# Visual Aids to Promote Adherence and Compliance with Screening Guideline for Diabetic Retinopathy: A Doctor of Nursing Practice Project

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**Abstract**

Diabetic retinopathy (DR) is the leading cause of adult blindness in the United States. It afflicted 7.7 million Americans in 2010, is anticipated to rise to 11 million by 2030, and will nearly double by 2050. Early DR is a microvascular complication of diabetes with no visual warning symptoms. Studies show that early detection with an annual dilated diabetic eye exam can prevent serious vision loss or blindness caused by advanced DR. Challenges to annual screening adherence include the lack of patient understanding of diabetic eye diseases and the low rate of timely diabetic eye referrals by clinicians. Research supports the use of visual aids to enhance patient education in outpatient settings. Implemented at a primary care clinic with predominantly non-English-speaking Vietnamese patients, this pilot project was an evidence-based initiative to place culturally-appropriate, English and Vietnamese-translated DR infographic posters in exam rooms as a tool to enhance patient education on the importance of annual dilated eye exam and to promote the rate of timely eye referrals by clinicians. Patient surveys confirmed that the presence of DR infographic posters had a positive impact on patient perspective, with 96% of diabetic patients declaring a positive intent to pursue annual DR eye screening. Almost 50% indicated that the presence of DR posters was the sole factor that influenced their decision. Prior to implementation, a review of the clinic's EMR showed that only 19% of diabetic or pre-diabetic patients had a referral or eye exam report from an eye specialist. This rose to 30% during implementation and increased to 33% post-implementation. The results from this pilot demonstrated that the use of culturally-appropriate visual aids in primary care clinics can influence both patient and clinician behaviors positively towards early and annual DR screening.

*Keywords:* diabetic retinopathy, blindness prevention, primary care, eye referral, dilated eye exam, eye screening, patient adherence, visual aids, poster

Visual Aids to Promote Adherence and Compliance with Screening Guideline for Diabetic Retinopathy: A Doctor of Nursing Practice Project

## Introduction

Diabetes mellitus (DM) is the seventh leading cause of death, affecting 34.2 million Americans, or 10.5% of the U.S. population, with 26.9 million diagnosed, and 7.3 million undiagnosed (Center for Disease Control and Prevention/CDC, 2020). DM is a complex healthcare problem to manage because it causes severe long-term adverse health outcomes and requires serious lifestyle modifications (Chawla, Chawla, & Jaggi, 2016). Among these complications, the severe effect on his or her vision greatly impacts a person's quality of life and independence. Diabetic retinopathy (DR) is a microvascular retinal complication of diabetes afflicting up to 80% of all patients who have had diabetes for 10 or more years (Doshi, Shenoy, Sidhpura, & Gharpure, 2016). DR is the leading cause of blindness among adults in the U.S., accounting for 80% of cases of legal blindness in Americans aged 20 to 74 years (Coney, 2019). In 2019, approximately 463 million adults worldwide had diabetes (International Diabetes Federation/IDF, 2019). According to Das (2016) between 35% to 49% of all diabetics have DR, of which one-third also has vision-threatening DR (Lee, Wong, and Sabanayagam, 2015). DR has become a growing national epidemic in the U.S., with more than 7.7 million Americans afflicted in 2010. That figure is expected to rise to 11 million by 2030 and nearly double to 14.6 million by 2050 (National Eye Institute/National Institutes of Health-NEI/NIH, 2020b). Despite the fact that early screening with an annual dilated eye exam has been proven to be an effective preventive measure for DR, adherence rates to early eye screening continues to remain lower than anticipated (Benoit et al., 2019). Such compelling evidence calls for change in the practice of health care, especially in regards to eye care services for diabetic patients.

## Background and Significance

DR can cause severe vision loss through chronic progressive damage to the capillary blood vessels of the retina (American Optometric Association/AOA, 2018). In a 2018 American Eye-Q survey by the AOA, almost half of the respondents did not know whether diabetic eye disease causes visible symptoms. Unfortunately, early-stage DR usually presents without any warning symptoms, such as blurry vision or eye pain. Also, over one-third of the respondents did not know that a dilated comprehensive eye exam is the only way to tell if a person with diabetes is at risk for blindness (AOA, 2018). The key to early detection and management of DR is an annual dilated diabetic eye exam, which can prevent significant vision loss and eventual blindness for people with DM (Sinclair & Schwartz, 2019). The American Diabetes Association (ADA) guidelines state that for patients with Type I or Type II DM with no or minimal DR, an annual dilated eye exam is recommended (Solomon et al., 2017). A biennial exam is recommended when there is no evidence of DR on one or more annual dilated eye exams and their blood sugar is well-controlled (ADA, 2019).

There are two main stages of DR: non-proliferative and proliferative. In the early-stages of non-proliferative DR (NPDR), chronically high blood sugar levels lead to damage of the walls of the capillary blood vessels in the retina, causing retinal veins to dilate into micro-aneurysms. NPDR damage can be seen on dilated eye exams as early as the pre-diabetes stage when blood glucose is borderline high (National Institute of Diabetes and Digestive and Kidney Diseases - NIDDK/NIH, 2017). Red blood cells and plasma fluid from damaged capillaries then leak into the surrounding retinal interstitial space resulting in intra-retinal hemorrhages and retinal edema (Corcóstegui et al., 2017). Macular edema occurs when the macula (the part of the retina responsible for detailed central vision) swells with fluid, causing significant loss of vision and

eventual blindness, if not promptly treated (Porter, 2018). Diabetic macular edema (DME), most commonly seen in moderate and advanced stages of DR, is the most common cause of vision loss for people with diabetes (Boyd, 2020).

Proliferative DR (PDR) is an advanced stage of DR characterized by the formation of retinal neovascularization due to chronic retinal ischemia following severe NPDR (Corcóstegui et al., 2017). Untreated PDR also leads to severe vision loss and blindness. This occurs when fragile, newly-formed retinal blood vessels break and bleed into the vitreous humor (vitreous hemorrhage) and ultimately cause a tractional retinal tear and detachment (Boyd, 2020). DR is a major cause of blindness in the U.S., accounting for 12,000 to 24,000 new cases per year (CDC, 2017). Forty to 45% of Americans with diagnosed diabetes have developed some degree of DR (NEI/NIH, 2020a).

Amongst patients with Type I DM, one-third had no eye exam visits within 5-years and only 26.3% have met the ADA recommendation (Benoit et al., 2019). Benoit et al. (2019) further mentioned that even amongst insured patients with diabetes, almost half of patients with Type II DM have had no eye exam visits within 5-years and only 15.3% have met the ADA recommendation. Since vision loss and blindness caused by diabetes is preventable in 95% of DR cases, it is essential to increase awareness and adherence to annual dilated eye exams (NEI/NIH, 2019). Visual aids, such as infographic posters in exam rooms, can be used to educate diabetic patients and to serve as a reminder for clinicians on the importance of referring their patients for an annual dilated eye exam.

## Implementation Model for Evidence-Based Practice

This project used the Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Iowa Model) as an implementation framework due to its versatility

and applicability. The Iowa Model is widely known and is commonly used as a guide for the implementation of evidence-based practice (EBP) at the organizational level (Iowa Model Collaborative, 2017). The Iowa Model describes a systematic, multi-step process for project implementation, presented as an algorithm that includes three critical decision points as well as feedback loops to implement practice change (see Figure 2).

The first step in the Iowa model is to identify the triggers or opportunities where an EBP is warranted which can be either knowledge-focused or a problem-focused in nature. The criteria for the triggers can be based on clinical, patient, or organizational issues, data regarding new evidence, agency requirements, regulations for accreditation, or the philosophy of care. The next step is to state the question or purpose of the project, followed by the first decision point. If the topic is determined to be a priority for the organization or the practice, then forming a team as well as assembling, appraising, and synthesizing a body of evidence would be the next steps. After conducting a systematic search with the clinical question and gathering and analyzing the literature related to the topic, a second decision point is made. If it's determined that there is adequate evidence to implement a practice change, then the following step would be to design and pilot the practice changes based on the evidence. Finally, the last decision point is evaluating the results and deciding whether or not the change is appropriate for adoption into practice. If the practice change is appropriate for adoption into practice, it would be integrated and sustained. Lastly, the results of practice change should be disseminated across the organization.

Brown (2014) also emphasized that using the Iowa Model can guide nurses and interdisciplinary team members through the process of organizing and translating research into clinical practice while improving patient outcomes. In addition, the model allows the project team to implement a small-scale pilot change and evaluate it in terms of feasibility and desired

outcome measures within a specific setting (Brown, 2014). Furthermore, the Iowa model is widely utilized as a practical process for disseminating EBP projects. The model allows its users to trial the practice change using a pilot approach and to critically analyze the results before a full adoption (Buckwalter et al., 2017). With strong support in literature accompanied by a distinct, systematic implementation process, the Iowa Model possesses all of the important components to serve as an appropriate guide for this DNP project. The permission to use this framework was granted by the University of Iowa Hospital and Clinics (see Appendix A).

## Identify Triggering Issues/Opportunities

According to Coney (2019), diabetes-related retinal disorders accounted for $4.1 billion in annual U.S. healthcare costs in 2013. In outpatient care, the yearly cost to treat DR ranked the highest in the total cost of treatment for visual disorders and imposed a high average cost per year in the treatment of diabetic patients. Today, the treatment cost for DR is even higher, making it even less affordable for many diabetic patients (Coney, 2019). The NEI/NIH (2019) reported that 95% of the time, serious vision loss or blindness caused by diabetes can be prevented with early detection, timely treatment, and appropriate follow-up care. Even though long-term treatment costs for DR are high and it significantly impacts a diabetic patient's quality of life, life-changing visual complications due to DR can be avoided through regular monitoring and early intervention. Annual diabetic eye exams help protect a diabetic patient's vision, preserve their quality of life, and reduce the financial burden of diabetes. Therefore, it is critically important and imperative for health care providers (HCPs) at the primary care level to promote referrals for annual dilated eye exams for their diabetic patients.

In primary care clinics, patient adherence to annual dilated diabetic eye exams varies widely due to barriers to screening, which include patient embarrassment or fear of diagnosis,

lack of awareness or knowledge of the effects of DR on eye health and vision, absence of eye referral recommendations by the providers, and financial concerns (van Eijk et al., 2012). The patient's lack of knowledge regarding the long-term effects of diabetes on vision and the importance of annual DR screening contributes to low patient compliance with the ADA's recommendation of annual eye exams (Lundeen et al., 2019). A lack of visual aids or cues, which may improve communication between the patient and their HCP, contributes to a patient's difficulty with making health-related decisions, along with their ability to fully understand their health conditions and the potential complications (Garcia-Retamero, Okan, & Cokely, 2012).

Visual aids or infographics such as models, photo-novelas, videos, drawings, pamphlets, pictures, or charts, and graphs with numerical information and minimal written details, are considered to be effective tools to illustrate and enhance health literacy skills (Hersh, Salzman, & Snyderman, 2015). Visual aids and infographics also elevate the understanding of health risks and promote overall health outcomes and patient safety (Hersh, Salzman, & Snyderman, 2015). The use of visual aids along with written health information helps to make patient education materials more comprehensible, more effective at promoting long-term health behaviors, as well as enhance patient behavior and disease prevention (Garcia-Retamero & Cokely, 2011). Furthermore, using visual aids is helpful and effective for promoting patient comprehension and education regarding health problems and preventative care for various health topics in populations of various ages, cultural backgrounds, and literacy abilities (Garcia-Retamero & Cokely, 2013).

A well-constructed infographic is considered to be the most economic, effective, easy-to-remember, and ethical method for the communication of health risk and promotion of preventative care approaches in various health care settings, including the primary care setting

(Garcia-Retamero & Cokely, 2011). Andrulis and Brach (2007) emphasized the importance of cultural and literacy appropriateness when translating the patient education materials into a different language since the concept of all-encompassing does not always apply for patients of Hispanic origins or non-Hispanic Asians. More specifically, 29% of Spanish-speaking individuals could not understand a Spanish drug information sheet which was translated directly from English and lacked cultural sensitivity and linguistic appropriateness (Andrulis & Brach, 2007). Therefore, the process of transcreation involves not only accurately translating educational materials from their English version but also ensuring they are appropriate for the intended audience's culture, language, as well as being easy to read (Andrulis & Brach, 2007).

Since DR is a preventable eye disease, early screening and detection, and timely treatment for patients can prevent severe vision loss and permanent blindness. Relevant research literature on the use of visual aids was gathered and appraised in order to develop an appropriate intervention strategy for this project. The project's aims were to overcome the barriers hindering patient adherence, promote timely referrals by HCPs for DR screening in outpatient settings, and ultimately reduce healthcare costs. This project may be used by other primary care clinics as a guide to transform their current practices regarding DR preventative care from a reactive to a more proactive approach. Successful implementation could result in increased patient adherence with annual eye exams, improvement in the quality of care for patients with diabetes, and lead to a reduction in the cost of health care for diabetic patients and the entire healthcare system.

## Purpose and Clinical Question

The purpose of this evidence-based practice project is to answer the clinical practice question: *In adult diabetic patients > 18 years of age, does the use of visual aids, in an outpatient primary care setting, promote an increase in the HCP's referral rate or improve the*

*patient's behavioral likelihood to see an eye doctor annually for a DR screening with a dilated eye exam?* For this project, a diabetes diagnosis was defined as documentation of the ICD-10 code, and any of its sub-classifications for greater specificity within a patient's problem list, and anyone who answered "Yes" to the question about their diabetes status on the survey questionnaire. The EBP project consisted of two measures: a Patient Measure and a Clinician Measure. Placement of visual aids with essential educational information on DR in each patient room served as a tool to (1) enhance diabetic patient education and awareness on the importance of obtaining an annual dilated eye exam per the ADA guideline (Patient Measure) and (2) to promote the rate of timely eye referrals by clinicians in the Clinician Measure. Patient surveys will be used to evaluate the Patient Measure of this project, and review of the clinic's diabetic patient Electronic Medical Record (EMR) will be used to evaluate the Clinician Measure.

## Form a Team

This project was conducted in an outpatient primary care clinic in Northern Virginia. This clinic provides care for predominantly non-English speaking Vietnamese patients >18 years old, with varying socioeconomic backgrounds and medical comorbidities, including diabetes. The clinical staff consists of two medical doctors (MDs), one nurse, two medical assistants, and two administrative staff members. Project approval was obtained from the clinical site stakeholders: the physician owner, who also served as the primary practice mentor, and the office manager. This EBP project also received support and guidance from a University of Virginia (UVA) faculty advisor, a second UVA faculty reader, a UVA medical librarian, an eye doctor, a graphic designer, and a UVA statistician for data collection and data analysis. Collaboration among the team members was aimed at ensuring the project was well-designed to deliver improvements for both the clinical practice and patient outcomes.

## Assemble, Appraise, and Synthesize the Body of Evidence

### Assemble the Relevant Literature

A systematic literature review was conducted to explore the effects of using visual aids in an outpatient care setting to increase the likelihood of timely referral rate and patient adherence with a dilated eye exam for DR screening. The literature search for this topic used electronic databases and a consultation with a UVA medical librarian available through Claude Moore Health Science Library. Four databases were searched: PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Web of Science, and Psych Info.

Two Boolean search phrases were used for this research to explore the barriers which can affect the adherence rate for diabetic patients toward DR screening, as well as the clinical benefits of using visual aids to overcome these barriers in primary care settings. The first phase was: (diabetes OR "diabetic retinopathy") AND (“eye exam” OR “eye screening” OR “vision screening” OR “diabetic eye disease” OR "screening guideline") AND (“patient education” OR knowledge OR awareness OR referral OR “referral rate”) AND (adherence OR barrier OR disparities). The second Boolean search phase was: (enhance OR improve) AND ("patient education” OR knowledge OR awareness OR referral OR “referral rate” OR adherence) AND (medical OR health OR "health literacy" OR "medical terminology") AND ("visual aid" OR "visual cue" OR poster OR infographic) AND ("primary care" OR outpatient).

A total of 133 articles were compiled using these search phrases. The same search limitations were used for all of the databases. The search timeline ranged between 2015 and 2020. After removing duplicate articles, 104 articles remained. Next, the title and abstracts were reviewed for its applicability to the project question. Inclusion criteria were English language; encompassed only the adult population; peer-reviewed, systematic review, academic journals,

meta-analysis, or randomized controlled trial (RCT) articles; out-patient setting; promoting early or timely referral or patients' compliance for DR screening and utilization of visual aids/infographic in enhancing patient understanding of health literacy within primary care were selected. Exclusion criteria included articles older than 2015; non-English; in-patient setting; not adult population; telemedicine or tele-retina, optical coherence tomography, as well as medical management of DM or DR. Thirteen full-text articles were screened, and 4 were excluded because their study results were not relevant or applicable for the intended objectives of this project. Nine articles were retained for further analysis and synthesis. See Figure 1, a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram for the detailed search process.

To check for publication bias, a search was performed by searching for two main key search phrases in Google Scholar and reviewing the gray literature of the first 20 results. There was no evidence of a publication bias based on the gray literature, and findings were consistent with findings in the systematic review and the intended project.

## Appraisal and Synthesis

### *Level of evidence*

The evidence level and quality of the final nine articles were evaluated using the Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) criteria (Dang & Dearholt, 2017) (see Figure 3 and Appendix B). Three of the nine articles were randomized controlled trials (RCTs). They yielded level I evidence and were deemed high (A) quality. Two quasi-experimental studies, one quantitative study, one qualitative systematic review, and one qualitative study yielded level III evidence and were deemed high (A) or good (B) quality. One quality

improvement (QI) study yielded level V evidence and was deemed high (A) quality. See Table 1 for a summary of the literature review.

Only literature related to the purpose of this project was reviewed. Included topics were various barriers that can influence and hinder the adherence rate for annual dilated eye exam for diabetic patients, as well as the beneficial effects of using visual aids, such as posters, in reducing a patient's health literacy barrier or increasing a clinician's prompt referral. Common challenges reported throughout the relevant articles were the lack of patient knowledge regarding diabetic eye diseases and the need for annual eye exams, as well as the essential role of primary care providers in educating their patients, along with initiating a referral for DR screening. Additionally, research supported the use of visual aids to enhance the effectiveness of patient education in outpatient settings.

***Lack of patient knowledge regarding diabetic eye diseases***

Several studies examined the effects of knowledge and awareness on patients' long-term eye health and utilization of preventative eye care to improve the retinopathy screening rate in patients with diabetes. Graham-Rowe et al. (2018) conducted a meta-analysis of 69 articles between January 1990 and February 2017. The purpose of this meta-analysis was to identify data on modifiable factors that can obstruct or promote DR screening adherence for diabetics. They identified six major facilitators of DR screening compliance: environmental context and resources, social influences, knowledge, memory/attention/decision process, beliefs about consequences, and emotions (Graham-Rowe et al., 2018). Amongst these facilitators, knowledge was ranked third and was one of the most powerful factors in DR screening attendance. Knowledge was identified in 35 studies and instances where knowledge was found to be a barrier include a lack of understanding of the link between diabetes and DR, lack of knowledge

regarding the differences between DR screening and a routine eye examination, as well as a lack of education and training regarding the importance of early DR screening on blindness prevention with diabetes (Graham-Rowe et al., 2018). Knowledge can also act as an enabler by encouraging patient adherence to annual diabetic eye exams after patients gain a clear understanding of diabetes and the risk of permanent blindness. With proper education on DR risk and blindness prevention through annual eye exams from primary care providers, local media, and community networks, the compliance rate for screening increased substantially (Graham-Rowe et al., 2018).

Cavan et al. (2018) performed a study to assess the major barriers to optimizing eye health for adults with DM using a telephone and online survey that included 2329 HCPs. Overall, 43% of providers in the study reported that patients' lack of knowledge and awareness of DR complications as a significant obstacle in optimizing eye health, 33% of providers mentioned a lack of importance given to eye screenings by patients, and only 22% of primary care clinicians in the study said they had patient education material that appropriately covered information on diabetic eye complications (Cavan et al., 2018). Additionally, Fairless and Nwanyanwu (2019) conducted a qualitative study of 24 patients with diabetes and low socioeconomic status at a federally qualified community health center to explore the influence of knowledge on DR screening utilization. The study showed that many participants were unaware of how DM can affect their vision or the importance of regular vision screening. Gaining more knowledge and awareness of DR resulted in them obtaining a comprehensive eye examination as recommended (Fairless & Nwanyanwu, 2019).

Furthermore, Weiss et al. (2015) conducted a randomized clinical trial from Oct 2010 to May 2014 at two medical centers. This trial included 206 African Americans with DM aged 65

years and older who had not had a dilated eye exam in the past year. Of the study population, 87.9% obtained dilated fundus examinations (DFE) at the 6-month follow-up, after using behavior activation for DR prevention with a combined specific DM educational material from the National Eye Institute (NEI) and behavior therapy on how to prepare for DR eye screening (Weiss et al., 2015). The participants in the intervention group were 2.5 times more likely to obtain a DFE than those in the supportive therapy only group, of which 34.1% obtained a DFE. However, since all of the participants were African American, it is unclear whether participants with other ethnicities would demonstrate similar results (Weiss et al., 2015).

In summary, the research consistently demonstrated that appropriate, guideline-directed educational materials increased patient awareness and adherence to recommendations for annual dilated eye examinations. Educational offering was particularly effective when social, cultural and environmental factors as well as cognitive status were taken into consideration.

***Early referrals for DR screening by health care providers (HCPs)***

In addition to promoting patient knowledge and awareness in obtaining diabetic eye exams, ensuring adequate screening for vision symptoms and timely eye doctor referrals for patients with diabetes was also essential to elevate the DR screening rate. Keel et al. (2017) conducted a National Eye Health Survey (NEHS), population-based study in Australia with 4836 participants ranging from 50 to 98 years of age. The purpose of the study was to examine the referral rate of participants to specialists to facilitate continued screening and management of DR. Keel et al. (2017) found that 21.8% (3.8% non-Indigenous, 18.0% Indigenous) of study participants with suspected DR and 73.1% (19.9% non-Indigenous, 53.2% Indigenous) of those who were previously non-compliant with diabetic eye examinations required referral to an eye specialist promptly for further evaluation. The authors also identified the critical need for

primary care providers to have a referral protocol in place and to utilize it to ensure timely referrals for detecting preventable eye disease such as DR at its earliest stage (Keel et al., 2017).

Silva et al. (2016) examined the records of 1,250 adult diabetic patients between the ages of 18 to 80 years-old, who had visited the Cleveland Clinic in 2014. The purpose of the study was to examine screening and referral rates for annual dilated eye exams in diabetic patients among primary care providers (PCPs) and endocrinologists. They reported that 95.5% of endocrinology and 71% primary care providers asked patients about ophthalmic concerns during office encounters ($p < .0001$). Also, 86.1% patients with an endocrinology visit and 49.7% of patients during PCP visits were verified to have previous and/or upcoming ophthalmology appointments ($p < .0001$) (Silva et al., 2016). The results showed that a significant number of diabetic patients were not screened sufficiently by their primary diabetic providers. The authors indicate that lack of screening can lead to delayed referrals to eye specialists for early detection of DR, thus delaying early and effective treatment and disease monitoring. The study further emphasized the crucial role of adherence to recommended screening guidelines to prevent permanent blindness in patients with DM (Silva et al., 2016).

Cavan et al. (2018) studied HCPs' perspectives in 41 countries, with 2329 participants, using an online survey, to address the assessment on the essential role of HCP to promote awareness and provide appropriate referral of DR screening and treatment for the diabetic population. According to the survey, 65% of eye specialists reported that most of their diabetic patients presented to their office only after experiencing vision changes, and only 29% indicated that diabetic patients had reported on-time for DR screening (Cavan et al., 2018). Not surprisingly, many HCPs did not have written protocols in place for early detection and management of DR. In fact, 40% of primary care providers disclosed that there was no protocol

in place. Another 13% had a protocol but it was not being followed by their staff members (Cavan et al., 2018). The lack of a protocol for initiating referrals for DR screening in diabetic patients poses significant concern for the prevention of ocular disease. Use of such a protocol can promote early detection and effective interventions to mitigate disease progression.

***The use of visual aids in outpatient settings***

With a better understanding of the problem and challenges presented through previous studies on patient education, Rahaman et al. (2018) conducted an RCT on 127 patients with DM to examine the effects of using visual presentations, such as a pamphlet, along with a patient education module in improving foot care knowledge and practice for diabetic patients in a primary care setting. After three visits, in a 3-month period, the intervention group showed a significant improvement in comprehension and foot care behavior compared to the control group. The results suggested that the use of visual aids for patient education may be a useful way to enhance patient knowledge in primary care settings (Rahaman et al., 2018).

To examine the effectiveness of flyers and posters in improving influenza and pneumococcal vaccination rates for the elderly in primary care, Ho et al. (2019) conducted a pragmatic, cluster-randomized crossover trial with a total of 4378 and 4459 participants recruited during intervention and control (usual care) period, respectively. The study included results from 22 private outpatient practices in Singapore, which showed an increase in uptake rate from 4.8% to 5.9% ($p = 0.047$) for influenza and 3.7% to 5.7% for pneumococcal vaccination between the control and intervention phase (Ho et al., 2019). Even though there might be practice and cultural differences between Singapore and the U.S., these studies further emphasized the benefits of using visual aids in enhancing patients' knowledge and adherence to preventive health and screening efforts. The literature supports that when patients understand the value and importance

of regular preventative care, they are more likely to pursue health-conscious behaviors and adherence to health guidelines and recommendations.

The benefits of visual aids may also extend to HCPs. In a QI study with 240 patients conducted by Hingorani et al. (2015), antibiotic guidelines posters were displayed in examination rooms and medical staff areas. Clinician adherence to antibiotic guidelines and stewardship in prescribing antibiotics for patients with acute respiratory infections (ARI) was measured to determine the impact of the visual aids. The results show an improvement of clinician's adherence rate from 57.58% to 90.90% for sinusitis ($p < 0.001$), 88.58% to 96.18% for upper respiratory infection ($p = 0.008$), and 78.68% to 91.25% for ARI ($p < 0.001$) (Hingorani et al., 2015). The outcome demonstrated a significant increase in adherence rate between the first Plan-Do-Study-Act and the second cycle. The findings in this study supported the use of visual aids as a means to positively change the prescribing habits of HCPs in promoting antibiotic stewardship (Hingorani et al., 2015).

***Discussion***

A literature search concerning the focused clinical question produced only a limited number of studies on the use of visual aids in primary care settings to enhance patient knowledge and improve patient awareness or adherence to screening for various DM complications. No articles were found specifically discussing the effectiveness of using visual aids to assist with DR education, to promote patient adherence to annual DR eye screening, or to increase the rate of PCP referrals to eye care specialists for annual DR eye examination. That said, visual aids did

demonstrate the ability to positively change both patient and provider behaviors in prevention and management of disease in the research literature.

The results from the literature review provides the foundation to form an appropriate plan of action to address barriers to patient adherence to annual dilated eye exams, the important role of primary care providers towards timely referral, and the benefits of using visual aids in enhancing patients and clinician's awareness of preventative care. Although the selected studies that measured the effect of visual aids on patient behavior had used populations other than DM, such as vaccine adherence or antibiotic stewardship, the positive results from these studies still offered support for a practice change. Based on the research, a pilot project was developed with the goal of increasing DR screening referrals as well as the rate of patient adherence to annual dilated diabetic eye exams using infographic visual aids in an outpatient primary care setting.

## Design and Pilot the Practice Change

### Setting and Sample

This pilot project was implemented in the Fall of 2020 in an outpatient, primary care clinic located in Northern Virginia. This clinic provides care for patients >18 years old, with a wide range of socioeconomic backgrounds and medical comorbidities, including diabetes. Additionally, the clinic has a high population of Vietnamese-speaking patients empaneled there for their primary health care. The goal of the project was to reduce the risk of permanent vision loss or blindness due to DR by encouraging patients with diabetes to see an eye doctor annually for their dilated eye exam, by enhancing timely clinician-driven DR eye screening referrals, and by promoting health care accessibility to the majority of Vietnamese patient population at the clinical site.

### Procedures and Tools

To ensure the protection of human subjects, the proposal of the project was submitted to the UVA's Institutional Review Board (IRB) for review. During their review, the IRB determined that the project did not meet the criteria for Human Subjects Research (#22650) and no additional IRB oversight was recommended. No personally identifiable information was collected or retained at any time throughout the project. With the support of evidence-based research and national guidelines, the project posed no additional risk over current practice to the clinic population. In addition, project implementation did not interfere with the treatment standard of care or workflow of the clinical practice site.

Per the recommendations within the research literature to provide patient education that is culturally informed, an English and a Vietnamese infographic poster was created and placed in the exam rooms to educate patients on DR and the risk of severe vision loss and blindness. The poster content was adapted from an NEI/NIH educational infographic. Permission to modify, tailor, and translate the NEI/NIH infographic into Vietnamese was obtained (see Appendix C). To ensure face validity and cultural fidelity of the Vietnamese translation, expert guidance and assistance was sought from the faculty advisor, the native Vietnamese-speaking practice mentor, a Vietnamese-speaking eye specialist, a Vietnamese content consultant, and a graphic designer (see Figure 4).

During the two-month implementation phase, all practice-established patients who presented to the clinic with a prior diagnosis of diabetes or pre-diabetes were pre-screened by the EBP project lead and asked to complete pre- and post-exam surveys at their visit (see Figure 5.1 and 5.2). The brief pre-exam questionnaire form labeled with a unique ID number for each patient was given at check-in. Patients were asked whether or not they had or plan to have a dilated eye exam by an eye doctor within the year.

The check-in staff member or the EBP project lead then immediately collected the completed pre-exam questionnaire and issued a post-exam questionnaire form labeled with the same matching ID number and instructed the patient to complete the form and turn it in during check-out. The post-exam survey asked patients for their history of diabetes or pre-diabetes diagnosis, whether or not they saw the DR poster during their visit, and whether or not they plan to see an eye doctor for a dilated eye exam this year. Also, diabetic patients who affirmed on post-exam survey that they will obtain their annual DR screening were asked who or what most likely influenced their positive intent: their healthcare provider or the DR poster.

The completed post-exam questionnaires were collected from patients upon check-out. Both pre- and post-questionnaires were presented in English and Vietnamese to make them more accessible to the large Vietnamese patient population at the clinical site. Face validity was obtained for the survey questionnaires from several clinical experts in the primary care field. Patients with further questions or those requesting additional educational materials to learn more on DR were given a bilingual hand-out in Vietnamese and English translated by the Health Information Translations organization (see Figure 6.1 and 6.2). At the end of the implementation pilot, a questionnaire was given to the practice medical director to subjectively assess the DR poster's impact on his dispensing of timely DR screening eye referrals for his diabetic patients.

**Data Collection and Analysis**

De-identified data was collected and entered into a Microsoft Excel spreadsheet for analysis. At the conclusion of data collection, a doctorally-prepared clinical research analyst and statistician was consulted to assist with data arrangement and analysis of results. The purpose of data analysis in this pilot project was to evaluate the successful transition and adoption of an

educational DR poster at the clinical site that would positively impact both patient and provider behaviors in support of referral for DR screening in diabetic patients.

Patient Measures included both process and outcome variables. Process variables included screening for eligibility as well as a question inquiring as to whether or not the patient had seen the infographic poster during their clinic visit. Outcome variables were based on the patient's expressed intent to change their health behavior in favor of DR screening based on their exposure to the poster. A ***positive intent*** was defined as one in which the diabetic patient's likelihood of obtaining an annual dilated eye exam changed from "No" or "Not sure" on pre-survey to "Yes" on post-survey. Patient Measures of the project were derived from the patient's pre- and post-exam surveys during the Implementation phase. All established patients presenting to the clinic were pre-screened by EMR review for history of DM or pre-DM by the project lead. Specifically, patients who were targeted for the project study were diabetic or pre-diabetic patients who answered "No" or "Not sure" to the question of obtaining an annual dilated eye exam on pre-survey and "Yes" to pre-DM or DM history on post-survey.

The primary Clinician Measure was the outcome variable assessing for percent of clinic visits that resulted in a positive encounter. A ***positive encounter*** was defined as an encounter in which a patient with EMR-documented history of DM or pre-DM resulted in either an eye referral or eye report from an ophthalmologist or optometrist. For the Clinician Measure, a cross-sectional EMR review was completed for empaneled diabetic patients to count the total number of positive encounters in each of the three phases: one-month period prior to the initiation of the pilot to establish the baseline, two-month implementation phase to assess for uptake of the new process, and one-month post implementation to evaluate for short term adoption and maintenance.

Using Excel, the list of the patients who visited the clinic was filtered by date of service. Each diabetic or pre-diabetic patient encounter was labeled by numerical order and only their status with regards to eye exam referral or eye report from an ophthalmologist or optometrist was collected. The variable was simply annotated as either Yes or No, with Yes indicating a positive encounter. To assess whether or not placing an educational poster inside the patient exam room had led to an increase of the rate of annual diabetic eye exam referral by the clinician, the rate of positive encounters within a one-year period was reviewed for each of the three phases (Pre-Implementation, Implementation, and Post-Implementation) for comparison analysis.

## Results

### *The Patient Measure – Patient Surveys*

During the 2-month Implementation phase, a total of 173 patients were surveyed for inclusion in the project. Of those 173 total patients assessed, 128 patients (those who answered "No" or "Not sure" to the question of obtaining an annual dilated eye exam on pre-survey and "Yes" to pre-DM or DM history on post-survey) were included in the project. Analysis of the data revealed that 96% demonstrated a positive intent on post-survey, with 123 of 128 qualified patients having answered "Yes, will go see an eye doctor", stating that they are likely to obtain their annual DR eye screening following their clinic visit (see Figure 7.1). Participants were then asked to identify influencing factors that led to their positive intent to obtain annual DR screening.

For the 123 participants with a positive intent ("Yes, will go see eye doctor" on post-survey), the reported reasons that influenced their decision to pursue annual dilated DR screening were as follows: Only DR poster (49.6%), Only doctor's reminder (1.6%), Both DR poster and doctor's reminder (38.2%), and Neither (10.6%) (see Figure 7.2). The results of the post-exam

survey data showed that almost 90% of qualified diabetics and pre-diabetics had indicated that the presence of the infographic posters within the clinic had positively influenced their decision. For half of the qualified diabetic or prediabetic patients surveyed, the presence of the DR educational posters in the clinic was the sole factor influencing their decision to go see an eye doctor for their annual dilated DR exam.

It is also worth noting that 100% of those 123 qualified patients with a positive intent had indicated on post-survey that they had seen and noted the DR educational posters during their visit (see Figure 7.3). The post-survey responses also demonstrated the positive impacts of a culturally sensitive, appropriately translated visual aid in exam rooms and waiting rooms to enhance patient education and to promote patient health outcomes in outpatient settings. The patient survey result is consistent with the literature review on using visual aids to promote patient behavior change.

***The Clinician Measure – EMR Review***

Nearly 60% of the total qualified encounters involved patients with type 2 diabetes (T2DM) while the remaining 40% had pre-diabetes (pre-DM). According to the overall clinic data collected via EMR chart review, 382 out of 641 total encounters qualified for analysis with an EMR-documented history of T2DM or pre-DM during the Pre-implementation phase. Among those 382 encounters, 71 (or 19%) were positive for EMR-documented eye referrals or had consult reports validating an annual dilated eye exam within the past year. The percentage of positive encounters among all diabetics and prediabetics empaneled to the clinic had increased to 30% during the 2-month Implementation phase and 33% during the 1-month Post-implementation phase using DR educational posters (see Figure 8.1).

A subgroup analysis was conducted within the qualified patients comparing rates of positive encounters within T2DM patients to pre-DM patients. The EMR review of the T2DM group revealed an increase in the rate of positive encounters from the Pre-implementation phase (30%) to the Implementation phase (45%). The rate of positive encounters continued to rise another 6% in the Post-implementation phase (51%). For the pre-DM group, there was an improvement in positive encounters from 3% on Pre-implementation to 11% during Implementation phase, and then slightly decreasing to 9% on Post-implementation (see Figure 8.2).

**Discussion**

The process of implementing EBP changes in a real-world clinical setting can be a challenging process. The Iowa Model (Iowa Model Collaborative, 2017) provides a succinct framework with an algorithm to serve as a systematic guide for the EBP project team through each step of this process, from identifying the clinical concern to long-term integration and sustainment of the practice change. However, the clinic's operational dynamics, culture, and patient population can significantly impact how the new practice change will be implemented and sustained over time. A helpful approach for the project lead when implementing the pilot, is to assign and provide appropriate training for the clinic change agent (Cullen, 2015).

Since the change agent typically is the most qualified to understand their clinic operation and patient populations, their support will be essential when piloting a new practice change. Unfortunately, there were limitations during the time of implementation related to the COVID-19 pandemic. While the tempo of clinic operations continued at a busy pace, the number of clinical and support staff was reduced. As a result, the total number of surveys collected from diabetic patients for the Patient Measures of the project was limited by the number of days the

project lead was permitted to be present on site. Despite there being no official change agent, all care team members received the project materials and hand-out for additional patient education of DR, understood their important role in this transition, and were involved with the project by working with providers to ensure timely eye referral for diabetic patients. Another limitation in the project was that the patient surveys did not distinguish between the subgroups DM and pre-DM. This led to an inability to assess for difference in post-implementation behavior change between the two groups. This limitation can be addressed with a slight modification of patient response choices for the question of DM status on post-survey in future projects.

Overall, this EBP project demonstrated favorable results after the placement of a culturally appropriate infographic poster in the exam rooms. Post-exam surveys showed the presence of the DR posters helped to produce a 96% rate of positive intent for diabetic patients to seek a dilated eye exam for DR screening in accordance with the ADA recommendations. In this particular project, the use of visual aids was more effective and more likely to impact patients' behavior than relying on the provider's recommendation alone. Additionally, since the majority of the patients within this practice were Vietnamese-speaking, it was important to create cultural and language-specific materials to overcome barriers that might otherwise hinder effective patient education. Increased DR awareness though the use of an appropriately translated infographic poster provided a truly eye-opening experience for many Vietnamese patients. The results of this pilot also underscored the importance of incorporating culturally appropriate patient education resources in a variety of languages to accommodate non-English speaking minority groups.

Data analysis of the Clinician Measure EMR review also yielded positive results for diabetic or prediabetic patients going from a 19% rate of positive encounters in the Pre-

implementation period to 30% during Implementation (a greater than 50% improvement), and stayed at 33% in the Post-implementation period. During Post-implementation, while the T2DM group sustained the increased trend in positive encounters, the pre-DM group had a slight 2% decrease. One possible reason for this slight decline in the pre-DM group could be due to potential time constraints for each visit and limited staff support, which may have caused clinicians to prioritize patients with an established DM diagnosis over pre-DM patients for patient diabetic education and DR eye screening referrals.

At the conclusion of the pilot in a project assessment survey for clinicians, the practice medical director stated that the infographic poster placed in the office was well-designed and informative and had served to remind him to recommend timely eye referrals for annual DR screening for his diabetic patients. The posters and DR education materials used in the project were adopted by the primary care practice and remained at the clinical site to continue to help deliver positive health impacts to future patients. Also, the medical director indicated that the poster was very helpful both to patients with DM and pre-DM because it encouraged patients to read and pay more attention to potential DM complications.

Diabetes creates a significant burden for the patients and the public health system because it is a progressive disease. Public education of diabetes and its complications play a critical role to raise awareness for people with diabetes (Ting, Cheung, & Wong, 2016). Due to the irreversible organ damage that diabetes can inflict, such as vision loss and blindness from advanced DR, tight glycemic control and early and annual DR screenings are essential in the health care plan. Furthermore, it is essential that all stakeholders to continue to search for new strategies for managing and preventing complications of DR such as visual loss and blindness

(Ting, Cheung, & Wong, 2016). This includes primary care providers, public health educators, health care professionals, insurers, governors, and legislators.

The results of this EBP project, along with established guidelines and results from literature reviews on the barriers for diabetic patients to obtain annual dilated eye exams, should be used to inform future primary care and public health planning. Medical providers and educators should maximize the use of visual aids to better inform and educate the patients, especially minority populations, on the importance of protecting their eye health and vision to improve their quality of life. Additionally, the use of these Vietnamese-translated posters should be expanded to other clinics that treat Vietnamese patients to further prevent blindness from DR. Reducing the population of individuals with diabetic complications also will help to significantly lower the economic and financial burden on public health and our healthcare system.

**Strengths and Limitations of the DNP Project**

This EBP project was conducted using the Iowa Model as a validated implementation framework throughout all phases of the project. The intervention posed no known risks to the participants and clear inclusion and exclusion criteria served to identify appropriate participants for the project. The pilot practice change also utilized the most current guidelines and recommendations from the ADA and incorporated stakeholder educational materials from the NEI/NIH and other professional literature. The result was a low-cost and culturally appropriate visual aid to promote adherence and compliance with annual dilated eye exam recommendations for DR screening.

Utilization of EMR review in place of making interview phone calls to individual patients during the COVID-19 pandemic for the Clinician Measure of this project helped to reduce data collection time and recall bias that might impact the accuracy of the information collected. The

project integrated a simple practice change but helped to produce a significant health impact for many patients at the practice site. The placement of infographic posters in exam rooms was appropriate and suitable for patient education and required minimal effort to implement. This project also promoted interprofessional collaboration and patient engagement through culturally sensitive patient care by tailoring the intervention to increase accessibility to non-English speaking, Vietnamese diabetic patients in a primary outpatient setting.

In addition to the previously discussed project limitations, health and safety concerns due to the COVID 19 pandemic may have also influenced participant enthusiasm for the face-to-face interaction needed for survey participation. There may have also been some apprehension related to additional medical appointments needed to follow through with the intent to see an ophthalmologist or optometrist for DR screening.

## Integrate and Sustain the Practice Change

The feasibility and suitability of using an infographic poster to promote patient education in a primary care setting, the poster's potential to overcome language barriers of the diabetic patient populations from various ethnic and cultural backgrounds, the poster's positive impacts on patient intent and clinical referrals, and the full endorsement of the poster from the practice owner and the clinic staff all demonstrated that the proposed change is appropriate for adoption into practice.

### Implications for Practice

This project provides an evidence-based framework for healthcare team members to explore the potential benefits and to implement the use of visual aids in promoting timely eye exam referrals for patients with diabetes and improving patient adherence and compliance to current DR screening guidelines. This project also illustrates the potential to create significant

positive impacts on patient health outcomes and promote patient engagement through the use of culturally appropriate DR infographic materials. The utilization of low-cost and easy-to-read infographic materials presented in appropriate languages in various primary clinics can be especially effective for educating patients with English language barriers. Educated and engaged patients, thus, are more likely to be proactive in seeking to improve their own health and quality of life.

**Sustainability Plan**

To ensure successful incorporation and sustainment of the EBP change, promoting strong support from and engagement of stakeholders, such as clinical site clinicians and the clinic office manager, along with other health care team members are critical. Requiring minimal clinic resources, the placement of the educational poster in each patient exam room integrated smoothly into the current workflow and helped reduce the patient education burden on the clinicians and staff, all while raising patient awareness of the importance of DR preventative care during the COVID-19 pandemic. All feedback from the project advisor and the stakeholders were taken into consideration to ensure an appropriate and effective integration and sustainment of the practice change.

Continuing utilization of the DR posters with patient education and assignment of a clinic change agent are essential to promote practice change success. A clinical staff member can take on the role of the change agent to continue to raise patient awareness concerning DR preventative care for diabetic patients as well as to assist clinicians to ensure timely eye referrals will be given to diabetic patients per ADA guidelines. Furthermore, the practice change can continue to promote clinicians and patient engagement, collaboration, as well as maximize the

impact and sustainability of the intervention to improve quality of care and health outcomes for diabetic patients.

## Disseminate Results

The project information, findings, and sustainability plans were shared with the practice site. Following a review of the EBP project by project faculty advisors, a full manuscript will be submitted to UVA-School of Nursing and published in the UVA's Libra database. Submissions to another publication potentially include the Journal of the American Association of Nurse Practitioners.

## Conclusion

Diabetes mellitus has remained as one of the top leading causes of death in the U.S. and worldwide. Diabetes can lead to numerous health complications which can severely affect the quality of life of those afflicted, including irreversible blindness due to untreated DR. Early detection of DR is critical to help facilitate early treatment and medical intervention to help protect diabetic patients from permanent vision loss. Therefore, it is essential to emphasize the need for patient education and awareness on the importance of obtaining an annual dilated eye exam for early detection of DR, in addition to tight glycemic control by utilizing culturally appropriate and affordable visual aids. The results of this project justify future implementation, taking the limitations of this project into future planning consideration.

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**Table 1**. *Summary of the Relevant Literature*

| Citation | Literature themes | Design | Sample/Setting/Purpose | Findings | Level of Evidence |
|---|---|---|---|---|---|
| **Weiss et al. (2015)** | Lack of patient's knowledge | RCT | From Oct 2010 to May 2014 at two medical centers was conducted, which included 206 African Americans with DM, who were 65 years and older, and without having a dilated eye exam in the past year. | Of the study population, 87.9% obtained dilated fundus examinations (DFE) at the 6-month follow-up, using behavior activation for DR prevention with a combined specific DM educational material from the National Eye Institute (NEI) and behavior therapy on how to prepare for DR eye screening. The participants in the intervention group were 2.5 times more likely to obtain a DFE compared with those in the supportive therapy group, with only 34.1% who obtained DFE. | I (A) |
| **Graham-Rowe et al. (2018)** | Lack of patient's knowledge | Systematic review or Meta-Analysis | 69 published literature in English between January 1990 and February 2017 (from MEDLINE, EMBASE, PsycINFO, Cochrane Library and the 'grey literature' for quantitative and qualitative studies) | 6 theoretical domains as the major facilitators of DR screening compliance: environmental context and resources, social influences, knowledge, memory/attention/decision process, beliefs about consequences, and emotions. Knowledge was ranked 3rd and one of the most powerful factors in DR screening attendance. Identified in 35 (51%) of included studies, can be seen as a barrier when there is lack of understanding about the link between diabetes and DR, awareness of the importance for early DR screening, differences between DR screening and routine eye examination, and education and training on blindness prevention with diabetes. Also, knowledge is considered as an enabler to encourage patient adherence to annual diabetic eye exams after patients gain a clear understanding about diabetes and risk of permanent blindness. | III (A/B) |

| Citation | Literature themes | Design | Sample/Setting/Purpose | Findings | Level of Evidence |
|---|---|---|---|---|---|
| **Fairless & Nwanyanwu (2019)** | Lack of patient's knowledge | Qualitative | A convenience sample of 24 patients with diabetes and low socioeconomic status at a federally qualified community health center to explore the influence of knowledge on DR screening rate | The study showed that many participants were unaware of how DM can affect their vision or the importance of regular vision screening. Gaining more knowledge and awareness about DR resulted in them obtaining a comprehensive eye examination as recommended | III (A/B) |
| **Silva et al. (2016)** | Time referral for DR screening by HCP | Quasi-Experimental | Electronic Medical Record of 1,250 adult patients with diabetes, between the ages of 18 to 80 years-old, who had visited the Cleveland Clinic in 2014 to identify if primary care providers (PCP) and endocrinologists have been screening and providing timely diabetic eye exam referrals for diabetic patients | 95.5% of endocrinology and 71% primary care providers asked about ophthalmic symptoms/signs during office encounters ($p < .0001$). 86.1% patients with an endocrinology visit and 49.7% of patients during PCP visits were verified with previous and future ophthalmology appointments ($p < .0001$). The results showed that a significant number of diabetic patients were not screened sufficiently by their primary diabetic providers which can lead to the delay in referral to eye specialists for early detection of DR, delay effective treatment and can result in irreversible eye complication. The study further emphasized the crucial role of adherence to recommended screening guidelines to prevent permanent blindness in patients with DM | III (A/B) |

| Citation | Literature themes | Design | Sample/Setting/Purpose | Findings | Level of Evidence |
|---|---|---|---|---|---|
| **Keel et al. (2017)** | Time referral for DR screening by HCP | Quantitative | A National Eye Health Survey (NEHS), population-based study in Australia with 4836 participants ranging from 50 to 98 years of age to examine the referral rate for participants in establishing future eye care and management of their chronic eye diseases, including diabetic eye disease. Multi-stage, random cluster sampling (30 sites, across 5 remoteness areas). | A total of 21.8% (3.8% non-Indigenous, 18.0% Indigenous) of participants with suspected diabetic retinal concerns and 73.1% (19.9% non-Indigenous, 53.2% Indigenous) who were non-compliant with general/diabetic ocular examination guidelines demonstrated a need for referral to see an eye specialist promptly for further evaluation. The findings also identified the critical need of HCPs in primary care services to have a referral protocol in place and to utilize it to ensure a timely referral for early diabetic eye screening, to be able to detect preventable eye disease such as DR at its early stage | III (A/B) |
| **Cavan et al. (2018)** | Time referral for DR screening by HCP | Quasi-Experimental | Telephone interviews and online survey. Studied HCP's perspective, with 2329 participants, using an online survey, to address the global assessment on the essential role of HCP to promote awareness and provide appropriate referral of DR screening and treatment for the diabetic population | In this survey, 65% of eye specialists reported that their diabetic patients visit their office only when the patients already have vision changes. 6% of HCPs stated that many patients waited until they had vision problems before seeing an eye specialist when it was too late for effective treatment. However, many HCPs do not have written protocols in place for early detection and management of diabetes-related vision disease. In fact, 40% of primary care providers disclosed that there is no written protocol in place. Another 13% has a protocol but it was not utilized by their staff members | III (A/B) |

| Citation | Literature themes | Design | Sample/Setting/Purpose | Findings | Level of Evidence |
|---|---|---|---|---|---|
| **Rahaman et al. (2018)** | The use of visual aids in outpatient settings | RCT | 127 Patients from outpatient clinic department, all India Institute of medical Sciences, New Delhi, with T1 or T2DM, and ready for f/u at 1 and 3 months between 07/2015 to 12/2016 were selected to examine the effects of using visual displays, like a pamphlet, along with a patient education module in improving foot care knowledge and practice for diabetic patients in a primary care setting | After three visits, in a 3-month period, the results in the intervention group showed a significant improvement with 1.17 (0.70-1.64) ($p < 0.001$) in comprehension score and foot care behavior compared to the control group with 0.1 (−0.30-0.50) ($p = 0.62$). The results suggest that the use of visual aids for patient education may be an effective, cost-saving, and easy way to reinforce patient knowledge on a regular basis in primary care settings | I (A) |
| **Ho et al. (2019)** | The use of visual aids in outpatient settings | RCT- A pragmatic, cluster-randomized crossover | 4378 and 4459 participants recruited during intervention and control (usual care) period, >65 y.o, with or without chronic disease, who visited and registered as a patient at 30 general practice clinics in Singapore | The study includes results from 22 private outpatient practices in Singapore, which shows an increase in uptake rate from 4.8% to 5.9% ($p = 0.047$) for influenza and 3.7% to 5.7% for pneumococcal vaccination between the control and intervention period | I (A) |

| Citation | Literature themes | Design | Sample/Setting/Purpose | Findings | Level of Evidence |
|---|---|---|---|---|---|
| **Hingorani et al. (2015)** | The use of visual aids in outpatient settings | QI | Patient encounters. Antibiotic guidelines posters were displayed in examination rooms and staff areas and clinician adherence to antibiotic guidelines and stewardship in prescribing antibiotics for patients with acute respiratory infections (ARI) was measured to determine effectiveness of the visual aids. | The results show an improvement of clinician's adherence rate from 57.58% to 90.90% for sinusitis ($p < 0.001$), 88.58% to 96.18% for upper respiratory infection ($p = 0.008$), and 78.68% to 91.25% for ARI ($p < 0.001$). This is a significant increase in adherence rate between the first Plan-Do-Study-Act (PDSA) and the second cycle. These findings support the use of visual aids to improve the awareness of antibiotic stewardship which can transform the way clinicians in primary care settings are prescribing antibiotics, thereby potentially increasing patient safety and reducing overall health care cost | V (A) |

*Note.* DM = Diabetes Mellitus; DR = Diabetic Retinopathy; HCP = Health Care Provider; PCP = Primary Care Provider; QI = Quality Improvement; RCT = Randomized Controlled Trial.

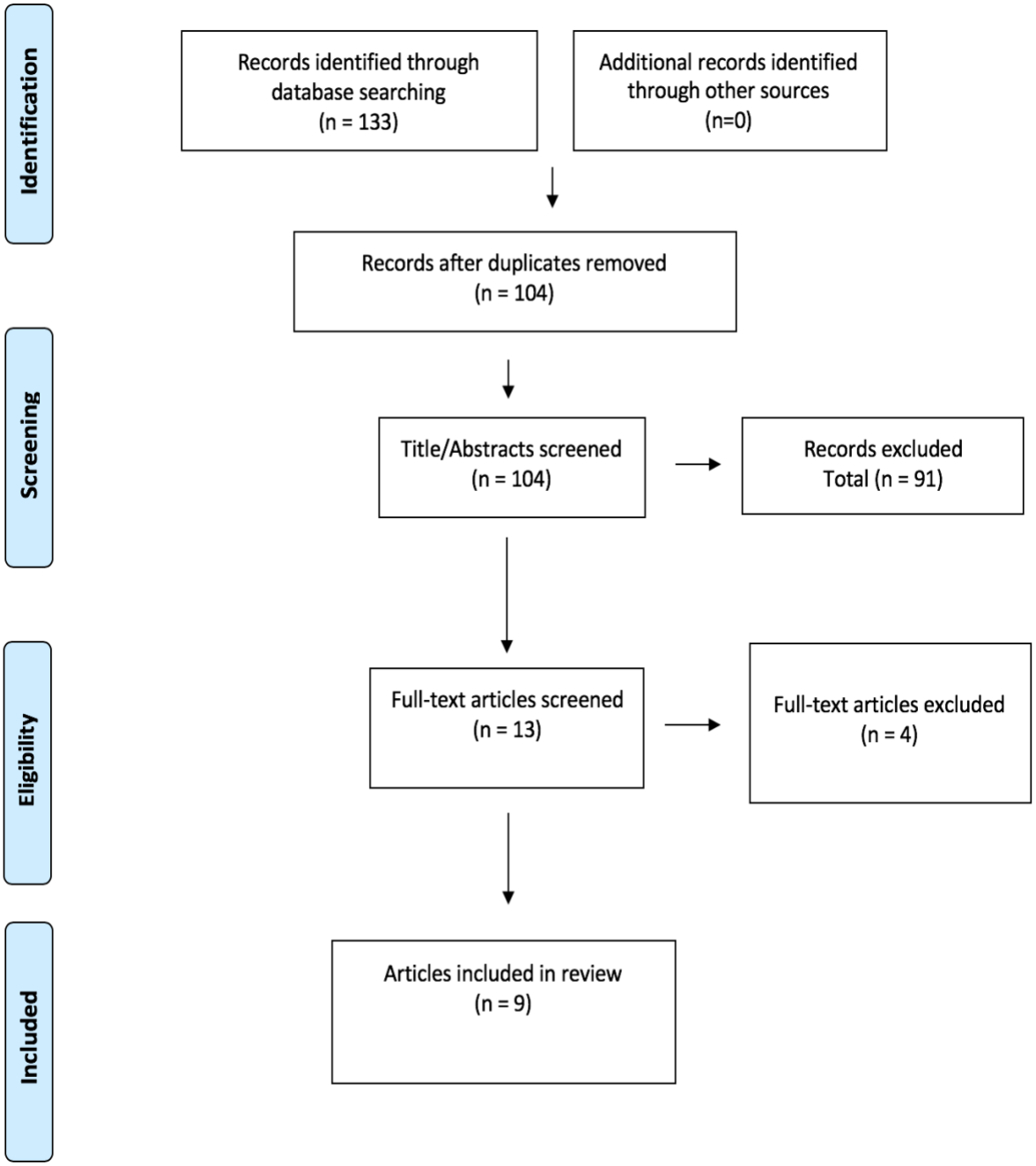



*Figure 1*. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram for the systematic literature search process.

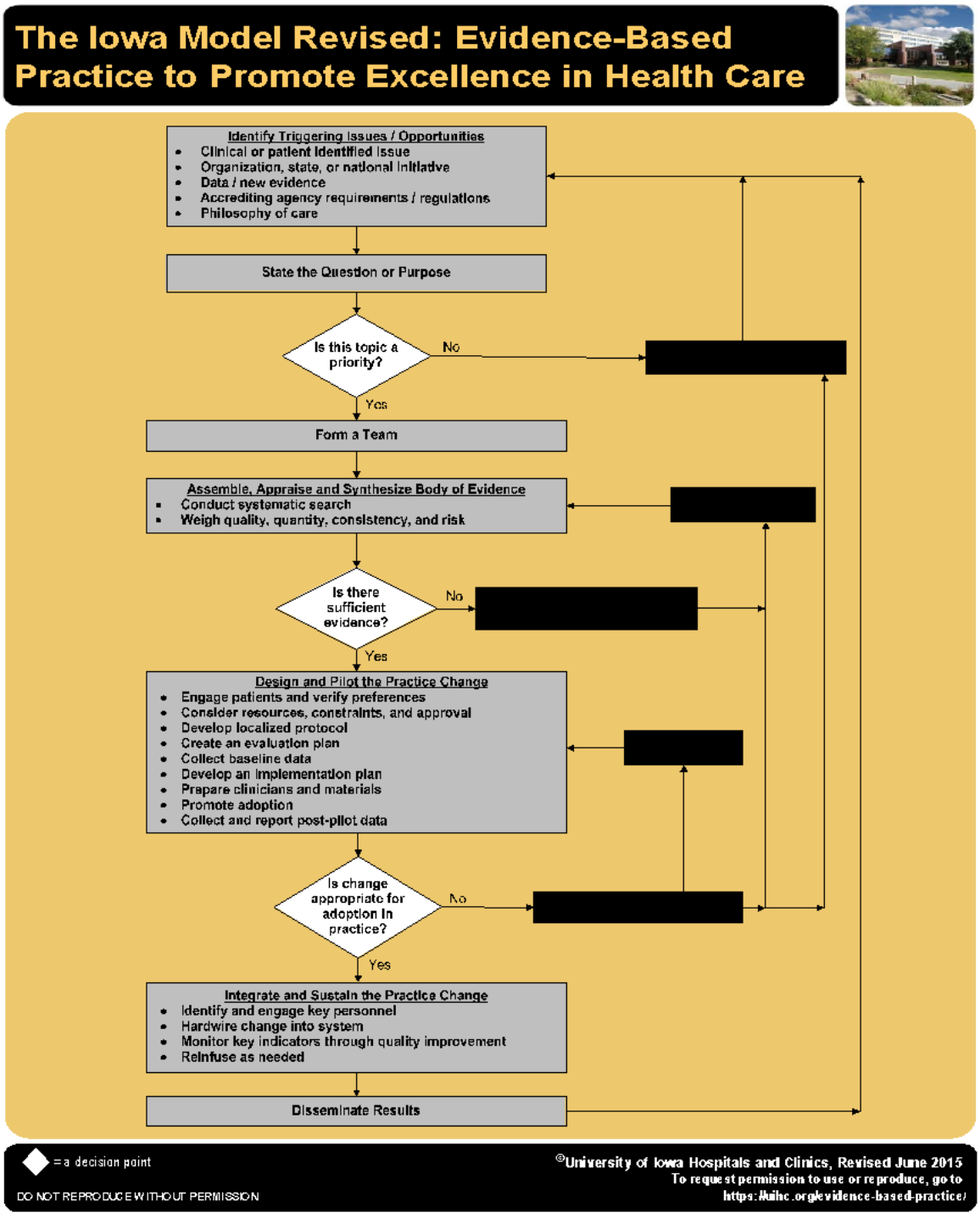
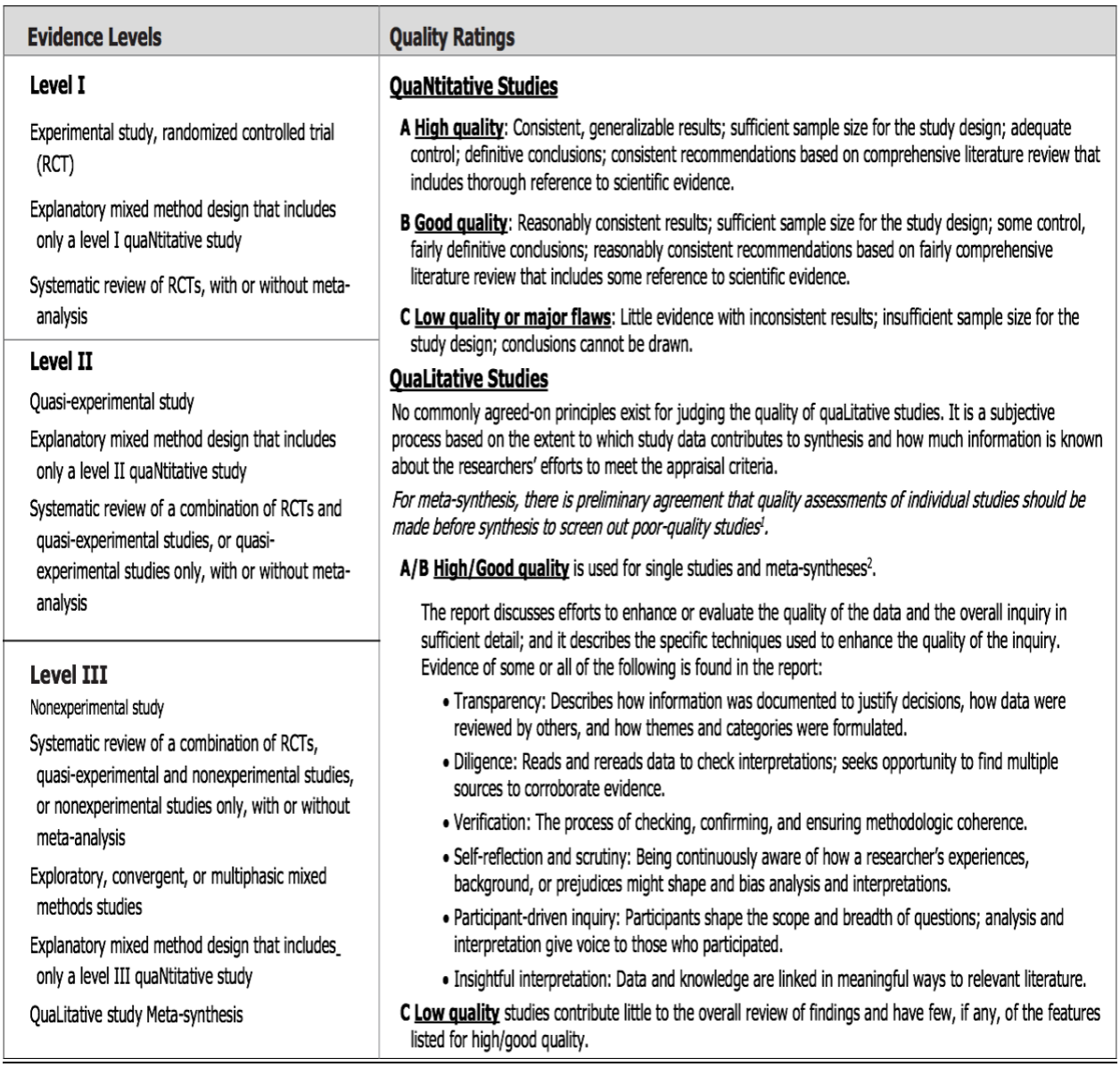



*Figure 2*. The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care. Used/Reprinted with permission from the University of Iowa Hospitals and Clinics.



| Evidence Levels | Quality Ratings |
|---|---|
| **Level I**<br>Experimental study, randomized controlled trial (RCT)<br>Explanatory mixed method design that includes only a level I quaNtitative study<br>Systematic review of RCTs, with or without meta-analysis | **QuaNtitative Studies**<br>**A High quality**: Consistent, generalizable results; sufficient sample size for the study design; adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence.<br>**B Good quality**: Reasonably consistent results; sufficient sample size for the study design; some control, fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence.<br>**C Low quality or major flaws**: Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn. |
| **Level II**<br>Quasi-experimental study<br>Explanatory mixed method design that includes only a level II quaNtitative study<br>Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis | **QuaLitative Studies**<br>No commonly agreed-on principles exist for judging the quality of quaLitative studies. It is a subjective process based on the extent to which study data contributes to synthesis and how much information is known about the researchers' efforts to meet the appraisal criteria.<br>*For meta-synthesis, there is preliminary agreement that quality assessments of individual studies should be made before synthesis to screen out poor-quality studies*[1].<br>**A/B High/Good quality** is used for single studies and meta-syntheses[2].<br>The report discusses efforts to enhance or evaluate the quality of the data and the overall inquiry in sufficient detail; and it describes the specific techniques used to enhance the quality of the inquiry. Evidence of some or all of the following is found in the report:<br>• Transparency: Describes how information was documented to justify decisions, how data were reviewed by others, and how themes and categories were formulated.<br>• Diligence: Reads and rereads data to check interpretations; seeks opportunity to find multiple sources to corroborate evidence.<br>• Verification: The process of checking, confirming, and ensuring methodologic coherence.<br>• Self-reflection and scrutiny: Being continuously aware of how a researcher's experiences, background, or prejudices might shape and bias analysis and interpretations.<br>• Participant-driven inquiry: Participants shape the scope and breadth of questions; analysis and interpretation give voice to those who participated.<br>• Insightful interpretation: Data and knowledge are linked in meaningful ways to relevant literature.<br>**C Low quality** studies contribute little to the overall review of findings and have few, if any, of the features listed for high/good quality. |
| **Level III**<br>Nonexperimental study<br>Systematic review of a combination of RCTs, quasi-experimental and nonexperimental studies, or nonexperimental studies only, with or without meta-analysis<br>Exploratory, convergent, or multiphasic mixed methods studies<br>Explanatory mixed method design that includes only a level III quaNtitative study<br>QuaLitative study Meta-synthesis | |

*Figure 3.1*. Johns Hopkins Nursing Evidence Level and Quality Guide, levels I-III. Used/Reprinted with permission from the Johns Hopkins Hospital/The Johns Hopkins University.

| Evidence Levels | Quality Ratings |
|---|---|
| **Level IV**<br>Opinion of respected authorities and/or nationally recognized expert committees or consensus panels based on scientific evidence<br>Includes:<br>• Clinical practice guidelines<br>• Consensus panels/position statements | A **High quality:** Material officially sponsored by a professional, public, or private organization or a government agency; documentation of a systematic literature search strategy; consistent results with sufficient numbers of well-designed studies; criteria-based evaluation of overall scientific strength and quality of included studies and definitive conclusions; national expertise clearly evident; developed or revised within the past five years<br>B **Good quality:** Material officially sponsored by a professional, public, or private organization or a government agency; reasonably thorough and appropriate systematic literature search strategy; reasonably consistent results, sufficient numbers of well-designed studies; evaluation of strengths and limitations of included studies with fairly definitive conclusions; national expertise clearly evident; developed or revised within the past five years<br>C **Low quality or major flaws:** Material not sponsored by an official organization or agency; undefined, poorly defined, or limited literature search strategy; no evaluation of strengths and limitations of included studies, insufficient evidence with inconsistent results, conclusions cannot be drawn; not revised within the past five years |
| **Level V**<br>Based on experiential and nonresearch evidence<br>Includes:<br>• Integrative reviews<br>• Literature reviews<br>• Quality improvement, program, or financial evaluation<br>• Case reports<br>• Opinion of nationally recognized expert(s) based on experiential evidence | **Organizational Experience (quality improvement, program or financial evaluation)**<br>A **High quality**: Clear aims and objectives; consistent results across multiple settings; formal quality improvement, financial, or program evaluation methods used; definitive conclusions; consistent recommendations with thorough reference to scientific evidence<br>B **Good quality**: Clear aims and objectives; consistent results in a single setting; formal quality improvement, financial, or program evaluation methods used; reasonably consistent recommendations with some reference to scientific evidence<br>C **Low quality or major flaws**: Unclear or missing aims and objectives; inconsistent results; poorly defined quality improvement, financial, or program evaluation methods; recommendations cannot be made<br>**Integrative Review, Literature Review, Expert Opinion, Case Report, Community Standard, Clinician Experience, Consumer Preference**<br>A **High quality**: Expertise is clearly evident; draws definitive conclusions; provides scientific rationale; thought leader(s) in the field<br>B **Good quality**: Expertise appears to be credible; draws fairly definitive conclusions; provides logical argument for opinions<br>C **Low quality or major flaws**: Expertise is not discernable or is dubious; conclusions cannot be drawn |

*1 https://www.york.ac.uk/crd/SysRev/!SSL!/WebHelp/6_4_ASSESSMENT_OF_QUALITATIVE_RESEARCH.htm*
*2 Adapted from Polit & Beck (2017).*

*Figure 3.2*. Johns Hopkins Nursing Evidence Level and Quality Guide, levels IV and V. Used/Reprinted with permission from the Johns Hopkins Hospital/The Johns Hopkins University.

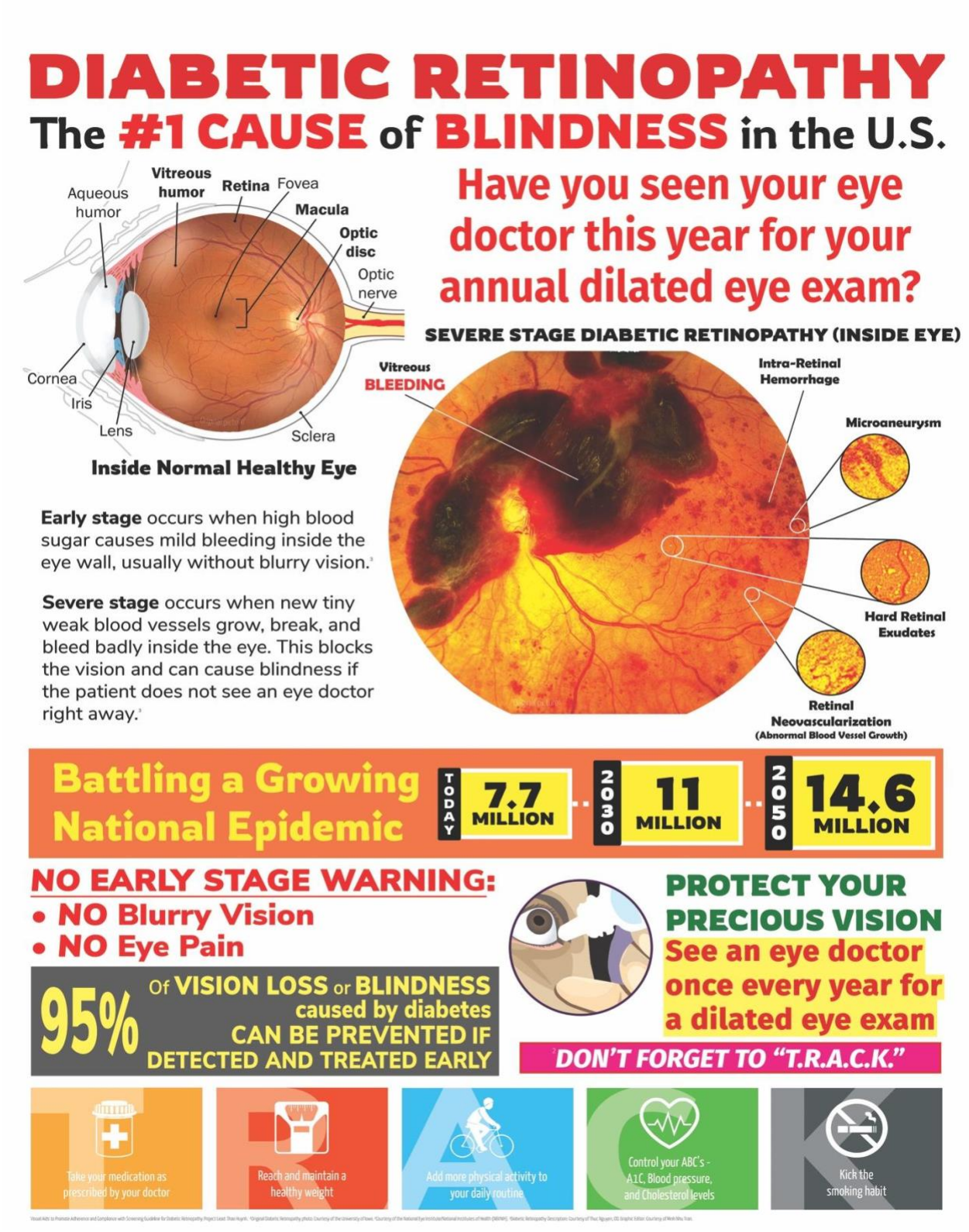



*Figure 4.1*. Diabetic Retinopathy Poster (English Version).

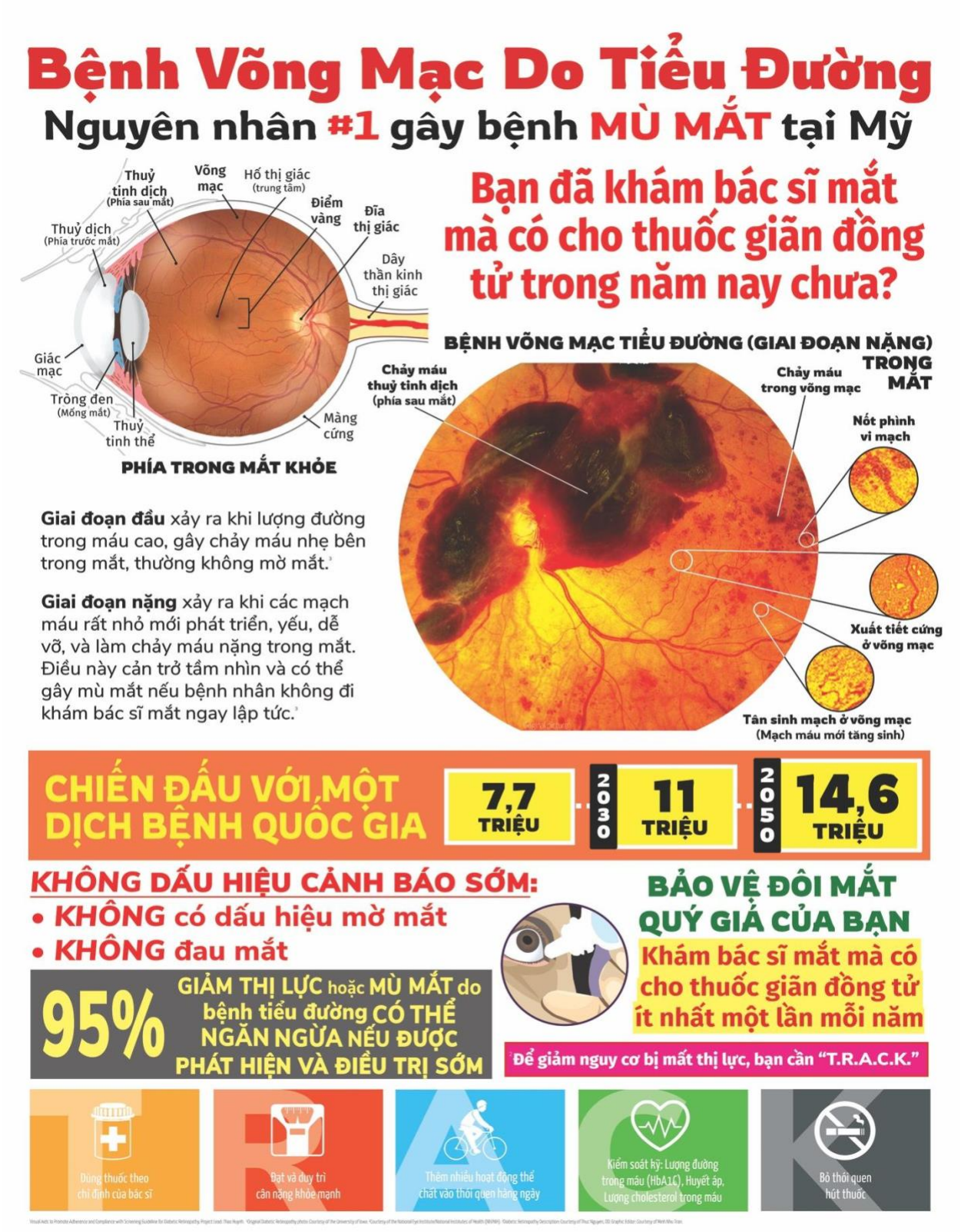



*Figure 4.2*. Diabetic Retinopathy Poster (Vietnamese Version).

Date ID:

# Pre-exam Survey
# (Khảo sát – Trước khi khám bệnh)

| | |
|---|---|
| Please circle the *best answer* for the question<br><br>Question:<br>Have you had or do you plan to have a *dilated eye exam* by an eye doctor this year?<br>a. No (0)<br>b. Yes (1)<br>c. Not sure (2)<br><br>**Important Notice -** Please complete and return this to the check-in staff. Thank you! | Xin quý vị khoanh tròn cho 1 câu trả lời đúng nhất<br><br>Câu hỏi:<br>Bạn đã có hay đang có dự định khám mắt có giãn đồng tử với bác sĩ mắt trong năm nay?<br>a. Không<br>b. Có<br>c. Không chắc/Không nhớ rõ<br><br>**Lưu ý -** Xin quý vị trả lời câu hỏi ở trên và đưa lại cho nhân viên của văn phòng. Xin cảm ơn! |

*Figure 5.1*. Pre-exam survey.

**Date** **ID:**

## Post-exam Survey
## (Khảo sát – Sau khi khám bệnh)

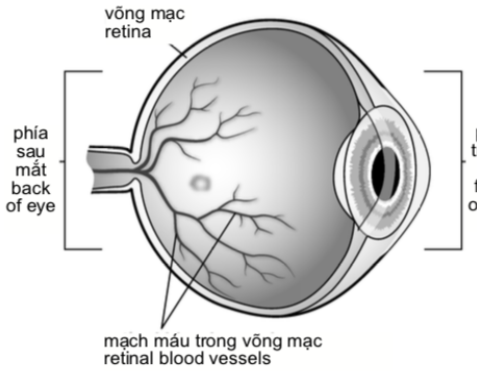
| Please circle the *best answer* for the question | Xin quý vị khoanh tròn cho 1 câu trả lời đúng nhất |
|---|---|
| **Question 1**:<br>Have you been diagnosed with *diabetes* or *pre-diabetes*?<br>a. No (0)<br>b. Yes (1)<br>c. Not sure (3) | **Câu hỏi số 1**:<br>Bạn có bị bệnh tiểu đường hay tiền tiểu đường?<br>a. Không<br>b. Có<br>c. Không biết chắc |
| **Question 2**:<br>Did you see the Diabetic Retinopathy poster in your clinic exam room today?<br>a. No (0)<br>b. Yes (1) | **Câu hỏi số 2**:<br>Bạn có thấy áp phích về *bệnh võng mạc do tiểu đường* trong phòng khám hôm nay?<br>a. Không<br>b. Có |
| **Question 3**:<br>Have you had or do you plan to have a *dilated eye exam* by an eye doctor this year?<br>a. No (0)<br>b. Yes (1)<br>c. Not sure (2) | **Câu hỏi số 3**:<br>Bạn đã có hay đang có dự định khám mắt có giãn đồng tử với bác sĩ mắt trong năm nay?<br>a. Không<br>b. Có<br>c. Không chắc/Không nhớ rõ |
| If you answered "Yes" for question 3,<br>Who or What *most* influenced your decision to go see an eye doctor for an *annual dilated eye exam*?<br>a. The Doctor's Reminder (1)<br>b. The Diabetic Retinopathy Poster (2)<br>c. Neither (3)<br>d. Both Doctor's Reminder and Diabetic Retinopathy Poster (4) | Nếu câu trả lời là "Có",<br>lý do gì khiến bạn muốn đi khám mắt mỗi năm nhất?<br>a. Bác sĩ nhắc nhở<br>b. Thông tin với hình ảnh trong tờ áp phích<br>c. Không phải a hay b<br>d. Nhờ bác sĩ nhắc nhở và thông tin trong áp phích |
| **Important Notice** - Please complete and return to the staff before leaving. Thank you! | **Lưu ý** - Xin quý vị trả lời câu hỏi ở trên và đưa lại cho nhân viên của văn phòng trước khi ra về. Xin cảm ơn! |

*Figure 5.2*. Post-exam survey.

# Bệnh Võng Mạc Do Tiểu Đường

## Diabetic Retinopathy

Diabetic retinopathy is an eye problem that can cause blindness. It occurs when high blood sugar damages small blood vessels in the back of the eye, called the retina. All people with diabetes are at risk for this problem. There are things you can do to reduce your risk and prevent or slow vision loss.




Võng mạc do tiểu đường là bệnh mắt có vấn đề và có thể gây mù. Điều này xảy ra khi lượng đường trong máu cao làm hỏng các mạch máu nhỏ ở phía sau mắt, được gọi là võng mạc. Tất cả những ai bị tiểu đường đều có nguy cơ mắc phải vấn đề này. Quý vị có thể làm theo một số chỉ dẫn để giảm nguy cơ, ngăn ngừa hay làm chậm lại quá trình mất thị lực.

Diabetic retinopathy can affect both eyes. You may not have any signs at first. As it worsens, blood vessels weaken and leak blood and fluid. As new blood vessels grow they also leak blood and fluid. This causes blocks in your vision.

Võng mạc do tiểu đường ảnh hưởng đến cả hai mắt. Sẽ không có dấu hiệu nào báo trước. Chỉ khi bệnh nặng hơn, mạch máu yếu đi rồi chảy máu và dịch. Mạch máu mới khi phát triển cũng bị chảy máu và dịch. Tình trạng này khiến tầm nhìn của quý vị bị che khuất.

### Signs of diabetic retinopathy

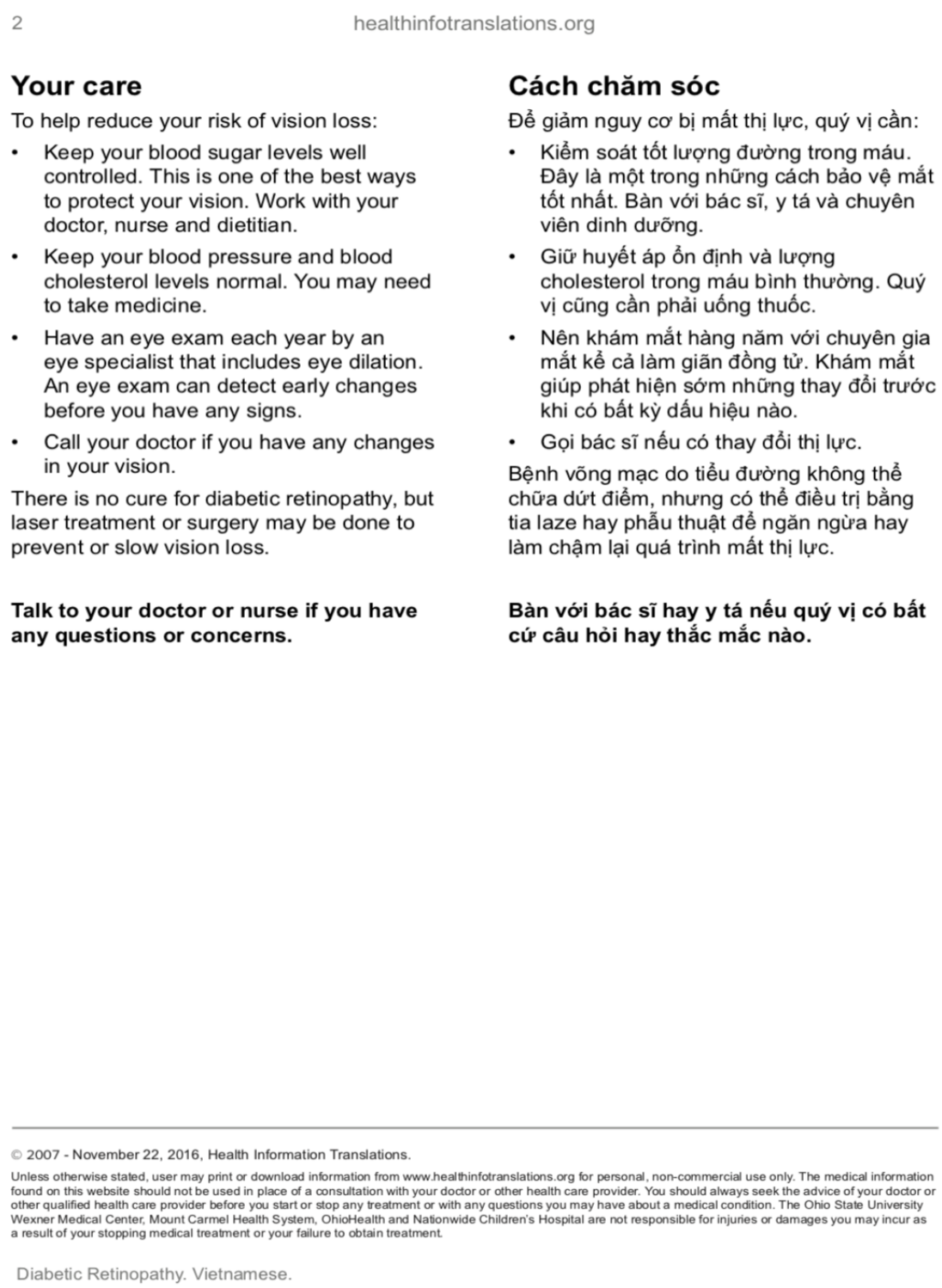
- Floating spots in your vision
- Blurred vision
- Blocked or hazy vision

### Dấu hiệu của bệnh võng mạc do tiểu đường

- Bị đom đóm mắt
- Tầm nhìn nhòe
- Tầm nhìn bị che và mờ

Diabetic Retinopathy. Vietnamese.

*Figure 6.1.* Additional DR educational materials in both Vietnamese and English (Page 1).



2 healthinfotranslations.org

## Your care

To help reduce your risk of vision loss:

- Keep your blood sugar levels well controlled. This is one of the best ways to protect your vision. Work with your doctor, nurse and dietitian.
- Keep your blood pressure and blood cholesterol levels normal. You may need to take medicine.
- Have an eye exam each year by an eye specialist that includes eye dilation. An eye exam can detect early changes before you have any signs.
- Call your doctor if you have any changes in your vision.

There is no cure for diabetic retinopathy, but laser treatment or surgery may be done to prevent or slow vision loss.

**Talk to your doctor or nurse if you have any questions or concerns.**

## Cách chăm sóc

Để giảm nguy cơ bị mất thị lực, quý vị cần:

- Kiểm soát tốt lượng đường trong máu. Đây là một trong những cách bảo vệ mắt tốt nhất. Bàn với bác sĩ, y tá và chuyên viên dinh dưỡng.
- Giữ huyết áp ổn định và lượng cholesterol trong máu bình thường. Quý vị cũng cần phải uống thuốc.
- Nên khám mắt hàng năm với chuyên gia mắt kể cả làm giãn đồng tử. Khám mắt giúp phát hiện sớm những thay đổi trước khi có bất kỳ dấu hiệu nào.
- Gọi bác sĩ nếu có thay đổi thị lực.

Bệnh võng mạc do tiểu đường không thể chữa dứt điểm, nhưng có thể điều trị bằng tia laze hay phẫu thuật để ngăn ngừa hay làm chậm lại quá trình mất thị lực.

**Bàn với bác sĩ hay y tá nếu quý vị có bất cứ câu hỏi hay thắc mắc nào.**



Diabetic Retinopathy. Vietnamese.

*Figure 6.2.* Additional DR educational materials in both Vietnamese and English (Page 2).

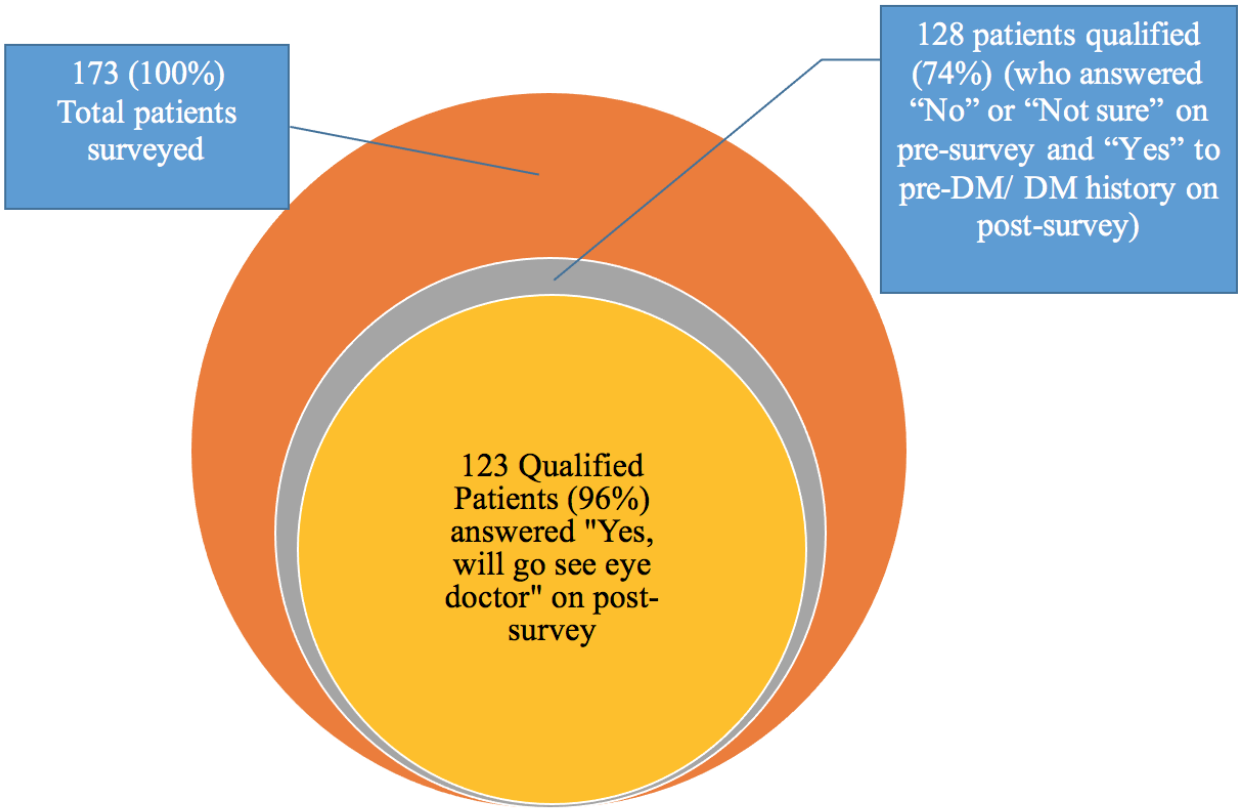



*Figure 7.1*. Patient Measure – Patient Survey Results.

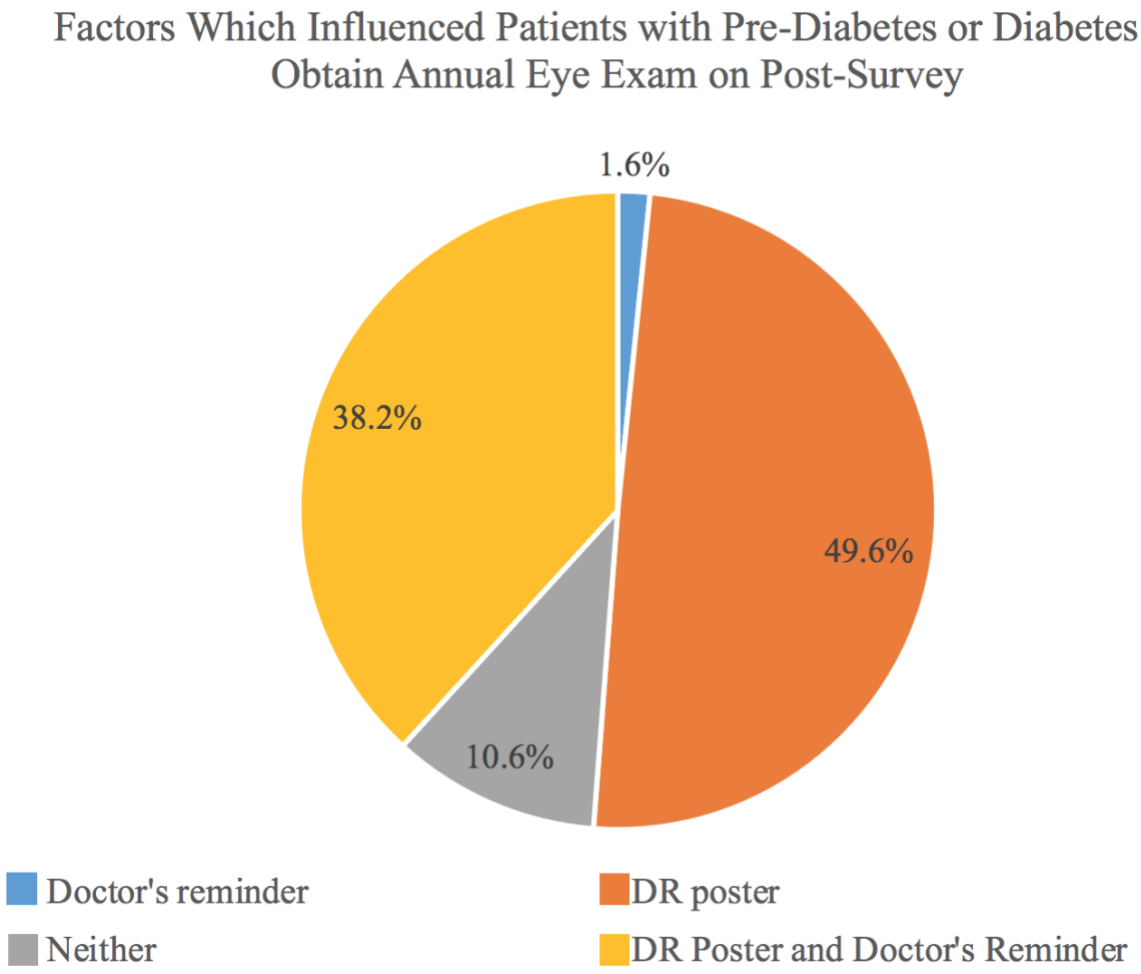



*Figure 7.2*. Patient Measure – Influential factors to see an eye doctor for an annual dilated eye exam.

| | Responded "YES", will plan/go to see an eye doctor annually on Post-survey | Responded "NO", do not plan to see an eye doctor annually on Post-survey | Total |
|---|---|---|---|
| **Had SEEN the DR educational posters** | 123 | 4 | 127 |
| **Had NOT SEEN the DR educational posters** | 0 | 1 | 1 |
| **Total** | 123 | 5 | 128 |

*Figure 7.3*. Patient Measure – Post-survey responses

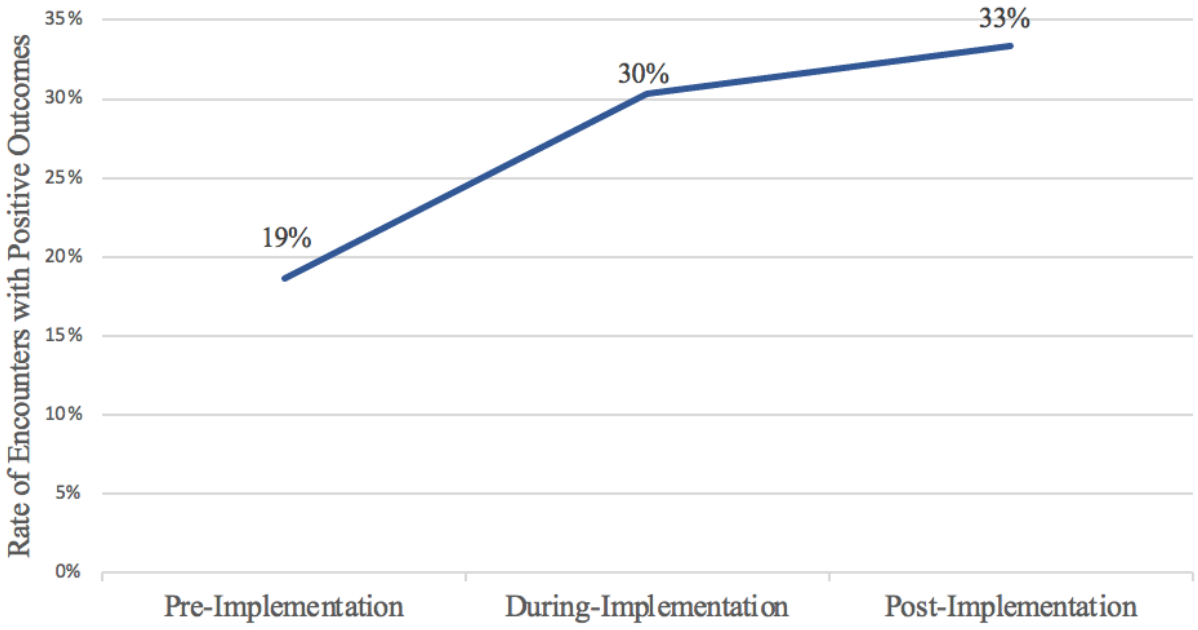



*Figure 8.1*. Clinician Measure-EMR Review of Total Positive Encounters for Pre-Diabetes and Type 2 Diabetes Group.

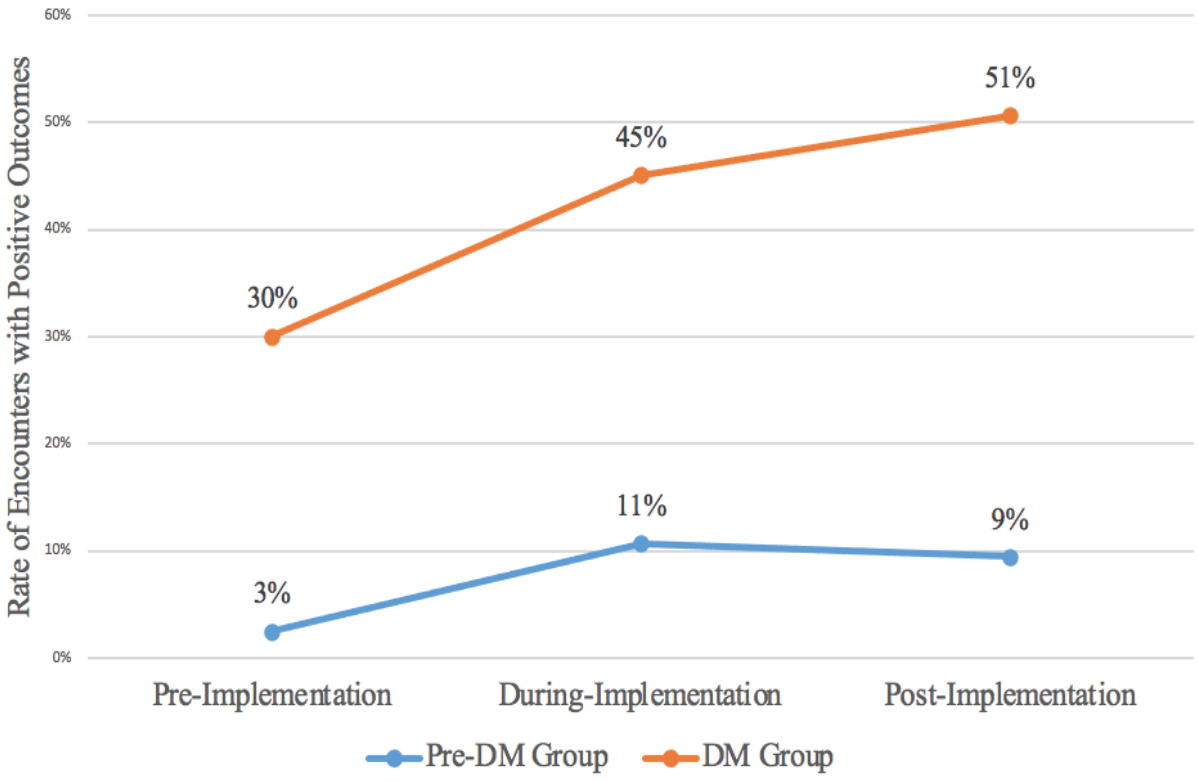



*Figure 8.2*. Clinician Measure - EMR Review of Positive Encounters for Individual Groups (Pre-Diabetes, Type 2 Diabetes).

# Appendix A

## Email permission to use The Iowa Model Revised

**Kimberly Jordan - University of Iowa Hospitals and Clinics** <noreply@qemailserver.com> Tue, Apr 28, 2020, 9:49 AM

to me

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care*. Click the link below to open.

The Iowa Model Revised (2015)

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**Citation:** Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing, 14(3), 175-182. doi:10.1111/wvn.12223*

In written material, please add the following statement:
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# Appendix B

## Permission to use JHNEBP Models and Tools

Home » JHNEBP Model and Tools- Permission

# JHNEBP MODEL AND TOOLS- PERMISSION

Johns Hopkins Nursing
Center for Evidence-Based Practice

Thank you for your submission. We are happy to give you permission to use the JHNEBP model and tools in adherence of our legal terms noted below:

- You may not modify the model or the tools without written approval from Johns Hopkins.
- All reference to source forms should include "©The Johns Hopkins Hospital/The Johns Hopkins University."
- The tools may not be used for commercial purposes without special permission.

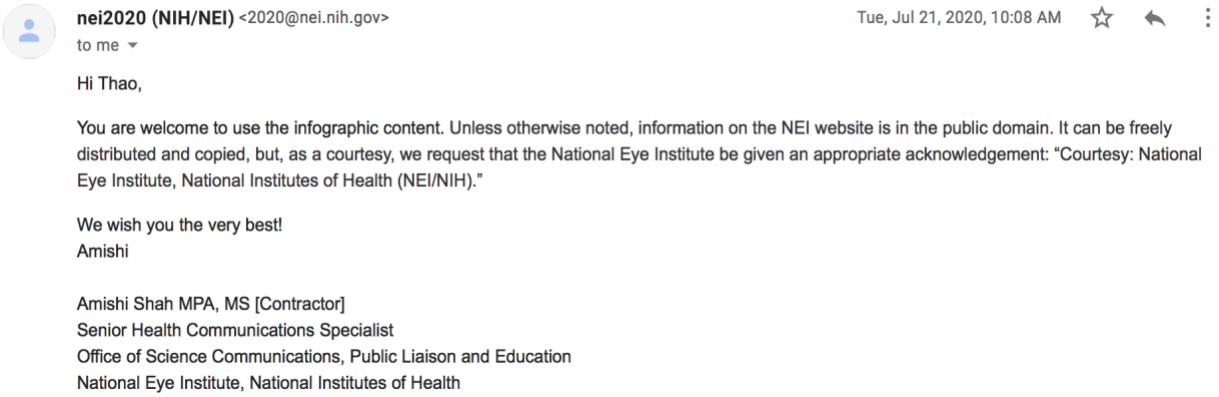
If interested in commercial use or discussing changes to the tool, please email ijhn@jhmi.edu.

Downloads:

JHNEBP Tools-Printable Version

# Appendix C

## Email Permission to Use DR Information from NEI/NIH



**nei2020 (NIH/NEI)** <2020@nei.nih.gov> Tue, Jul 21, 2020, 10:08 AM

to me

Hi Thao,

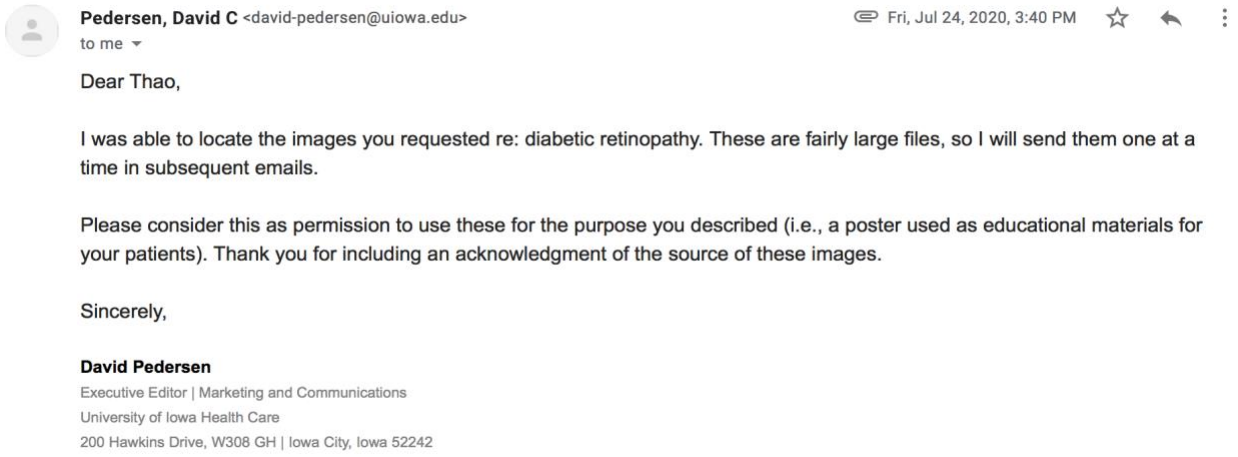
You are welcome to use the infographic content. Unless otherwise noted, information on the NEI website is in the public domain. It can be freely distributed and copied, but, as a courtesy, we request that the National Eye Institute be given an appropriate acknowledgement: "Courtesy: National Eye Institute, National Institutes of Health (NEI/NIH)."

We wish you the very best!
Amishi

Amishi Shah MPA, MS [Contractor]
Senior Health Communications Specialist
Office of Science Communications, Public Liaison and Education
National Eye Institute, National Institutes of Health

# Appendix D

## Email Permission to Use the Retinal Images



**Pedersen, David C** <david-pedersen@uiowa.edu> Fri, Jul 24, 2020, 3:40 PM

to me

Dear Thao,

I was able to locate the images you requested re: diabetic retinopathy. These are fairly large files, so I will send them one at a time in subsequent emails.

Please consider this as permission to use these for the purpose you described (i.e., a poster used as educational materials for your patients). Thank you for including an acknowledgment of the source of these images.

Sincerely,

**David Pedersen**
Executive Editor | Marketing and Communications
University of Iowa Health Care
200 Hawkins Drive, W308 GH | Iowa City, Iowa 52242

# Appendix E

## The Institutional Review Board (IRB) Determination

**Mills, Karen C (kcm6t)** <kcm6t@virginia.edu> Mon, Sep 14, 2020, 4:30 PM

to me

Good afternoon, ,

It was determined that this project as described does not meet the criteria for Human Subject Research. No additional IRB submission/review is necessary for you to proceed with this project. Please refer to the attached IRB signed Determination (see PDF) for additional information.

Your project was assigned IRB Tracking Id # 22650 . This tracking ID has been added to the project documents attached.

Please keep this email and all attached documents with the project files.

Contact the IRB if there are changes to this project that may affect the initial non-human subject determination OR if you have questions or concerns.

Thanks,
Karen

Karen Coleman (Mimms) Mills, RN
Compliance Coordinator
IRB-HSR Board Member
Institutional Review Board-Health Sciences Research