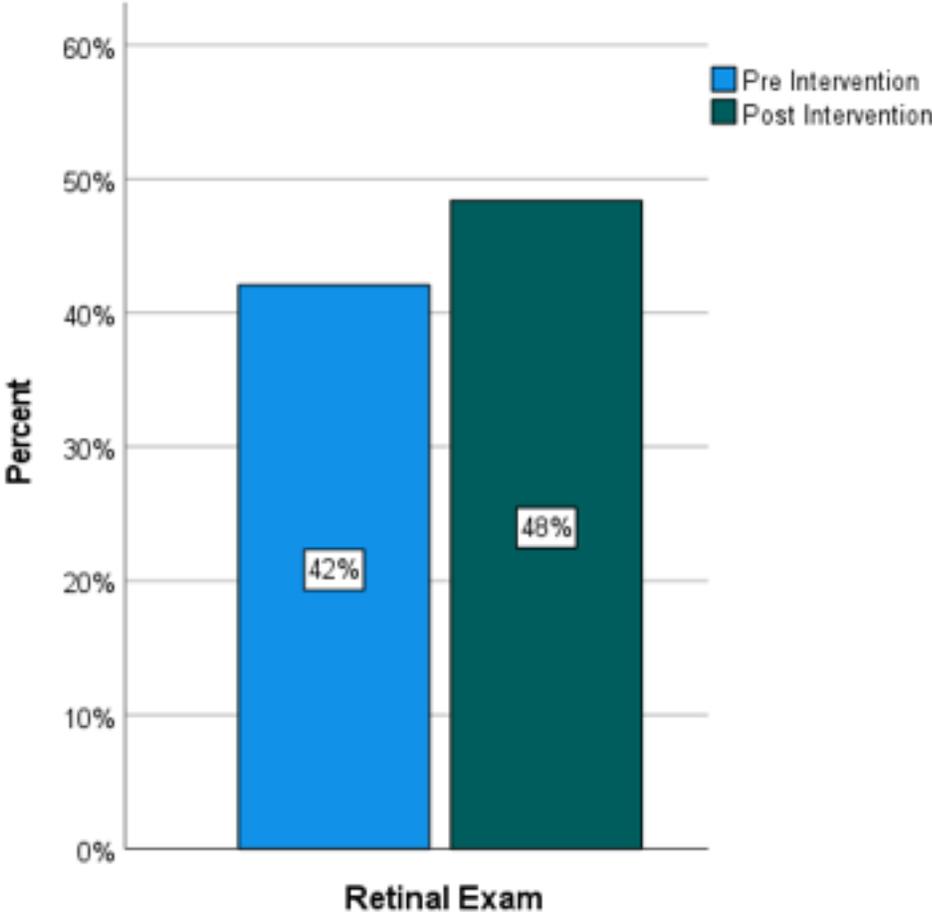
- La retinopatía es cuando los vasos sanguíneos pequeños en la retina (en la parte posterior del ojo) se debilitan y posiblemente pierden sangre.
- Esta enfermedad puede causar ceguera si no es tratada.
- Esta enfermedad no tiene síntomas cuando comienza, por lo que es importante revisarse los ojos con regularidad.**
- La retinopatía está causada por la elevación prolongada de los niveles de azúcar en la sangre, la presión arterial alta, el colesterol alto y el tabaquismo; el control de estos factores puede ayudar a prevenirla.

Consejos para mantener sus ojos saludables

- Hacerse un examen de la vista al menos una vez al año.**
- Un examen de los ojos con dilatación utilizando gotas especiales para agrandar las pupilas puede ayudar a su oftalmólogo a encontrar y tratar los problemas para evitar que pierda la visión a causa de la diabetes.
- Sin embargo, no todos los pacientes requieren este tipo de examen con dilatación; algunos pacientes simplemente pueden sentarse en una habitación oscura durante unos minutos para permitir que sus pupilas se dilaten naturalmente.
- Puede que su médico tome imágenes de sus ojos con una herramienta llamada fotografía de la retina que ayuda al médico a ver su retina.
- ¿Sabía que este examen se puede realizar durante su cita médica de rutina en Family First Healthcare-Capac?**
- ¡Pregúntele a un miembro del personal sobre su examen anual de retina hoy mismo!**

Adaptado de: Centros para el Control y Prevención de Enfermedades. (s.f.). Tome el control de su diabetes: Ojos sanos. <https://www.cdc.gov/diabetes/pdfs/library/Diabetes-Eyes-h.pdf>

Figure 3. Patient Results



Tables

Table 1. SWOT Analysis

<h1>SWOT Analysis</h1>	
Strengths	Weaknesses
<ul style="list-style-type: none"> <input type="checkbox"/> <i>Retinavue700 already available in office</i> <input type="checkbox"/> Support from office manager for this measure <input type="checkbox"/> The staff has been working here for a long time and know patients well <input type="checkbox"/> <i>The staff knows the patients well/patients trust the providers</i> <input type="checkbox"/> Motivation to increase adherence from all levels <input type="checkbox"/> <i>Some front staff already ask patients if they want to be screened during their current visit</i> <input type="checkbox"/> Many patients are motivated to adhere to health maintenance recommendations 	<ul style="list-style-type: none"> <input type="checkbox"/> Longtime staff may be resistant to change <input type="checkbox"/> No case manager to manage diabetic needs <input type="checkbox"/> Staff dynamics <input type="checkbox"/> Recent staff turnover • No recent update training • Opportunity to increase staff knowledge of DR
Opportunities	Threats
<ul style="list-style-type: none"> • Improving quality measures increases opportunity to capture incentive dollars from payors • Fully utilize the tools available at the site to meet quality measures • <i>Potential to increase reimbursement</i> • Potential to train staff in office • Potential to increase patient knowledge of DR • Address access barriers to retinal screening related to SDoH 	<ul style="list-style-type: none"> • Loss of payor reimbursement • Severe weather impacting patient appointments • Potential for Covid-19/influenza surge impacting in-person appointments • Reimbursement for teleretinal imaging changing/being decreased

Table 2. Master List for Data Collection

Date	Patient Name	Flyer given? Y/N	Did MA ask if they have questions? Y/N	Did MA provide education/reinforcement on DR/need for exam? Y/N	Did patient have exam? Y/N	If no exam done, reason: 1- not enough time 2- just did not want to today 3-already have an appointment scheduled with eye dr. 4- will do it "next time"

Table 3. Staff Survey Results

Question	Pre- Implementation Survey (n = 9)	Post- Implementation Survey (n = 6)
1. How comfortable are you with your knowledge of what diabetic retinopathy is? 0-5 (0 is no knowledge, 5 is very confident).	1 = one 2 = three 3 = two 4 = one 5 = two	No answer = one 4 = one 5 = four
2. How often should diabetics have retinal exams? a. every visit b. every 6 months c. every year d. whenever they remember	C = nine	C = six
3. Did you know we are able to offer annual retinal exam in office? Yes or No	Yes = eight No = one	Yes = six
4. How confident are you in the use of RetinaVue 700? 0-5 (0 is unable to use, 5 is very comfortable).	0 = two 1 = one 3 = two 5 = three No answer = one	3 = one 5 = five
5. When you see that a diabetic has not had their annual retinal exam, do you ask them about it/encourage them to have it? Yes or No	Yes = eight No = one	Yes = six

Table 4. Flyers and Education

Exam (Y/N)		Flyer Provided	Medical Assistant Provided Education	Medical Assistant allowed for/answered questions
YES Exam n = 15	YES	12 (80%)	15 (100%)	14 (93%)
	NO	3 (20%)	0	1 (7%)
NO Exam n = 16	YES	13 (81%)	13 (81%)	14 (87%)
	NO	3 (19%)	3 (19%)	N/A = 2

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Improving Adherence to Annual Retinal Screening Among Adult Diabetics in Rural Midwest

Sarah Hunger, BSN, RN
DNP Project Final Defense
March 28, 2023



Acknowledgements

Faculty Advisor:

Dr. Anne McKay, DNP, ANP-BC

Advisory Team:

Dr. Donna Rinker, DNP, MSN, FNP-BC, PMHNP

Dr. Karey Hartford, DNP, MSN, FNP-C

Staff at site



Objectives for Presentation

1. Explore the clinical phenomenon of annual retinal screening adherence among adult diabetics.
2. Synthesize supportive literature and discuss theoretical frameworks used for interventions, organizational assessment, and project plan.
3. Discuss results of project.
4. Discuss implications for practice.
5. Obtain approval of completed DNP project.

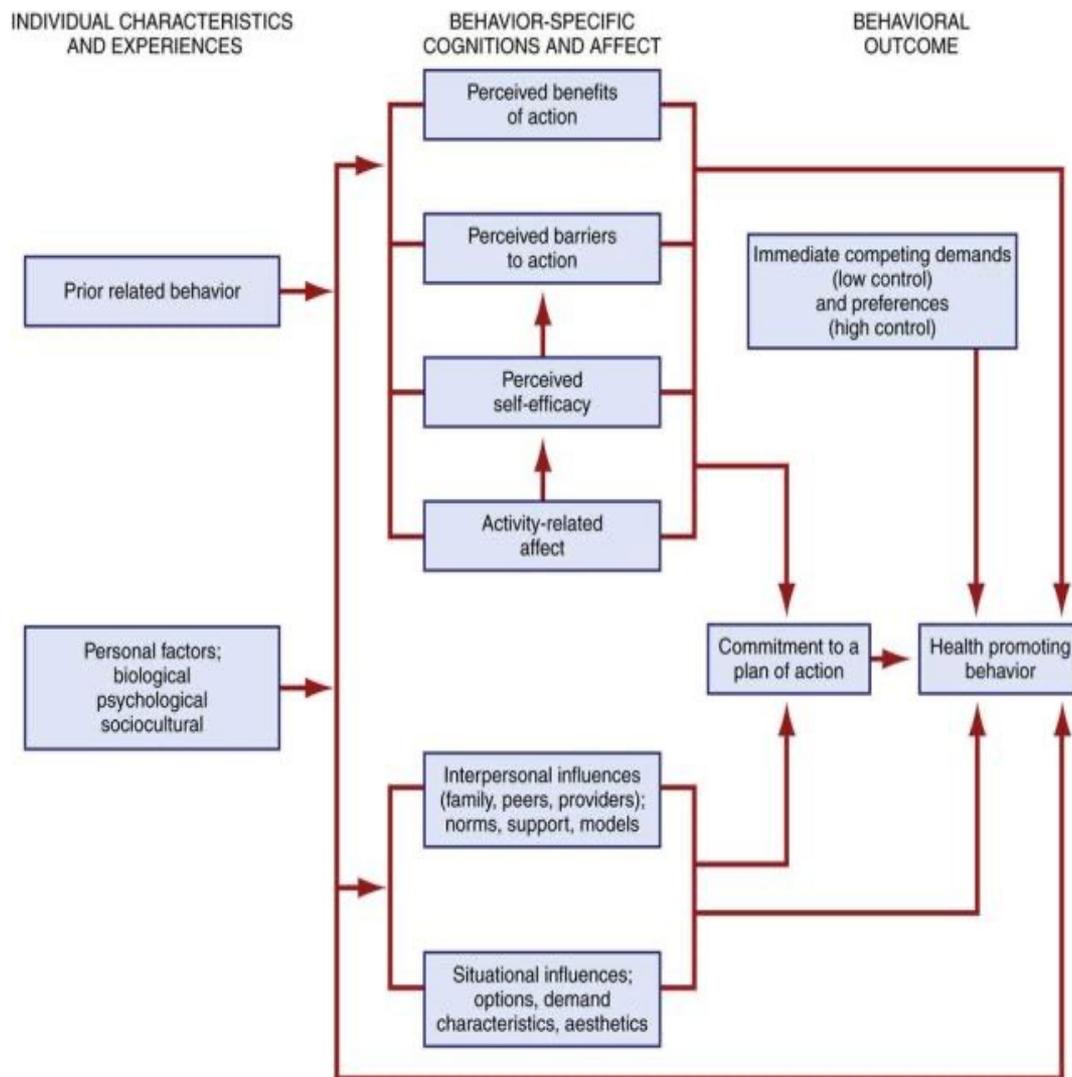


Introduction to Phenomenon

- The prevalence of diabetes is projected to increase by 16 million people by 2030 (Coney, 2019).
- Diabetic retinopathy (DR) affects about 4 million people in the United States (US) and is the top cause of blindness in working aged US adults (Chen et al., 2018; Papadakis et al., 2022).
- Half of all US diabetics have some form of DR (Coney, 2019).
- Many of those living with DR do not know they have it until it is severe, as it is often asymptomatic until the later stages (Coney, 2019; Eppley et al., 2019; Leeman et al., 2022; Martinez et al., 2019).



Conceptual Model for Phenomenon: Pender's Health Promotion Model



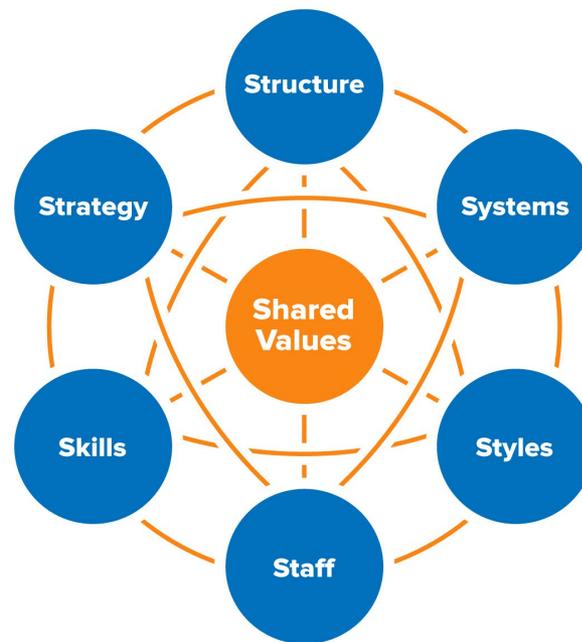
(Psych-Mental Health Hub, 2022).



Current State of the Organization: Data

- 499 diabetic patients actively (within 3 years) seek treatment at a rural, Midwestern family practice (XXXX, 2022).
- 58% of patients had not met the standard of receiving an annual retinal exam (MEDENT Disease Management Report, 2022).
- Barriers to screening were identified when speaking to patients and staff.

Framework: McKinsey 7S



(Mind Tools, 2016).



Current State of the Organization: Stakeholders



SWOT Analysis

Strengths

- *Retinavue700 already available in office*
- Support from office manager for this measure
- The staff has been working here for a long time and know patients well
- *The staff knows the patients well/patients trust the providers*
- Motivation to increase adherence from all levels
- *Some front staff already ask patients if they want to be screened during their current visit*
- Many patients are motivated to adhere to health maintenance recommendations

Weaknesses

- Longtime staff may be resistant to change
- No case manager to manage diabetic needs
- Staff dynamics
- Recent staff turnover
- No recent update training
- Opportunity to increase staff knowledge of DR

Opportunities

- Improving quality measures increases opportunity to capture incentive dollars from payors
- Fully utilize the tools available at the site to meet quality measures
- *Potential to increase reimbursement*
- Potential to train staff in office
- Potential to increase patient knowledge of DR
- Address access barriers to retinal screening related to SDoH

Threats

- Loss of payor reimbursement
- Severe weather impacting patient appointments
- Potential for Covid-19/influenza surge impacting in-person appointments
- Reimbursement for teleretinal imaging changing/being decreased



Clinical Practice Question

In adults (aged 18 and over) with Diabetes*, does increasing staff and patient education on DR lead to increased use of teleretinal imaging at primary care visits, thereby increasing adherence to recommended annual retinal exams?

*For this project, diabetes is defined as type 1 or type 2 diabetes.



Literature Review

- Dual Purpose:
 - 1) Analyze the most recent evidence related to trends in adherence to annual diabetic retinal exams.
 - 2) Identify current evidence/attitudes surrounding teleretinal imaging.
- Aims
 - Understand barriers to annual retinal exams.
 - Identify methods to overcome barriers.
 - Understand the level of evidence behind the use of point of care teleretinal imaging.
 - Establish support behind the use of teleretinal imaging.

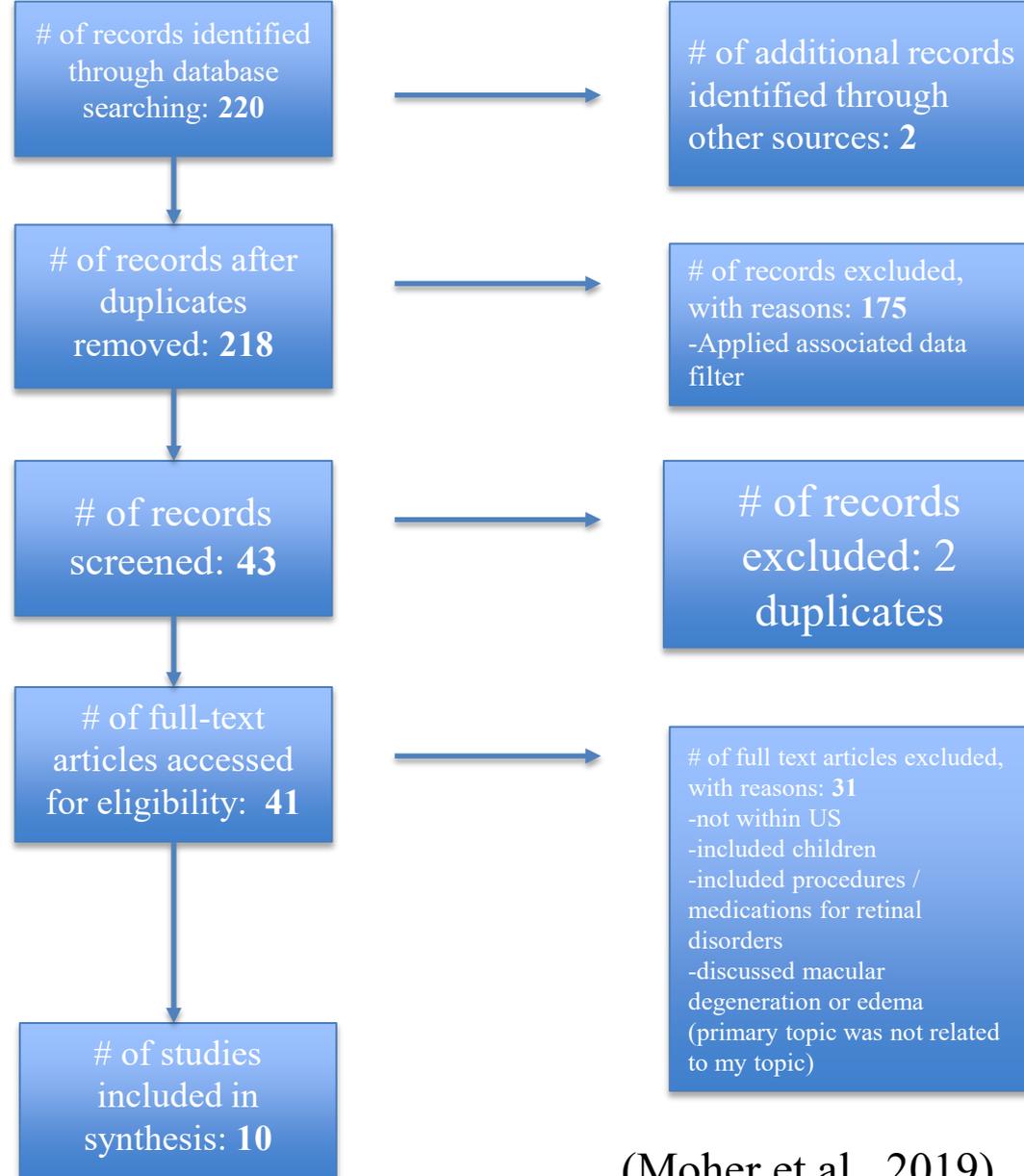


Review Method

- Integrative Review.
- PubMed, CINAHL, Medline.



Literature Synthesis: PRISMA Handout



(Moher et al., 2019).



Literature Review Results

- Two main themes
 1. Major factors which negatively affect adherence to annual retinal screening (An et al., 2018; Chen et al., 2018; Coney, 2019 ; Eppley et al., 2019; Gange et al., 2020; Hatef et al., 2017; Wu et al., 2022).
 - **Modifiable factors** (An et al., 2018; Chen et al., 2018; Gange et al., 2020; Wu et al., 2022).
 - **Nonmodifiable factors** (An et al., 2018).



Literature Review Results

2. The use of teleretinal imaging as an evidenced- based method for increasing adherence to recommended annual exams (Hatef et al., 2017; Leeman et al., 2022; Liu et al., 2021; & Martinez et al., 2019).
- Screening tools, such a teleretinal imaging, lessen the burden of diseases, and thereby medical costs (Coney, 2019).



Literature Review Results

Strengths related to teleretinal imaging:

- Removing some of disease burden from eye care providers (Leeman et al., 2022; Martinez et al., 2019).
 - This may also cut specialist-related costs.
- Significantly cuts costs by:
 - Only paying one copay.
 - Less travel to multiple doctors.
 - DR caught earlier when less severe.
 - High sensitivity/specificity for detection of DR (Hatef et al., 2017; Leeman et al., 2022).



Literature Review Results

Limitations to teleretinal imaging:

- Technology is expensive (Leeman et al., 2022).
- User error can lead to suboptimal images.
 - This could result in the patient needing to be re-screened (Leeman et al., 2022).
 - Potentially leading to higher costs.



Summary of Table

- An et al. (2018)
 - Improving eye exams rates is one of the most challenging measures to attempt, but one of the most important.
- Chen et al. (2018)
 - HCPs have an obligation to their patients, especially those with barriers to measures.
- Coney (2019)
 - The burden of DM and DM related complications will continue to rise.
 - Methods for earlier detection of these complications, such as teleretinal screening, can help to decrease the burden of disease.
- Gange et al. (2020)
 - Teleretinal imaging improved screening rates, especially among those with barriers to care.
- Martinez et al. (2019)
 - Telemedicine increases adherence to annual retinal exams.
 - Teleretinal exams can help to reduce the burden of DR.
- Leeman et al. (2022)
 - DR is often undetectable until it is too severe for intervention.
 - Screening can help prevent the more undetected cases of DR.



Evidence for Project

- Teleretinal technology provides options for those with barriers to care.
- Teleretinal imaging has high sensitivity and specificity.
- Training is easy and device is easy to maintain.
- Exams are quick and do not require pupillary dilation.
- Supported by the ADA and AAO (American Diabetes Association, 2022; American Academy of Ophthalmology, 2019).



Project Methodology



Methods

- **Project Type:** QI
- **Setting:** Rural, privately owned, primary care clinic in the Midwest.
- **Participants:** Patients and Staff
 - Staff (1 physician, 2 NPs, MAs, front desk staff).
 - Patients: Adult diabetics selected by convenience sampling.



Purpose

- The purpose of this quality improvement project was to increase annual retinal screening adherence among adult diabetics through:
 - Increasing education and training to staff.
 - Increasing education to patients.
 - Encouraging patients to have in-office teleretinal exams, when appropriate.



Intervention Timeline

Activity	December 2022	January 2023	February 2023
Staff Education	X		
Pre-implementation staff surveys	X		
Patient education/flyers/data collection	X	X	X
Completion of patient education/data collection period			X
Post-Implementation evaluation and data analysis			X
Post-implementation staff surveys			X

Implementation Framework

Kotter's 8-Step Change Model



(Expert Program Management, 2018).



Implementation Strategies (Powell et al., 2015)

1. Identify and prepare champions.
2. Promote adaptability.
3. Provide local technical assistance.
4. Assess for readiness/identify barriers & facilitators.
5. Develop educational materials.
6. Distribute educational materials.
7. Audit and provide feedback.
8. Facilitation.

Implementation Strategies

Implementation Strategy	Description/Products	Framework Alignment (Model Alignment)
Identify and prepare champions (Powell et al., 2015)	Informal interviews during organizational assessment Project updates periodically throughout planning and prior to implementation	Create Urgency Build coalition Create vision (Interpersonal Influences)
Promote adaptability (Powell et al., 2015)	Pre-implementation surveys Periodic informal interviews with staff Time in organization visualizing workflow	Empower others Build on the change Embed the change (Commitment to POA)
Provide local technical assistance (Powell et al., 2015)	Training prior to implementation	Empower Others (Situational influences)

Implementation Strategies

Implementation Strategy	Description/Products	Framework Alignment (Model Alignment)
Assess for readiness/identify barriers & facilitators (Powell et al., 2015)	Pre-implementation surveys Educational luncheon Informal Interviews	Create vision Communicate vision Empower others (Situational/Interpersonal Influences)
Develop educational materials (Powell et al., 2015)	Flyers/handouts created in English and Spanish	Create vision (Commitment to POA)
Distribute educational materials (Powell et al., 2015)	Educational luncheon. White board in waiting room was used.	Communicate vision Empower others (Commitment to POA)

Implementation Strategies

Implementation Strategy	Description/Products	Framework Alignment (Model Alignment)
Audit and provide feedback (Powell et al., 2015)	Informal staff interviews throughout implementation Offered staff opportunities for feedback.	Empower others Build on the change Embed the change (Perceived Barrier/Benefits/Self efficacy)
Facilitation (Powell et al., 2015)	Collaboration with team and staff to determine trajectory of interventions Ongoing support/encouragement of staff to participate	Build a coalition Empower others Create quick wins Build on the change Embed the change (Perceived Barriers/Benefits/Self efficacy, commitment to POA)

Evaluation & Measures Handout

Topic	Concept	How Measured	When Measured	Who Measured
Implementation Strategies (Powell et al., 2015)	Identify and prepare champions	Staff interviews (informal), Org. assessment	Pre implementation	Student
	Promote adaptability	Staff interviews	Pre-implementation, during implementation	Student
	Provide local technical assistance	Educational Luncheon	Pre-implementation, during implementation as necessary	Student
	Assess for readiness/identify barriers & facilitators	Staff interviews (informal), Org. Assessment	Pre-implementation	Student
	Develop educational materials	N/A	N/A	N/A
	Distribute educational materials	Attendance, staff discussions	Pre-implementation	Student
	Audit and provide feedback	Pre-and post surveys, periodic staff interviews/discussions	Pre-implementation, throughout implementation, post-implementation	Student,
	Facilitation	Post implementation survey	Post implementation	Student

Evaluation & Measures

Topic	Concept	How Measured	When Measured	Who Measured
Patient outcomes	Increased annual retinal exams	EHR audit	Post-implementation	Student
	Decreased instances of missed DR/ DR caught earlier	EHR audit	Post implementation	Student
	Increased understanding of DR	Patient discussions	Post-implementation	Student, medical assistants

Topic	Concept	How Measured	When Measured	Who Measured
System Outcomes	Increased compliance of annual retinal screening	EHR audit	Post-implementation	Student
	Increased use of point of care teleretinal imaging	EHR audit	Post-implementation	Student, champion
	Improved use of teleretinal device	Staff observation	Throughout implementation	Student
	Increased staff awareness of DR	Survey	Post-implementation	Student
	Increased staff confidence with usage of teleretinal imaging device	Survey	Post-implementation	Student



Ethical Considerations

- Patient information was protected, and DNP student was HIPAA compliant.
 - Epigeum Human Subjects Protection training.
 - Epigeum Responsible Conduct of Research training.
 - Organizational computer with site VPN used.
 - Data stored in REDCap account provided by GVSU.
- IRB determination completed by GVSU's review board.
- Deidentified data was shared with project team and statistician.



IRB Approval

Handout



Date: November 10, 2022

To: Anne McKay
From: Office of Research Compliance & Integrity
Project Title: Improving Adherence to Annual Retinopathy Screening Among Adult Diabetics in Rural ██████████ Midwest
Project Number: 23-085-H
Submission Type: IRB Research Determination Submission

Action: Not Research
Effective Date: November 10, 2022
Review Type: Administrative Review

Thank you for your submission of materials for your planned scholarly activity. It has been determined that this project does not meet the definition of research* according to current federal regulations. The project, therefore, does not require further review and approval by the IRB.

Scholarly activities that are not covered under the Code of Federal Regulations should not be described or referred to as "research" in materials to participants, sponsors or in dissemination of findings. While performing this project, you are expected to adhere to GVSU's code of conduct and any discipline-specific code of ethics.

A summary of the reviewed project and determination is as follows:

The purpose of this project is to determine whether a plan including training staff and patient education will increase the use of point of care tele-retinal imaging technology, thereby increasing adherence to recommended annual retinal screening by adult diabetics. Although this is a systematic investigation, it is designed to improve the care patients receive at a local health clinic using evidence-based practices. Because this is not designed to create new generalizable knowledge, it does not meet the federal definition of research and IRB oversight is not needed.

This determination letter is limited to IRB review. It is your responsibility to ensure all necessary institutional permissions are obtained prior to beginning this project. This includes, but is not limited to, ensuring all contracts have been executed, any necessary Data Sharing Agreements and Material Transfer Agreements have been signed, and any other outstanding items are completed.

If you have any questions, please contact the Office of Research Compliance and Integrity at (616) 331-3197 or rci@gvsu.edu. Please include the project title and project number in all correspondence with our office.

*Research is a systematic investigation, including research development, testing, and evaluation, designed to develop or contribute to generalizable knowledge (45 CFR 46.102 (d)).

Office of Research Compliance and Integrity | 1 Campus Drive | 049 James H. Zumberge Hall | Allendale, MI 49401
Ph 616.331.3197 | rci@gvsu.edu | www.gvsu.edu/ri





Pre/Post Implementation Staff Surveys

- Based on KAP surveys (Knowledge, Attitude, Practice).
- Were available for 1 week and were anonymous.
- Submitted to folder at site mentor's desk; data entered onto DNP student's password-protected computer; hard copies were shredded.



Pre/Post Survey

1. How comfortable are you with your knowledge of what diabetic retinopathy is?
0-5 (0 is you do not know what it is, 5 is you are very confident in your knowledge)
2. How often should diabetics have retinal exams?
 - a. Every visit
 - b. Every 6 months
 - c. Every year
 - d. Whenever they remember
3. Did you know we are able to do the annual retinal exams for diabetics at this office?
(Yes/No)
4. How confident are you in the use of the RetinaVue700?
0-5 (0 is you do not know what it is, 5 is you are very confident in your ability).
5. When you see that a diabetic patient has not had their annual exam yet, do you ask them about it/encourage them to have it? **(Yes/No)**



Patient Education Flyers

- Handed out by up front staff at check-in for diabetic check-ups.
- Available in English and Spanish.
- Adapted from information from the Centers for Disease Control and Prevention.



DIABETIC EYE HEALTH:

IMPORTANCE OF THE ANNUAL EXAM



Patient Education Flyer, English Handout

How Can Diabetes Harm Your Eyes?

- Diabetes is the main cause of blindness in adults aged 20 to 74. It is also a major cause of blindness for those aged 75 or older.
- Serious eye problems happen more often among people with diabetes.***
- Regular eye exams help your doctor find and treat eye problems early to protect your vision.
- Retinopathy*** is one of the main blindness causing complications of diabetes.

What is Retinopathy?

- Retinopathy is when small blood vessels in the retina (at the back of the eye) become weak and possibly leak blood.
- This disease can cause blindness if not treated.
- This disease has no symptoms when it starts, so it's important to get your eyes checked regularly.***
- Retinopathy is caused by prolonged high blood sugars, high blood pressure, high cholesterol, and smoking-controlling these factors can help prevent it.

Tips to Keep Your Eyes Healthy

- Get an eye exam at least once a year.***
- A dilated eye exam using special drops to make your pupils large can help your eye doctor find and treat problems to keep you from losing your vision from diabetes.
- However, not all patients require this type of dilated exam; some patients can simply sit in a dark room for a few minutes to let their pupils dilate naturally.
- Your doctor may take pictures of your eyes with a tool called retinal photography which helps the doctor see your retina.
- Did you know this exam can be done during your routine doctor's appointment at Family First Healthcare-Capac?***
- Ask a staff member about getting your annual retinal exam today!**

Adapted from: Centers for Disease Control and Prevention. (n.d.). Take charge of your diabetes: Healthy eyes. <https://www.cdc.gov/diabetes/pdfs/library/Diabetes-Eyes-h.pdf>

SALUD OCULAR EN LA DIABETES:



Patient Education Flyer, Spanish Handout

¿Cómo puede dañar la diabetes sus ojos?

- La diabetes es la principal causa de ceguera en adultos de 20 a 74 años. También es una causa importante de ceguera para las personas de 75 años o más.
- Los problemas oculares graves ocurren con más frecuencia entre las personas con diabetes.**
- Los exámenes oculares regulares ayudan a su médico a encontrar y tratar los problemas oculares temprano para proteger su visión.
- La retinopatía es una de las complicaciones de la diabetes que con más frecuencia causa ceguera.**

¿Qué es la retinopatía?

- La retinopatía es cuando los vasos sanguíneos pequeños en la retina (en la parte posterior del ojo) se debilitan y posiblemente pierden sangre.
- Esta enfermedad puede causar ceguera si no es tratada.
- Esta enfermedad no tiene síntomas cuando comienza, por lo que es importante revisarse los ojos con regularidad.**
- La retinopatía está causada por la elevación prolongada de los niveles de azúcar en la sangre, la presión arterial alta, el colesterol alto y el tabaquismo; el control de estos factores puede ayudar a prevenirla.

Consejos para mantener sus ojos saludables

- Hacerse un examen de la vista al menos una vez al año.**
- Un examen de los ojos con dilatación utilizando gotas especiales para agrandar las pupilas puede ayudar a su oftalmólogo a encontrar y tratar los problemas para evitar que pierda la visión a causa de la diabetes.
- Sin embargo, no todos los pacientes requieren este tipo de examen con dilatación; algunos pacientes simplemente pueden sentarse en una habitación oscura durante unos minutos para permitir que sus pupilas se dilaten naturalmente.
- Puede que su médico tome imágenes de sus ojos con una herramienta llamada fotografía de la retina que ayuda al médico a ver su retina.
- ¿Sabía que este examen se puede realizar durante su cita médica de rutina en Family First Healthcare-Capac?**
- ¡Pregúntele a un miembro del personal sobre su examen anual de retina hoy mismo!**

Adaptado de: Centros para el Control y Prevención de Enfermedades. (s.l). Tome el control de su diabetes: Ojos sanos. <https://www.cdc.gov/diabetes/es/pdfs/library/Diabetes-Eyes-h.pdf>



Analysis Plan

- SPSS Version 27.
- A 2-sample Z-proportion test compared pre- and post-intervention proportions of patients who received retinal exams.
 - The pre-intervention proportion was taken from the prior year adherence rate.



Results



Results: Participant Characteristics

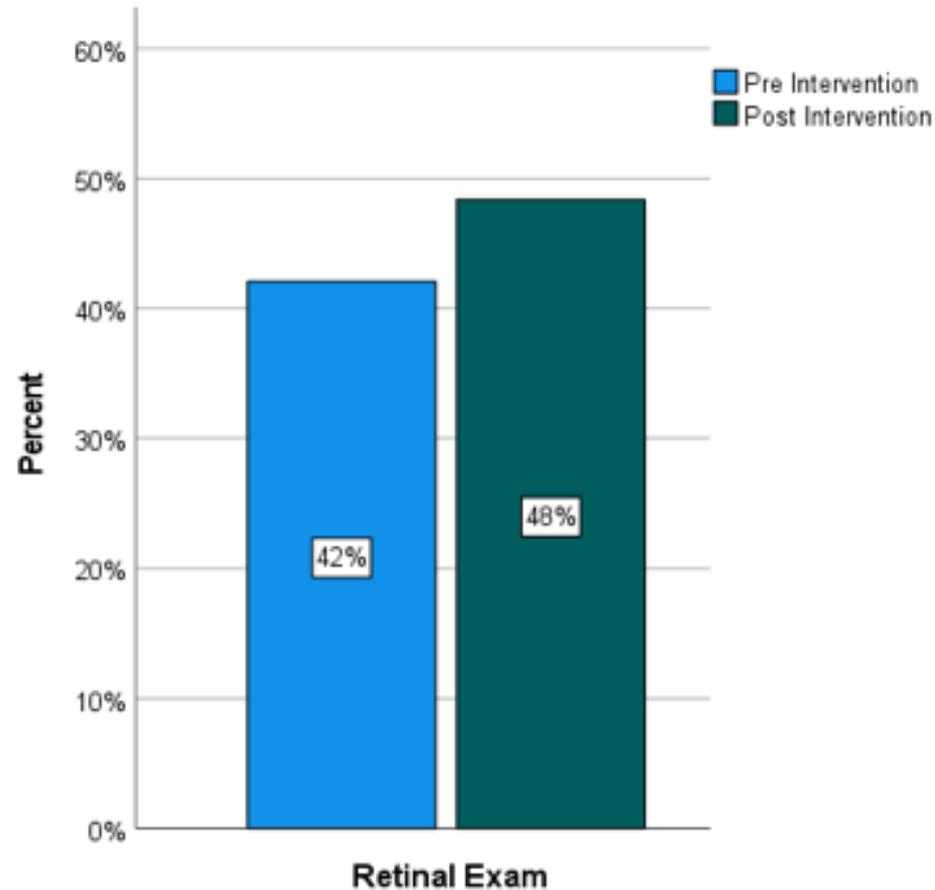
- Staff: 1 physician, 2 NPs, Medical Assistants, Front Desk staff, office manager.
- Patients: 59 met initial inclusion criteria.
 - 28 excluded from analysis due to adherence.
 - 31 included in final analysis.
 - Demographic trends analyzed.

Results: Patient Outcomes Handout

n = 31

YES Exam = 15

p = .248





Results: Pre/Post Education Survey Handout

Question	Pre- Implementation Survey (n = 9)	Post- Implementation Survey (n = 6)
1. How comfortable are you with your knowledge of what diabetic retinopathy is? 0-5 (0 is no knowledge, 5 is very confident).	1 = one 2 = three 3 = two 4 = one 5 = two	No answer = one 4 = one 5 = four
2. How often should diabetics have retinal exams? a. every visit b. every 6 months c. every year d. whenever they remember	C = nine	C = six
3. Did you know we are able to offer annual retinal exam in office? Yes or No	Yes = eight No = one	Yes = six
4. How confident are you in the use of RetinaVue 700? 0-5 (0 is unable to use, 5 is very comfortable).	0 = two 1 = one 3 = two 5 = three No answer = one	3 = one 5 = five
5. When you see that a diabetic has not had their annual retinal exam, do you ask them about it/encourage them to have it? Yes or No	Yes = eight No = one	Yes = six

Results: Implementation Strategy

Implementation Strategy	Result
Identify and prepare champion (Powell et al., 2015).	Two champions were identified (up front staff).
Promote adaptability (Powell et al., 2015).	Several challenges presented during the project and made adaptability a key component.
Provide local technical assistance (Powell et al., 2015).	Attempted on multiple occasions. The local representative stopped responding to calls and emails.
Assess for readiness/identify barriers & facilitators (Powell et al., 2015)	Done during organizational assessment. Also done throughout when challenges presented.



Results: Implementation Strategy

Implementation Strategy	Result
Develop educational materials (Powell et al., 2015)	Whiteboard in waiting room was utilized. Handouts were developed in English and Spanish.
Distribute educational materials (Powell et al., 2015)	Staff education was done in December 2022. Patient flyers were distributed upon check-in.
Audit and provide feedback (Powell et al., 2015)	Staff were asked daily about progress and room for improvement. Patients were asked about exams.
Facilitation (Powell et al., 2015)	DNP student was readily available during implementation to assist with changes, if necessary. Daily encouragement/verbal/email/reminders.

Proposed Budget & Resources Handout

Revenue for Project

Project Manager Time	\$19,600	
PCP Time (Site Mentor) Time	\$2,280	
Primary Project Advisor Time	\$3,090	
Secondary Advisory Time	\$515	
Office Manager Time	\$2,280	
Consultations (Stats, Equipment Rep)	\$314	
Supplies (Use of computer, printing)	\$800	
Total Revenue		\$28,879

Expenses of Project

Project Manager Time	\$19,600	
PCP Time (Site Mentor) Time	\$2,280	
Primary Project Advisor Time	\$3,090	
Secondary Advisory Time	\$515	
Office Manager Time	\$2,280	
Consultations (Stats, Equipment Rep)	\$314	
Supplies (use of computer, printing)	\$800	
Total Expenses		\$28,879

Potential Revenue/Expenses of Start up

Cost of technology (RetinaVue 700)	\$11,450	
Monthly maintenance costs	\$125	
Average reimbursement per patient from commercial insurance	\$38.76	(salary.com, 2022)



Discussion

- Several unexpected barriers arose during the project.
- Continuance would require an actual protocol agreed upon by front desk staff and MAs.
- There is potential to increase adherence and reimbursement.



Limitations

- Small sample size.
- Short data collection period.
- Nondiverse sample.
- Lack of triangulation.



Implications for Practice

- Staff feedback is essential.
- Use of education for future projects.
- The need for a consistent process/protocol is essential.
- Fine-tuning inclusion criteria for future projects.
- Ensuring correct CPT coding is completed.
- Evaluation of patient education as a potential future implication.



Conclusions

- Results were not statistically significant, however did show clinical significance.
- Engagement by staff is crucial for similar projects.
- The use of teleretinal imaging technology in primary care is beneficial in many ways.
- Enactment of project was critical to gaining competency in DNP essentials.



Sustainability Plan

- Identify adherence champion (Powell et al., 2015).
- Collaborate with Welch Allyn to ensure technology/software is always updated and new staff receives formal training on device.
- Develop a consistent process for identifying which patients to screen, who is responsible for recording the completion of exams, and making sure the correct CPT codes are billed.
- Explore the options to send reminders in mail/via text (Watterson et al., 2018).



Dissemination

- Organizational
 - Each provider and the office manager will receive a copy of the results and manuscript.
 - The results will be posted in the lunchroom, as well as at the front desk, and the medical assistant desk.
- Scholarly
 - Manuscript will be submitted to Scholarworks for public dissemination.

DNP Essentials Reflection

DNP Essential (American Association of Colleges of Nursing, 2006).	Reflection
I: Scientific Underpinnings for Practice	Completed lit review and used evidence to support, develop, and implement plan.
II: Organizational and Systems Leadership	Organizational assessment, SWOT, engaging stakeholders, encouraging feedback, facilitation of intervention.
III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice	Developing a process for an evidence-based method to increase retinal screening rates. Retrospective chart review, evaluation and analysis of data collected.
IV: Information Systems/Technology	Using teleretinal imaging technology, REDCap for data storage, and EMR for chart audits.

DNP Essentials Reflection

DNP Essential (American Association of Colleges of Nursing, 2006).	Reflection
V: Advocacy for Health Care Policy	Advocated for increased use of teleretinal imaging technology within organization, as well as patient empowerment for health promotion through education to improve patient outcomes.
VI: Interprofessional Collaboration	Met with physician, nurse practitioners, office manager, medical assistants, and front desk staff. Collaborated with Welch Allyn representative.
VII: Clinical Prevention and Population Health	Analyzed data collected and trends among demographical groups with the goal of improving health among ALL patients.
VIII: Advanced Nursing Practice	Completed > 1000 hours in clinical and immersion



Questions?

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