Screening for Diabetic Retinopathy:
Strategies for Improving Patient Follow-up

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Diabetic retinopathy is a leading cause of preventable blindness. Timely screening and treatment prevent morbidity, though low follow-up rates remain problematic. Feasible and efficacious methods for increasing screening follow-up rates include patient education, a streamlined referral and scheduling process, and collaboration with local ophthalmologists and primary care providers.

In the US, 29 million people (9.3% of population) have diabetes, and over a million adults in North Carolina (about 10% of population) have diabetes [1]. Diabetes and its associated morbidities pose a significant health risk for the individual patient and a large burden for our already burgeoning health care system. Diabetic retinopathy is the leading cause of new cases of blindness in the US and the most common cause of blindness in North Carolina. With timely laser treatment and intravitreal anti-vascular endothelial growth factor (VEGF) therapy, severe vision loss from diabetic retinopathy can be reduced by 90% [2-4]. However, because early diabetic retinopathy is usually asymptomatic, the only avenue for patients to present in a timely fashion is through early screening.

Background

Diabetic retinopathy screening meets the World Health Organization criteria for screening programs, which stipulates the following: the condition must have not only a recognizable early or latent stage but also effective and well-accepted treatment options, and the condition must currently be (and be expected to remain) an important public health concern [5]. Of course, efforts to increase patient screening for diabetic retinopathy should accompany efforts to increase patient education regarding the disease. Although significant effort is being made to screen for and educate people about diabetic retinopathy, a recent national survey showed that 73% of adults aged 40 and over with diabetic retinopathy were unaware of their condition [6]. This was particularly prevalent in patients with less severe diabetic retinopathy, shorter diabetes duration, and lack of a recent eye examination [6].

Current Guidelines

Current diabetic retinopathy screening guidelines recommend a retinal examination in type 1 diabetics 5 years after diagnosis and at least annually thereafter. Type 2 diabetes patients should be examined immediately at the time of diagnosis and at least annually thereafter. More frequent examinations are advised for patients with progressing retinopathy. Gestational diabetes patients are not at risk of developing diabetic retinopathy and do not require eye examinations, whereas diabetes patients who become pregnant are at increased risk for progression of retinopathy and should receive eye examinations in the first trimester and at 1 year postpartum [7]. The retinal examination is usually conducted by an ophthalmologist or optometrist who looks through a dilated pupil using the indirect or direct ophthalmoscope or slit lamp biomicroscopy [7]. Recently, fundus photography telemedicine has become an alternative method for obtaining the retinal examination [8]. This method involves a trained photographer taking retinal images and sending them to a remote trained reader (typically an ophthalmologist or optometrist) for interpretation. Fundus photography telemedicine has been shown to have acceptable sensitivity and specificity for screening of diabetic retinopathy compared to in-person screens. It is also cost-effective and generally well-liked by patients [9, 10].

Disparities

Disparities in screening rates exist between ethnic, socioeconomic, and geographical groups nationally and in North Carolina. A North Carolina survey of people with diabetes showed that approximately 70% of non-Hispanic whites and African Americans received eye examinations in the year before the survey, compared to 61% of Native Americans and 52% of Hispanics [1]. This is consistent with national data showing that minorities tend to have lower rates of screening [10]. Screening rates also vary by geographic location, with rural populations having lower rates of screening, likely due to issues with access to care [11]. Diabetes patients with retinopathy who have access to reti-

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nopathy screening at or near the office of their primary care provider may more likely be screened out of convenience compared with those who are referred to an eye care specialist [12]. Other potential barriers to screening include financial difficulties and language differences [13].

Focus for Research

Improving screening rates for diabetic retinopathy has been a focus of research. Recommended interventions utilized by different communities include increasing patient and provider awareness, collaborating with community-based programs and disciplines, using electronic medical records and automatic reminders, utilizing mobile diabetes clinics, and providing services in multiple languages [13]. The University of North Carolina's management of diabetes patients is a current example of a health care system utilizing electronic medical records, automatic reminders, and interdisciplinary collaboration. In UNC's system, all diabetes patients are automatically reminded to schedule an annual eye examination. System alerts let primary care providers know when eye examinations are due and when they have been completed, giving them the opportunity to remind and counsel patients.

Patient Retention and Education

In many locations around North Carolina, diabetes patients are being seen for initial eye examinations; retaining these patients for their follow-up is a bigger challenge. This difficulty in following up with patients is not just a local phenomenon; in a recent study by Keenum et al published in JAMA Ophthalmology, based largely on an African American population in an urban setting, less than 30% of the study participants adhered to their recommended follow-up ophthalmic examinations [14]. These patients had access to a health care center housing both ophthalmology and primary care physicians in the same building that welcomed patients, including those without insurance [14]. Patients with higher rates of follow-up in the study were older and had knowledge of their hemoglobin A1C level, but tended not to accept assistance with setting up their follow-up ophthalmic examination appointments [14]. The fact that this study minimized many barriers to follow-up and provided assistance with scheduling follow-up, yet displayed a dismally low follow-up rate of 30% [14], suggests that patients experience additional barriers to care and that more research is needed to elucidate factors involved in low follow-up rates.

Some studies have shown that follow-up rates increase most with education. A randomized, controlled study in 1999 showed that intensive education to an intervention group increased follow-up appointment rates to about 54%, from about 27% [15]. The study's intensive education intervention group received a 9 page color book aimed at 3rd grade reading called *The World is a Beautiful Place to See*, a motivational video tape, and a semi-structured telephone call with counseling, all within a few weeks of the patient's first visit. Control patients, on the other hand, received nothing until 6 months after their first visit when they were mailed an American Diabetes Association meal planning booklet accompanied by a letter urging them to schedule a follow-up appointment [15].

In addition to more education, some studies show that telehealth efforts, especially those including an ongoing remote relationship with non-physician providers such as dietitians, nurse certified diabetes educators, and certified health educators, improve diabetes self-management [16]. Studies of this collaborative telehealth effort demonstrated improved hemoglobin A1C levels and better adherence to ocular examination follow-up [17].

Current Research

Currently Dr. Seema Garg, a retinal specialist at the University of North Carolina, is at the helm of a multicenter study to evaluate the effectiveness of telemedicine on diabetic retinopathy screening rates at busy primary care practices. So far in her study, retinal photographs using a non-mydriatic (no pupil dilation) retinal camera have been obtained for over 1700 patients in 5 sites spanning North Carolina. These images have been securely transferred to her over the internet, and she interprets them for the presence and severity of diabetic retinopathy. Thus far, more than half of the patients have attended these follow-up appointments at their primary care medical homes. The rate of follow up in her study is significantly higher than that of other studies. She postulates the reasons for this are manifold. First, patient education, as in other studies mentioned above, is a significant part of her study's program. The retinal telescreening in and of itself facilitates patient education regarding diabetes and its ocular effects. Also, English and Spanish educational materials from the National Eye Institute have been provided to each primary care clinic to raise patient awareness of retinal screening's importance for reducing diabetes complications. Second, collaboration with local ophthalmologists prior to the onset of the project made them aware that patients would be referred from the telemedicine network if they needed treatment or if their images were not clear enough to grade. Third, assistance by clinic staff in scheduling appointments for patients requiring a referral to an ophthalmologist may have encouraged patients to keep these appointments.

The high retention rate achieved by Dr. Garg supports a multidimensional approach that synthesizes telescreening with primary care collaboration and patient education. A similar approach that included an annual retinal assessment was used in a previous successful multidisciplinary telescreening effort by Davis et al [17]. Participants were randomized to receive either routine care or Diabetes TeleCare, a 12-month remote telehealth diabetes self-management program administered by dietitians and certified diabetes educators [17]. The Diabetes Telecare group, compared with

the routine care group, was shown to have lower glycated hemoglobin and lipids at the 12 and 24 month marks. A higher portion of the Diabetes Telecare group (81.2%) also underwent eye exams compared to the routine care group (38.8%) [17]. Retinal telescreening in collaboration with patients' primary care providers is a promising new avenue for increasing rates of follow-up and compliance with diabetic retinopathy screening.

Conclusion

Diabetic retinopathy is a leading cause of preventable blindness and requires timely screening and treatment. Racial, socioeconomic, and geographic disparities in screening rates and follow-ups still exist. Efforts to decrease barriers including utilization of electronic medical records, system alerts, educational programs, language services, and combination of primary care and ophthalmology services into single facilities have improved screening rates and follow-up. Telehealth has also shown great promise as a method for extending specialist coverage. Future research is needed in this important area. NCMJ

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