

Preventing and Managing Visual Disability in Primary Care

Clinical Applications

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DESPITE THE FACT THAT MANY ophthalmic problems are preventable or treatable, limited or delayed eye care results in permanent visual loss and unnecessary visual disability for many patients in the United States. Although clinicians in primary care settings serve as the access point into the health care system for many patients with eye problems, they generally lack the training, resources, and time to perform all of the elements of the basic eye examination. Nevertheless, they can have a significant impact on their patients' visual health by screening for vision problems, aggressively controlling known risk factors for visual loss, ensuring adherence to ophthalmologic treatment and continuity of eye care, and by timely referral of specific patient populations to qualified eye care professionals (eg, ophthalmologists and optometrists). Many of the interventions to prevent and control visual disabilities are already the focus of primary care and the accompanying scientific review presents the evidence supporting primary care clinicians' participation in vision care. In the

See also p 1487.

Clinicians in primary care settings are well positioned to participate in the prevention and management of visual disability. They can have a significant impact on their patients' visual health by screening for vision problems, aggressively controlling known risk factors for visual loss, ensuring adherence to ophthalmologic treatment and continuity of eye care, and by timely referral of specific patient populations to qualified eye care professionals (eg, ophthalmologists and optometrists). Using their knowledge about common ophthalmic medications, clinicians can detect adverse effects of these agents, including exacerbations of heart or lung disease. They can ensure that appropriate patients are screened for common serious eye diseases, such as glaucoma, and that patients with disabilities related to vision problems are assessed for treatable conditions, such as cataracts or refractive error. Finally, clinicians can direct patients with low vision from any cause to resources designed to help enhance patient function and emotional support.

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following clinical cases, we identify specific opportunities for clinicians to address and help prevent visual disability. In the context of this article, we define a clinician as a primary care physician, nurse practitioner, or other mid-level practitioner who provides ongoing general medical care and serves as the primary contact point between the patient and the health care system.

CLINICAL CASES

Case 1

A 54-year-old Hispanic man presents to the office for routine follow-up. He is treated for hypertension and diabetes mellitus (DM), both of which are managed with oral medications. At the

last visit 3 months ago, he was referred to an ophthalmologist for a routine eye examination. Today, the patient has no specific complaints but admits that he has not been following his diabetic diet. His glucose level measured at home has been running high, with fasting levels generally higher than 200 mg/dL (>11.1 mmol/L). He occa-

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sionally experiences headaches, particularly if he forgets to take his blood pressure medications. Examination is significant with blood pressure of 174/96 mm Hg and an S4 on cardiac examination. His glucose level measured with a finger stick in the office is 289 mg/dL (16.0 mmol/L). A letter from the ophthalmologist in the chart indicates that the patient has early signs of hypertensive eye disease and mild nonproliferative diabetic retinopathy.

Most clinicians are well aware of recommendations for routine eye care for patients with DM (Table 3 in the accompanying scientific review¹). This examination should be comprehensive and include a dilated eye examination. Most major guidelines recommend routine examinations by an eye care professional or by specialized fundus photography. Although the American Diabetes Association recommends yearly eye examinations for all patients with DM, other guidelines have changed in terms of the frequency of these examinations for subsets of patients with DM. For example, revised versions of the National Committee for Quality Assurance Health Employer Data and Information Set (HEDIS) measures² and the Department of Veterans Affairs Clinical Guideline for Diabetes³ provide for biannual screening for patients at low risk of retinopathy (Table 3 in the accompanying scientific review¹). These guidelines are based in part on evidence from the Wisconsin Epidemiologic Study of Diabetic Retinopathy,^{4,5} which suggests that patients with type 2 DM and glycosylated hemoglobin of less than 8%, no evidence of retinopathy on previous examination, and no proteinuria can have less frequent examinations without the risk of missing the development of significant retinopathy. Nevertheless, patients with DM who have or who are at high risk for developing retinopathy as a result of poorly controlled blood glucose, such as the patient described, need closer follow-up with an eye care professional, including at the very least, annual examinations. More frequent

follow-up may be recommended by the eye care professional if abnormalities are detected.

Clinicians can substantially preserve patients' health by educating patients about eye screening. Multiple studies highlight what are frequently surprising misunderstandings in patients' conceptions of their own eye disease.⁶⁻¹⁰ As many as half of all patients with glaucoma are unaware that they have the disease¹¹ and in 1 study only 21% of patients with DM believed there is effective treatment for diabetic retinopathy.¹² Patients who are visually impaired are often unaware of the existence of effective preventive and therapeutic measures, and of the importance of timely care.^{6-10,13} The primary care physician can be the key factor influencing patients to seek needed eye care.¹³⁻¹⁵ In fact, in 1 small study of black patients with DM, 91% reported that their physician's advice was an important reason they sought eye care.¹²

In addition to referring to eye care specialists for screening and follow-up care, clinicians can assist in reducing the risks of progressive eye disease in patients with DM by aggressively managing DM and associated comorbidities. Many of the risk factors for diabetic retinopathy are related to conditions or habits that are under the direct influence of the clinician. Tight glycemic control can lead to reductions in the risk of microvascular complications for patients with both type 1 and type 2 DM.^{16,17} Controlling blood pressure may be even more effective in reducing diabetic complications: current recommendations require more stringent control of blood pressure in patients with DM (<130/80 mm Hg).¹⁸ In this patient, tight blood pressure control is also important to reduce the risk of progressive hypertensive eye disease.

It is widely recognized that treating hyperlipidemia and tobacco cessation programs are critical to reducing the risk of heart disease in patients with DM.^{1,19-21} Likewise, these interventions may decrease the risk of diabetic

retinopathy and other eye conditions, such as macular degeneration and cataracts.^{1,22-26}

Case 2

A 59-year-old black man who is a construction worker presents in the office for an annual physical examination. He has been in good health and denies any other symptoms, including vision or eye problems. He has been a smoker for many years and admits to a 40 pack-year history. His family history is significant for DM in his mother, who died at age 82 years, and colon cancer and glaucoma in his father, who died at age 72 years. He currently takes no medications. On examination, his blood pressure is 140/87 mm Hg but he has an otherwise unremarkable examination. Visual acuity by Snellen Visual Acuity testing is 20/20.

Although there is variability in recommendations for periodic vision evaluation (Table 3 in the accompanying scientific review¹), many authorities, including the US Preventive Services Task Force, recommend that asymptomatic adult patients be referred to an eye care professional at the discretion of the referring physician. However, the effectiveness of this practice has not been demonstrated in a randomized controlled trial.¹ For populations at increased risk for visual loss, most authorities recommend examination intervals ranging from 1 to 4 years. Those patients at increased risk for visual loss include elderly patients (≥ 65 years) and patients at increased risk for glaucoma, including black patients older than 40 years and patients with a family history of glaucoma.¹ The basic elements of a comprehensive eye examination are listed in **Box 1**^{27,28} and include specific tests to evaluate for glaucoma, such as measurement of intraocular pressure (tonometry) and biomicroscopic evaluation of the retina and optic nerve.

The patient was counseled on tobacco cessation, exercise, and a low-salt diet, and colon cancer screening was recommended in addition to a referral

to an eye care specialist. When the patient returned 1 month later, he was having frequent episodes of shortness of breath and his wife had noticed that he had intermittent wheezing. He went to the ophthalmologist who diagnosed mild glaucoma and administered timolol eye drops. On examination, the patient had scattered expiratory wheezes.

This patient with previously undetected chronic obstructive pulmonary disease is having an exacerbation that may be due to the ophthalmic β -blocker, because topically applied ophthalmic medications can be absorbed systemically and may result in clinically significant adverse effects. Although his respiratory symptoms should be addressed, the timolol should be discontinued in consultation with the ophthalmologist, who may recommend an alternative class of glaucoma medication with fewer systemic adverse effects.

Although topical ophthalmic β -blockers in particular can result in the known adverse effects of systemic β -blockers, other ophthalmic medications also can produce adverse effects distant from the eye. The TABLE lists commonly prescribed topical eye medications and their potential adverse systemic effects.^{29,30} Primary care physicians should be aware of all ophthalmic medications taken by their patients and the potential adverse effects of these agents, and should ask patients specifically about eye drops they are using.

Because this patient is a construction worker, he is potentially at risk for eye trauma while performing his job. Clinicians should be aware of eye safety issues related to specific types of employment or leisure activities of their patients. In general, eyeglasses made of shatter-resistant materials are warranted. Both the Occupational Safety and Health Administration and the American Academy of Ophthalmology have established standards and recommendations for eye protection (<http://www.osha.gov/SLTC/eyefaceprotection/standards.html> and <http://www.aao>

[.org/aao/education/courses/athletic/standards.cfm](http://www.aao/education/courses/athletic/standards.cfm)).

Case 3

A 76-year-old Asian woman is referred for primary care. She recently moved from a rural town to be closer to her daughter. The patient has mild hypertension, which has been controlled by a diuretic, and is taking alendronate and calcium for osteoporosis. She informs you that she is happier living in the city because she has access to public transportation, but nevertheless, does not get out much. She stopped driving a number of months ago because she was having some problems with blurry vision, particularly at night. She is now quite reliant on her daughter to take her shopping or on other errands. On routine physical examination, her eyes are examined and it is noted that there are no obvious anterior segment or pupillary abnormalities but the fundus is hard to visualize clearly. On further questioning, the patient admits that she used to be an avid golfer but quit playing about 1 year ago.

Visual problems can have a major impact on the lives of patients and can force them into various accommodations that limit their mobility as well as their quality of life. For instance, having blurry vision can have a greater impact on role limitations than having hypertension, type 2 DM, or a history of myocardial infarction.³¹ Among individuals 60 years or older, distance visual acuity of 20/30 or worse is associated with an increased risk of falls and fractures compared with those individuals with 20/20 or better visual acuity.⁸ Worse visual function is linked to limitations in mobility, activities of daily living, and physical performance³¹⁻³⁷ and quality-of-life studies specific to cataract, glaucoma, diabetic retinopathy, and macular degeneration have all shown significantly decreased quality of life associated with vision loss from these diseases.^{33,38-41} Therefore, amelioration of vision problems could be expected to favorably impact function and quality of life.

Box 1. Basic Elements of a Comprehensive Eye Examination

A complete medical and ocular history and family history
Measurement of near and distance visual acuity
Refraction when appropriate
Pupillary examination
Extraocular motility examination
Intraocular pressure measurement
External examination
Slit-lamp examination
Examination of the vitreous humor, retina, and optic nerve head
Confrontation visual field testing

Resources: American Optometric Association²⁷ and American Academy of Ophthalmology.²⁸

Although functional problems are common in elderly individuals, relating the problems to vision loss is not always obvious. The Activities of Daily Vision Scale assesses the impact of visual loss on the ability to perform vision-specific tasks but it is a 19-question survey, generally precluding its routine use in a busy primary care practice.⁴² A recent Cochrane review found limited evidence for or against screening for vision problems in primary care when patients were asked 1 general question about subjective visual loss.⁴³ Clinicians may wish to evaluate the impact of vision loss on activities of daily living by asking specifically about trouble with activities, such as driving at night, recognizing a friend across the street, seeing details on television, reading a newspaper, cooking, sewing, paying bills, going up stairs or steps, or playing sports on a sunny day. There are no national standards for reporting visual loss to Departments of Motor Vehicles and different states have different recommendations. Clinicians can consult with their local Department of Motor Vehicles or with eye care professionals if they have questions in this regard.

In this patient, the most common diagnoses that could explain her visual

Table. Common Topical Ophthalmic Medications With Potential Systemic Adverse Effects*

Medication	Examples	Uses	Contraindications	Systemic Adverse Effects	Alternative Therapies
Vasoconstrictors	Naphazoline hydrochloride (sometimes with pheniramine maleate or antazoline phosphate)	Allergic conjunctivitis	Absolute: hypersensitivity to agent or components Relative: monoamine oxidase inhibitor therapy; tricyclic antidepressants; caution in presence of hypertension, diabetes, hyperthyroidism, heart disease, coronary artery disease, cerebral arteriosclerosis, or long-standing bronchial asthma	Hypertension, cardiac arrhythmias (rare), dizziness, headache (frequency not defined)	Artificial tears Cold compresses Antihistamines
Adrenergic agonists	Epinephrine hydrochloride or borate Dipivefrin	Glaucoma	Absolute: hypersensitivity to agent or components Relative: use with caution in patients with hypertension, diabetes, hyperthyroidism, heart disease, cerebrovascular disease, bronchial asthma	Generally well tolerated because a low dose is administered, but tachycardia, premature ventricular contractions, hypertension, tremor, anxiety (frequency not defined) may be experienced	Other class of glaucoma medication
α_2 -Adrenergic agonists	Apraclonidine Brimonidine	Glaucoma	Absolute: hypersensitivity to agent or components, monoamine oxidase inhibitor therapy Relative: use caution when patients are using cardiovascular medications, central nervous system depressants, tricyclic antidepressants (decrease efficacy of medication)	Bradycardia, vasovagal attack, palpitations, orthostasis (rare) Dry mouth (2%) Headache (<3%) Somnolence, dizziness, depression (<1%)	Other class of glaucoma medication
β -Adrenergic antagonists	Timolol Betaxolol Levobunolol Carteolol Metipranolol	Glaucoma	Absolute: hypersensitivity to agent or components, bronchial asthma, severe chronic obstructive pulmonary disease, sinus bradycardia, second- and third-degree atrioventricular block (in absence of pacemaker), overt cardiac failure or cardiogenic shock Relative: use with caution in patients receiving oral β -blockers, calcium antagonists, reserpine, digitalis, quinidine	Bradycardia Reduced cardiac output Reduced exercise tolerance Bronchospasm Hypotension and syncope Reduced libido Lethargy and depression (Frequency of adverse events not defined and related to comorbidities and therapies in specific patients)	Other class of glaucoma medication
Cholinergic agonists	Pilocarpine	Glaucoma	Absolute: hypersensitivity to agent or any component of the formulation, acute inflammatory disease of the anterior chamber of the eye Relative: use with caution in patients with cardiovascular disease as may affect hemodynamics or rhythm, although risk is very low with topical form; may cause decreased visual acuity, especially at night or with reduced lighting	With correct dose: brow ache, headache (occasional) With overdose (>4 times/d): abdominal cramping, diarrhea, vomiting, diaphoresis, bronchospasm, unstable blood pressure	Other class of glaucoma medication
Cholinesterase inhibitors (rarely used)	Echothiophate	Glaucoma Accommodative esotropia in children	Absolute: hypersensitivity to agent or components General anesthesia with succinylcholine (discontinue at least 2 wk before surgery; can cause prolonged apnea after general anesthesia with succinylcholine)	With correct dose: brow ache, headache (occasional), bradycardia, flushing, hypotension, vomiting (<1%)	Other class of glaucoma medication
Sympathomimetics	Phenylephrine 2.5% and 10%	Dilates pupil	Absolute: hypersensitivity to agent or components Relative: patients with cardiac arrhythmias, hypertension, myocardial infarction, poor cardiac output	Predominantly with 10% phenylephrine Cardiac arrhythmias, hypertension, myocardial infarction (frequency not defined)	Use low-dose medication (2.5%)

*Resources: *Physician's Guide to Eye Care*²⁹ and *Drug Facts and Comparisons*.³⁰ This table does not list all potential adverse effects from the ophthalmic medications. Adverse effect profiles of these medications vary depending on concomitant treatments that an individual patient is receiving.

problems include cataracts, age-related macular degeneration (AMD), refractive error, and advanced glaucoma. Refractive error can generally be detected by performing Snellen Visual Acuity testing followed by pinhole visual acuity testing (BOX 2). An improvement in visual acuity with pinhole testing may indicate a refractive error that could improve with a new or updated prescription for glasses. However, full elucidation of this and other causes of visual loss requires referral to an eye care professional for a comprehensive examination. If this elderly patient requires eyeglasses, the optician making the glasses should be instructed to use shatter-resistant materials because these types of lenses can prevent injury in patients at high risk for falls.

Case 4

A 72-year-old white woman presents for follow-up. She has had progressive loss of vision from AMD. She otherwise is healthy and had previously been active, volunteering for senior organizations, regularly participating in ballroom dancing with her husband, and helping to care for her grandchildren. She is finding it increasingly difficult to participate in these activities and admits to feeling isolated. She also admits to some depressive thoughts, poor sleep, and intermittent tearfulness. She denies any thoughts or plans of suicide.

Management of patients with permanent, nonreversible blindness can be challenging. It is important for the clinician to collaborate with the ophthalmologist to ensure that the patient has continued follow-up for any treatable or preventable causes of further vision loss. The clinician should also recognize the importance of immediate referral if the patient describes any rapid loss of vision. Some patients with progressive visual deterioration will conclude that there is "nothing more that the eye doctor can do." However, although visual disability can be irreversible, particularly in the case of macular degeneration and glaucoma, continued ophthalmologic

Box 2. Technique for Visual Acuity Testing

Test 1 eye at a time
 Occlude fellow eye with a patch or equivalent
 Use best available glasses for each task (readers vs distance glasses)
 Use wall chart at 20 ft for distance visual acuity
 Use near card in good light at the recommended distance printed on the card for near visual acuity
 Remeasure visual acuity through a pinhole (if available) if visual acuity is worse than 20/25
 Use "tumbling E's," picture charts, or equivalent if patient is illiterate
 Record best visual acuity for each eye separately

follow-up may prevent further vision loss or preserve sight in the fellow eye. For example, ophthalmologists may recommend specific formulations of antioxidants to some subsets of patients with AMD as there is some evidence for modest benefit in terms of reduced risk of severe vision loss.⁴⁴ Eye care professionals can also arrange for assistive devices for the vision impaired. Thus, it is imperative that the benefits of continued ophthalmologic monitoring be explained to this patient. Clinicians should counsel patients with AMD on tobacco cessation^{22,24,25} because there is some evidence that smoking is associated with worse disease.

Age-related macular degeneration can be frustrating for both patients and clinicians because there are very few therapeutic options for most patients and vision loss is generally irreversible. As in other chronic diseases, patients with AMD or other eye diseases may develop depression as a result of their functional restrictions. Case series and case-control studies have demonstrated rates of depression in patients with AMD in the range of 24% to 33%.^{45,46} Clinicians should be certain to screen patients with visual loss for depression and initiate treatment by prescribing antidepressant medication or referring to a mental health professional (eg, psychologist, psychiatrist). Additionally, clinicians should consider referring patients with AMD and other causes of blindness to support groups for the visually impaired or to organizations focused on specific con-

ditions (eg, Macular Degeneration Foundation at <http://www.eyesight.org>; Association for Macular Diseases at <http://www.macula.org>).

Clinicians can assist patients with AMD or other causes of blindness in leading fuller, more active lives by making patients aware of resources and assistive devices for patients with low vision. Patients with severe visual impairment certified by an ophthalmologist may qualify for disability and financial or other social services assistance through government and private programs. Vision rehabilitation (low vision) and vision-specialized occupational therapists and physical therapists can assist patients with low vision. Vision rehabilitation programs may be located through eye care professionals, academic centers, and public and private programs for the blind and visually impaired. Many low-vision devices, including insulin delivery and glucose-monitoring equipment, talking watches, large-print books, special glasses, various magnifiers, and computers with low-vision devices, can be obtained directly by the patient or through the clinician. Some of the available resources for low-vision patients are described at <http://www.medem.com>, in addition to a list of resources for individuals with visual impairment compiled by the American Academy of Ophthalmology.

CONCLUSION

Although eye care professionals are uniquely positioned to diagnose and develop the management plan for spe-

cific eye problems, clinicians can play a critical role in preventing the onset of vision problems and deterioration in vision from existing problems. Clinicians can reduce the burden of visual disability among their patients by ensuring routine screening and follow-up, identifying high-risk patients and

educating them about the need for specialized eye care, and managing comorbidities associated with low vision. Assessing for vision problems should become a routine component of any new patient evaluation, and, for certain subsets of patients, part of a periodic reevaluation. Appropriate atten-

tion to vision in the primary care setting can preserve both vision and quality of life.

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