South Atlantic Medical Group	**Clinical Protocol: Diabetes Management**	**SUBDEPARTMENT:** N/A
	POLICY NO.	**ORIGINAL EFFECTIVE DATE:** 12/01/2019
		REVIEWED/REVISED DATE(S): 11/15/2023, 03/6/2024
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TITLE OF POLICY: Routine Screening for Diabetic Retinopathy		

PROTOCOL OVERVIEW

Retinopathy is a major cause of morbidity in patients with diabetes. Most patients who develop diabetic retinopathy (DR) have no symptoms until the very late stages (by which time it may be too late for effective treatment). Because the rate of progression may be rapid and therapy can be beneficial for both symptom amelioration and reduction in the rate of disease progression, it is important to screen patients with diabetes regularly for the development of retinal disease.

This Clinical Protocol provides indications and guidelines for Routine Screening for Diabetic Retinopathy.

INDICATIONS

Screening for DR is important because the majority of patients who develop DR have no symptoms until macular edema (ME) and/or proliferative diabetic retinopathy (PDR) are already present. The efficacy of laser photocoagulation and/or vascular endothelial growth factor (VEGF) inhibitors in preventing visual loss from PDR and ME is well established in randomized trials. However, these therapies are more beneficial in preventing visual loss than reversing diminished visual acuity. Thus, early detection through screening programs and appropriate referral for therapy are important to preserve vision in individuals with diabetes

METHOD OF SCREENING

Initial screening can be accomplished with dilated fundus examination or retinal photography. Screening must be performed by those with expertise in the chosen modality (eg, ophthalmologist/optometrist experienced with diagnosing DR or trained photographer and reader for retinal photography).

When previous exams have been normal, subsequent examinations can be done with retinal photographs. A comprehensive examination is required for follow-up of abnormalities detected on retinal photographs. These recommendations are largely consistent with American Diabetes Association (ADA) guidelines.

Ophthalmoscopy by well-trained personnel on dilated fundi has been the standard screening method for DR. (The accuracy of ophthalmoscopy is substantially lower when performed by primary care physicians.) However, the availability of digital stereoscopic retinal imaging may improve retinopathy screening in areas with a shortage of eye care specialists.

Digital stereoscopic retinal imaging takes 15 to 20 minutes and does not require dilation of the eyes. The images can be interpreted remotely by an ophthalmologist or onsite using an automated computer algorithm for evaluation. When compared with dilated fundoscopic examination or the gold standard seven-field stereoscopic fundus photography for retinopathy screening, digital imaging (three fields) has good sensitivity and specificity for detecting DR. As an example, in one study comparing digital imaging with dilated fundoscopic examination, there was concordance in 86 percent of cases.

Most discordant diagnoses (35 of 46 eyes) were related to a greater frequency of finding mild to moderate non-proliferative diabetic retinopathy (NPDR) with digital images compared with dilated fundoscopic exam. Although there were few cases of macular edema (ME; six eyes), there was 100 percent concordance between the two modalities.

Automated evaluation of digital retinal images using a computer algorithm with the ability to continually learn and update parameters for detecting referable DR shows promise for use in the clinical setting. The automated evaluation should not be used in pregnant women, in whom retinopathy can progress rapidly, as the available device was not intended for evaluation of rapidly changing retinopathy.

It should also not be used in patients with previously diagnosed severe NPDR, proliferative diabetic retinopathy (PDR), ME, radiation retinopathy, retinal vein occlusion or in patients with a history of laser treatment, surgery, injections in the eye, or with persistent vision loss, blurred vision, or floaters.

SCREENING INITATION AND FREQUENCY

When should screening begin?

Adults – In patients with type 2 diabetes, we suggest an initial comprehensive examination by an ophthalmologist or optometrist shortly after the diagnosis of diabetes is made. In patients with type 1 diabetes, we suggest an initial comprehensive examination by an ophthalmologist or optometrist within five years after diagnosis.

Type 2 diabetes is typically a disease with insidious onset, and some patients already have retinopathy at the time of diagnosis of hyperglycemia. In contrast, it is unusual for patients with type 1 diabetes (under age 30 years) to develop retinopathy that requires specific ophthalmologic therapy earlier than five years after the onset of diabetes. As an example, in 1613 patients with type 1 diabetes of less than five years' duration who were screened for enrollment in the Diabetes Control and Complications Trial (DCCT), 874 had evidence of DR either by fundus photography or fluorescein angiography. However, none had proliferative diabetic retinopathy (PDR) requiring laser treatment, and only six (0.4 percent) had preproliferative retinopathy.

Children and adolescents – In children with type 1 diabetes, it is unusual to develop retinopathy prior to age 10 years. Initial screening in children and adolescents is reviewed separately.

Frequency of examinations — The frequency of follow-up examinations should be individualized, with more frequent follow-up in patients who have abnormal findings or if retinopathy is progressing. Less frequent examinations (every two to three years) may be considered with the advice of an eye care professional in the setting of a normal examination. There are few data evaluating the frequency of follow-up examinations after the initial screening examination. An individualized schedule, rather than annual or biannual screening, may be preferable and more cost effective.

Type 2 diabetes – In the Wisconsin Epidemiology Study of Diabetic Retinopathy (WESDR), patients with type 2 diabetes and no retinopathy on baseline examination (standard stereoscopic color fundus photographs) did not progress to PDR over four years. However, patients with a longer duration of diabetes, retinopathy on baseline examination, gross proteinuria, or poor glycemic control were at greater risk of developing PDR.

Similarly, a cohort study from the United Kingdom found that the incidence of sight-threatening DR (moderate preproliferative retinopathy or worse, or clinically significant macular edema [ME]) in patients with type 2 diabetes with no retinopathy on initial screening was 0.3 percent (95% CI 0.1-0.5) in the first year and 1.8 percent (95% CI 1.2-2.5) in the fifth year, suggesting that screening every three or four years

may be adequate in those with normal initial examinations. Yearly or more frequent screening was required for those with background or preproliferative retinopathy on initial screening.

Based upon these studies, some health care organizations and auditing groups (such as the National Committee on Quality Assurance) have suggested that those individuals documented to have no DR may be screened every two years. However, it is not clear if the results of the above studies are applicable to all patients with type 2 diabetes. As an example, it should be noted that the WESDR study individuals were White patients of northern European extraction, and some studies suggest racial and ethnic variation in DR. In the Veterans Affairs Diabetes Trial (VADT), the prevalence of moderate to severe DR was higher for Hispanic (36 percent) and African American persons (29 percent) than for non-Hispanic White persons (22 percent). Furthermore, it is not clear that the standards used in the WESDR study for evaluation of the photographs can be adopted nationwide. Finally, there is greater potential to lose patients to follow-up with less frequent screening intervals.

Type 1 diabetes – The appearance and progression of retinopathy has been assessed regularly with scheduled fundus photography in patients with type 1 diabetes participating in the DCCT and EDIC (Epidemiology of Diabetes Interventions and Complications) study, giving rise to a mean 23.5 years of follow-up data. Among almost 24,000 retinopathy examinations, 14.5 percent showed worsening from the previous visit, 7.8 percent showed improvement, and 77.7 percent showed no change. Higher glycated hemoglobin (A1C) levels were associated with a significantly increased risk of worsening retinopathy.

A Markov model was used to calculate the probabilities of transitioning from lower levels of retinopathy with varying screening intervals. The time interval during which patients progressed from lower to higher categories of retinopathy was dependent upon the previous retinal examination and A1C level, with optimal screening intervals ranging from every three months among patients with severe non-proliferative diabetic retinopathy (NPDR) to every four years among those who had no retinopathy. This individualized schedule for retinopathy screening resulted in an overall reduction in the frequency of eye examinations and a substantial reduction in cost. These data support an individualized approach to examination intervals.

Pregnancy — The effect of pregnancy on the natural history of DR has been addressed in several studies; progression has been observed in 16 to 85 percent of patients, and the rate of progression may be accelerated. This topic is reviewed in more detail elsewhere.

Because pregnancy may exacerbate underlying DR, women with diabetes who are planning pregnancy should have a comprehensive eye examination and be counseled on the risk of development and/or progression of DR.

Women with diabetes who become pregnant should have a comprehensive eye examination in the first trimester and close follow-up throughout pregnancy and for one year postpartum. This guideline does not apply to women who develop gestational diabetes, as these women are not at increased risk for DR.

RECOMMENDED RECORDS

- CBC
- CMP
- Mg Phos
- UA with micro including urine protein to creatinine ratio
- Diabetic foot exam
- Diabetic eye exam and further evaluation by optometrist and ophthalmologist

CITATIONS

1. Frank RN. Diabetic retinopathy. N Engl J Med 2004; 350:48.

2. American Diabetes Association. 11. Microvascular Complications and Foot Care: Standards of Medical Care in Diabetes-2020. Diabetes Care 2020; 43:S135.

3. O'Hare JP, Hopper A, Madhaven C, et al. Adding retinal photography to screening for diabetic retinopathy: a prospective study in primary care. BMJ 1996; 312:679.

4. Shi L, Wu H, Dong J, et al. Telemedicine for detecting diabetic retinopathy: a systematic review and meta-analysis. Br J Ophthalmol 2015; 99:823.

5. Taylor CR, Merin LM, Salunga AM, et al. Improving diabetic retinopathy screening ratios using telemedicine-based digital retinal imaging technology: the Vine Hill study. Diabetes Care 2007; 30:574.

6. Kirkizlar E, Serban N, Sisson JA, et al. Evaluation of telemedicine for screening of diabetic retinopathy in the Veterans Health Administration. Ophthalmology 2013; 120:2604.

7. Ahmed J, Ward TP, Bursell SE, et al. The sensitivity and specificity of nonmydriatic digital stereoscopic retinal imaging in detecting diabetic retinopathy. Diabetes Care 2006; 29:2205.

8. Vujosevic S, Benetti E, Massignan F, et al. Screening for diabetic retinopathy: 1 and 3 nonmydriatic 45-degree digital fundus photographs vs 7 standard early treatment diabetic retinopathy study fields. Am J Ophthalmol 2009; 148:111.

9. Bragge P, Gruen RL, Chau M, et al. Screening for presence or absence of diabetic retinopathy: a meta-analysis. Arch Ophthalmol 2011; 129:435.

10. Chasan JE, Delaune B, Maa AY, Lynch MG. Effect of a teleretinal screening program on eye care use and resources. JAMA Ophthalmol 2014; 132:1045.

11. Gulshan V, Peng L, Coram M, et al. Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs. JAMA 2016; 316:2402.

12. Walton OB 4th, Garoon RB, Weng CY, et al. Evaluation of Automated Teleretinal Screening Program for Diabetic Retinopathy. JAMA Ophthalmol 2016; 134:204.

13. https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm604357.htm?utm_campaign=PR_FDA%20permits%20AI%20device%20for%20diabetes%20eye%20problems&utm_medium=email&utm_source=Eloqua (Accessed on September 18, 2018). 5

14. Malone JI, Morrison AD, Pavan PR, et al. Prevalence and significance of retinopathy in subjects with type 1 diabetes of less than 5 years' duration screened for the diabetes control and complications trial. Diabetes Care 2001; 24:522.

15. Klein R, Klein BE, Moss SE, Cruickshanks KJ. The Wisconsin Epidemiologic Study of diabetic retinopathy. XIV. Ten-year incidence and progression of diabetic retinopathy. Arch Ophthalmol 1994; 112:1217.

16. Younis N, Broadbent DM, Vora JP, et al. Incidence of sight-threatening retinopathy in patients with type 2 diabetes in the Liverpool Diabetic Eye Study: a cohort study. Lancet 2003; 361:195.

17. Thomas RL, Dunstan F, Luzio SD, et al. Incidence of diabetic retinopathy in people with type 2 diabetes mellitus attending the Diabetic Retinopathy Screening Service for Wales: retrospective analysis. BMJ 2012; 344:e874.

18. McCulloch, et al. Diabetic Retinopathy Screening. Uptodate Topic 1755 Version 26.0 202