



## What Eye Care Professionals Would Like Team Members to Know About Eye Health and Diabetes

In this section, you will find an overview of key medical issues related to eye health and diabetes in order to support the pharmacy, podiatry, optometry, and dentistry (PPOD) model of team care to inform all members of the health care team about diabetes and eye health.

The information presented in this section validates key Healthy People 2020 objectives for diabetes and reinforces your value as PPOD professionals in the team care approach to comprehensive diabetes care.

**Healthy People 2020 Objective** (Released by the U.S. Department of Health and Human Services each decade, [Healthy People](#) is a set of goals and objectives with 10-year targets designed to guide national health promotion and disease prevention efforts to improve the health of all people in the United States.)

**Diabetes Objective #10 (D-10):** Increase the proportion of adults with diabetes who have an annual dilated eye examination.

**Target:** 58.7%.

**Baseline:** 53.4% of adults ages 18 years and older with diagnosed diabetes had a dilated eye examination in the past year, as reported in 2008 (age adjusted to the year 2000 standard population).

**Target Setting Method:** 10% improvement.



**Data Source:** [National Health Interview Survey](#), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics.

## Current Data and Trends

Diabetes is the leading cause of new cases of blindness among adults ages 20 to 74 years. Approximately 11.0% of U.S. adults with diabetes have some form of visual impairment (3.8% uncorrectable and 7.2% correctable).<sup>1</sup>

Of late, 4.2 million people with diabetes ages 40 years or older (28.5%) had diabetic retinopathy (DR) and, of these, 655,000 (4.4% of those with diabetes) had advanced DR that could lead to severe vision loss.<sup>2</sup>

DR is projected to affect 16 million people with diabetes by 2050. Other diseases, like cataracts and glaucoma, also are projected to increase in this population.<sup>3</sup>

## Diabetes-related Eye Conditions

People with diabetes are at 25 times greater risk for blindness than people without diabetes.<sup>4</sup>

People with diabetes who currently smoke, have poor nutrition, and do not control their diabetes have an even greater risk of developing eye complications. Because many people with diabetes have slower healing time, eye injuries—even minor corneal abrasions—should not be taken lightly.

Further, many of the complications of diabetes and the eye are painless and sightless diseases that the patient will only notice after the disease has progressed.

With cataracts, DR, glaucoma (other than angle closure), and early dry eye and corneal disease, the patient is unaware that a pathology is present without an examination.

## Patient Case Example

A 45-year-old woman tells her podiatrist that she can't check her feet because she "just can't see as well" as she used to. She has not had an eye exam because she never had poor vision before, but she was recently diagnosed with diabetes.

The podiatrist recognizes that the patient's blurred vision could be a sign of poor glucose control or eye pathology and explains the relationship between diabetes and vision problems.

The podiatrist then refers the patient to an optometrist for a comprehensive eye examination, including pupil dilation. The podiatrist also refers her to her primary care physician or an endocrinologist for glucose management.

## Retinopathy

DR is a common complication of diabetes. Elevated blood sugar damages the retinal blood vessels, causing them to break down, leak, or become blocked. Over time, this causes retinal hemorrhage and impaired oxygen delivery to the retina, which can lead to the growth of abnormal vessels (proliferative diabetic retinopathy, or PDR). These new vessels are fragile and can break easily, resulting in fibrovascular scar tissue that detaches the retina and causes permanent vision loss (traction retinal detachment).

Additionally, increased vascular permeability in the macula—the central area of the retina responsible for good detail and color vision—may lead to accumulation of fluid that significantly impairs vision (diabetic macular edema, or DME).

Studies have shown that aspirin use (e.g., for cardiovascular disease prophylaxis) is safe in persons with retinopathy and has no adverse effect on the development or progression of DR.<sup>5,6</sup>

Poor glycemic control and longer duration of diabetes lead to increased rates of retinopathy in people with type 1 and type 2 diabetes. However, DR is treatable and is one of the most preventable causes of vision loss and blindness. The risks of DR are reduced through good management of the ABCs (A1C, blood pressure, cholesterol, and smoking cessation).<sup>7</sup>

Early diagnosis and proper treatment reduce the risk of vision loss; however, as many as 50% of patients do not get their eyes examined or are diagnosed too late for treatment to be effective.<sup>8</sup> Individuals with diabetes are also at an increased risk for other eye diseases, including glaucoma, cataracts, cranial nerve palsies affecting binocular vision, staphylococcal eyelid disease, and dry eye.

## Cataracts

Cataracts are a clouding of the eye's internal lens, most often caused by aging. The lens is responsible for focusing images onto the retina, and, thus, a clouding of the lens can result in diminished vision and increased sensitivity to glare.

More than 22 million Americans ages 40 and older have cataracts, making it the number one age-related eye disease.<sup>9</sup> More than half of all Americans ages 65 years and older have cataracts, but patients with diabetes often develop them 10 to 20 years prematurely, a phenomenon aggravated by both poor blood glucose control and increased body mass index.<sup>10</sup> The treatment for cataracts is usually surgery.

## Glaucoma

Glaucoma is a progressive disease that damages the optic nerve. It is this nerve that carries the retinal image to the brain, so disruption of this transmission causes irreversible blind spots or field loss, which over time can lead to total blindness.

A view of the optic nerve during a dilated eye exam—combined with visual field testing, intraocular pressure testing (IOP), and other tests—can often reveal damage at an early stage, thus providing opportunity for treatment. It is important to note that IOP should never be used as a sole diagnostic indicator, as some patients sustain optic nerve damage at lower levels and many patients have variable IOP depending on the time of day.

Some studies have suggested that patients with diabetes are more likely to develop the most common type of glaucoma—primary open angle glaucoma—whereas diabetes is a well-established and major risk factor for neovascular glaucoma that may accompany proliferative retinopathy.

Among Americans ages 40 years or older, nearly 3 million have glaucoma and more than half are unaware of having the disease.<sup>13</sup>

## Comprehensive Diabetic Eye Exam: How Often and By Whom?

- The American Diabetes Association (ADA) recommends that adults and children ages 10 years or older with type 1 diabetes should have an initial dilated comprehensive eye exam by an optometrist or ophthalmologist within 5 years after the onset of diabetes, and patients with type 2 diabetes should undergo an examination shortly after diagnosis of the disease. As many as 21% of patients with newly diagnosed type 2 diabetes will have retinopathy at diagnosis.<sup>11</sup>
- Patients with either form of the disease should generally be examined annually thereafter by an optometrist or ophthalmologist. According to ADA, the recall interval may be shortened if the retinopathy is progressing but extended to every 2 to 3 years if it is not.<sup>12</sup> However, it is important to note that annual eye examinations are an opportunity for optometrists and ophthalmologists to reinforce the importance of good metabolic control, diagnose and treat eye complications other than diabetic retinopathy, and make appropriate referrals to other members of the diabetes care team.

For this reason, glaucoma often is referred to as the “silent thief of sight.” Glaucoma is two to five times as common among older black adults as among older white adults.<sup>11,14</sup>

## Double Vision

People with diabetes may complain about sudden onset of double images. Because this can be due to damage to the nerves from the brain to the eye, it is important to see an optometrist or ophthalmologist immediately.

This symptom can be misinterpreted by the patient or by a non-eye care provider unfamiliar with this ocular complication as a sign of a stroke or other neurological problem, prompting unnecessary diagnostic procedures such as radiological exams. Double vision (diplopia) may be due to damage to a single nerve (mononeuropathy) where cranial nerves III and VI are most frequently affected.

In the majority of cases, IIIrd nerve palsies occur with pupillary sparing. Most diabetic IIIrd nerve palsies usually resolve spontaneously within 2 to 3 months, and symptoms of double vision can often be controlled with the use of special lenses.

## Vision Fluctuation

Poor control of blood glucose levels can lead to a fluctuation in vision. These temporary visual fluctuations occur because of fluid imbalance in the crystalline lens.

When the glucose level is elevated, the lens thickens due to osmotic swelling, causing vision changes that may increase nearsightedness or farsightedness. When the glucose level returns to normal, the lens can shrink back to its normal state.

For patients who need glasses, if the glucose level is poorly controlled, the constant state of flux can pose a challenge to the optometrist or ophthalmologist in determining the best prescription lenses until blood glucose levels stabilize.



## Dry Eye and Corneal Disease

Elevated blood glucose levels increase the osmolarity of the tears and impair the ability of the tear (lacrimal) gland to secrete tears, resulting in dry eye. Increased glucose in the meibomian glands of the eyelid may disrupt the normal flow of oils that prevent evaporation of the tears, which increases the risk of staphylococcal overgrowth. Patients with diabetes are twice as likely to report symptoms of dry eye and/or frequent use of artificial tears products.

Hyperglycemia also adversely affects adherence of corneal epithelial cells to underlying tissue, which can result in chronic sloughing of the corneal surface (recurrent corneal erosion syndrome) and increased risk of infection. Accordingly, both contact lenses and corneal refractive surgery should be prescribed with care and only to those patients who maintain good glycemic control.

## Comprehensive Eye Examination

People with diabetes can maintain optimal vision and healthy eyes by having an annual comprehensive vision examination, including a dilated retinal examination, with early intervention if retinopathy is found. More than 90% of vision loss caused by diabetes can be avoided by good diabetes management (i.e., good control of blood glucose, blood pressure, and lipids), early detection, and timely treatment.<sup>1</sup>

Early detection and treatment can prevent or delay blindness due to DR in 90% of people with diabetes. Studies show that good glycemic control can reduce or significantly delay the development of retinopathy and the risk of visual impairment in people with both type 1 and type 2 diabetes.<sup>7,12,15,16,17,18</sup> Intensive management of blood glucose reduces the first appearance of any retinopathy by 27%, and improved blood pressure control has been shown to reduce substantially the risk of significant vision loss in people with type 2 diabetes.<sup>18</sup>

New evidence suggests that angiotensin conversion enzyme inhibitors and angiotensin receptor blocking agents (-prils and -sartans) further reduce the risk of worsening retinopathy in people with type 1 diabetes.<sup>19,20</sup> For patients with type 2 diabetes, emerging evidence shows that fenofibrate therapy reduces the risk of worsening retinopathy.<sup>21</sup>

Retinal laser photocoagulation surgery can reduce the risk of severe vision loss from the worst form of the disease, PDR, to 4% or less.<sup>22</sup> Treatment of significant DME may include focal laser photocoagulation (per Early Treatment of DR Study guidelines<sup>23</sup>), injected or implanted, and sustained release of intraocular steroids and/or agents that block vascular endothelial

growth factor (anti-vascular endothelial growth factor medicines like Avastin™ and Lucentis™).

Optometrists and ophthalmologists can provide low-vision aids and devices—from simple handheld and stand magnifiers to innovative, computer-assisted optical devices—to help those who have experienced uncorrectable vision loss due to DR. These eye care professionals can also provide or ensure the provision of a full spectrum of care and services that

may allow people with vision impairment and diabetes to maintain their independence and quality of life and help control their diabetes (e.g., to read instructions, take medications, perform self-monitoring of blood glucose levels, continue with household tasks).



## Patient Education

The goal is to prevent low-risk patients from moving to the high-risk category through control of the ABCs (A1C, blood pressure, cholesterol, and smoking cessation).

PPOD providers can help by educating patients about the connection between diabetes and eye health. Encourage patients to get a dilated eye exam at least once a year. Discuss with patients how to prevent diabetic eye disease. And, tell patients to visit their eye care provider right away if they:

- See little black lines or spots that don't go away.
- See any red spots or red fog.
- Have a sudden change in how clearly they see.
- Take longer than usual to adjust to darkness.

Please visit the [Resource Center](#) section of the PPOD Guide and Toolkit for resources on eye health.

## Key Questions That All Members of the Health Care Team Should Ask Patients About Eye Health

*Patients should be referred to an optometrist or other eye care professional if the answers to these questions are “no” or “unsure”:*

- Do you get a full eye exam with dilated pupils at least once a year? This is important because diabetes can affect your eyes without any signs or symptoms.
- Do you know how diabetes can affect your eyes?
- Do you know what to do if you suddenly have a change in your vision?

## Key Points

- Optometrists and ophthalmologists play a key role in the early detection and intervention of diabetes-related eye complications. Retinopathy, glaucoma, cataracts, and other common eye complications can be avoided with annual comprehensive vision examinations that include dilated retinal examination. Special fundal photography may also be helpful.
- Optometrists and ophthalmologists are important in the collaborative interprofessional team care approach for diabetes management.

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# Eye Health and Diabetes



**This is what a person with normal vision sees.**



**This is what a person with diabetic retinopathy sees.**



**This patient with ptosis (drooping lid) and double vision from an inability to turn the eye up, down, or inward has a Cranial Nerve III palsy. Cranial nerve palsy is not uncommon in diabetes; a person with this condition should be referred for an eye exam to rule out other serious conditions.**



**This patient with eye pain, light sensitivity, and a 2-mm white lesion has a corneal ulcer. People with diabetes may not complain of pain because of corneal neuropathy. Steroid or over-the-counter eye drops would be a serious mistake—this patient needs a referral.**



**Hypopyon, white cells collecting in the anterior chamber of the eye, is a sign of serious intraocular infection and/or inflammation; this person should be referred immediately.**



**An irregular pupil can be a sign of iritis or nerve palsy—a potential complication of diabetes or other conditions. Iritis can lead to pupillary block glaucoma, a sight-threatening condition. This patient needs a referral.**