

The Visually Impaired Patient

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Blindness or low vision affects more than 3 million Americans 40 years and older, and this number is projected to reach 5.5 million by 2020. In addition to treating a patient's vision loss and comorbid medical issues, physicians must be aware of the physical limitations and social issues associated with vision loss to optimize health and independent living for the visually impaired patient. In the United States, the four most prevalent etiologies of vision loss in persons 40 years and older are age-related macular degeneration, cataracts, glaucoma, and diabetic retinopathy. Exudative macular degeneration is treated with laser therapy, and progression of nonexudative macular degeneration in its advanced stages may be slowed with high-dose antioxidant and zinc regimens. The value of screening for glaucoma is uncertain; management of this condition relies on topical ocular medications. Cataract symptoms include decreased visual acuity, decreased color perception, decreased contrast sensitivity, and glare disability. Lifestyle and environmental interventions can improve function in patients with cataracts, but surgery is commonly performed if the condition worsens. Diabetic retinopathy responds to tight glucose control, and severe cases marked by macular edema are treated with laser photocoagulation. Vision-enhancing devices can help magnify objects, and nonoptical interventions include special filters and enhanced lighting. (*Am Fam Physician*. 2008;77(10):1431-1436, 1437-1438. Copyright © 2008 American Academy of Family Physicians.)

► **Patient information:** A handout on vision loss, written by the authors of this article, is provided on page 1437.

Blindness is one of the most feared illnesses by Americans, ranking fourth after acquired immunodeficiency syndrome, cancer, and Alzheimer's disease.¹ The National Eye Institute reports that blindness or low vision affects 3.3 million Americans 40 years and older; this number is projected to reach 5.5 million by 2020.² As the U.S. population ages, the number of persons with major eye disease is increasing. Octogenarians currently make up 8 percent of the population, but they account for 69 percent of blindness.² Age-related macular degeneration (AMD) accounts for 54 percent of all blindness and is the leading cause of blindness among white Americans.² Cataracts are the most prevalent eye disease in older persons and are the leading cause of blindness worldwide.³ Almost all persons in their 90s will have had a cataract, and one half will have had cataract surgery.⁴ Cataract surgery is the most common therapeutic surgical procedure reimbursed by Medicare, with more than 1.5 million operations performed annually.^{3,4} Diabetic retinopathy is the leading cause of new blindness in U.S. adults 20 to 74 years of age.⁵

Low vision ranks behind arthritis and heart disease as the third most common chronic cause of impaired function in

persons older than 70 years.⁶ Patients with vision impairment are more likely to fall, make medication errors, have depression, or report social isolation.⁷ With rehabilitation, many patients with impaired vision can attain independence, retain their jobs, and lessen their reliance on social services and institutions. A list of resources for patients with vision impairment is presented in *Table 1*.

Evaluation of Visual Impairment in a Primary Care Setting

Early detection of eye disease by regular screening can assist in diagnosis and treatment of underlying causative factors, which may slow the progression of visual problems. Patients might not volunteer information about vision problems when speaking to their primary care physician because they may be focused on other medical symptoms or conditions. They may not be aware of the connection between vision loss and their other symptoms, or they may not think their primary care physician is the appropriate person to address vision problems. Physicians can encourage patients to discuss their vision by asking a few simple but pointed questions about face recognition, reading difficulties, and problems performing regular tasks. An ocular medical history should be taken,

SORT: KEY RECOMMENDATIONS FOR PRACTICE

<i>Clinical recommendation</i>	<i>Evidence rating</i>	<i>References</i>	<i>Comments</i>
Patients should be routinely screened for visual impairment.	C	8	USPSTF update is pending
A high-dose regimen of zinc and antioxidants will decrease progression of some forms of intermittent and advanced age-related macular degeneration.	B	13	Beta carotene has been shown to increase cancer and mortality rates in smokers and persons exposed to asbestos
Patients should be routinely screened for glaucoma to prevent vision loss.	C	14, 21	USPSTF found insufficient evidence to recommend for or against screening adults for glaucoma
Optimal glucose control in persons with diabetes prevents progression of retinopathy.	A	18, 19	—
Routine eye examinations should be performed in persons with diabetes to identify and prevent progression of retinopathy.	C	20, 21	—

USPSTF = U.S. Preventive Services Task Force.

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, see page 1360 or <http://www.aafp.org/afpsort.xml>.

including symptom onset, previous ophthalmologic or optometric care, surgeries, and current medications. About one half of cases of visual impairment are correctable, and about one fourth are preventable.⁴ The U.S. Preventive Services Task Force (USPSTF) is updating its 1996 screening recommendations for visual impairment. The American Academy of Ophthalmology (AAO) suggests comprehensive medical eye evaluations every two to four years for patients 40 to 54 years of age, every one to three years for patients 55 to 64 years of age, and every one or two years for patients older than 65 years.⁸

Vision screening using a standard Snellen chart with graduated visual acuity stimuli should be performed in patients suspected of having vision impairment. An impairment of 20/50 or worse or a one-line difference between the eyes should warrant referral to an eye care specialist (*Table 2*). Patients should also be evaluated for other sensory impairments, such as hearing or speech problems. Vision loss that accompanies the aging process has been associated with impaired postural stability and a resulting increase in the rate of falls.⁹ Patients should be assessed for impairments in mobility and activities

Table 1. Resources for Visually Impaired Patients

American Academy of Ophthalmology P.O. Box 7424 San Francisco, CA 94120-7424 Telephone: (415) 561-8500 Web site: http://www.aao.org	Jewish Guild for the Blind 15 W. 65th St. New York, NY 10023 Telephone: (800) 284-4422 Web site: http://www.jgb.org	National Federation of the Blind 1800 Johnson St. Baltimore, MD 21230 Telephone: (410) 659-9314 Web site: http://www.nfb.org
American Council of the Blind 1155 15th St. NW, Suite 1004 Washington, DC 20005 Telephone: (800) 424-8666 Web site: http://www.acb.org	National Association for the Visually Handicapped 22 W. 21st St., 6th Floor New York, NY 10010 Telephone: (212) 889-3141 Web site: http://www.navh.org	Prevent Blindness America 211 W. Wacker Dr., Suite 1700 Chicago, IL 60606 Telephone: (800) 331-2020 Web site: http://www.preventblindness.org
American Foundation for the Blind 11 Penn Plaza, Suite 300 New York, NY 10001 Telephone: (800) 232-5463 Web site: http://www.afb.org	National Eye Institute, National Institutes of Health 31 Center Dr. Bethesda, MD 20892-2510 Telephone: (301) 496-5248 Web site: http://www.nei.nih.gov	Visions/Services for the Blind and Visually Impaired 500 Greenwich St., 3rd Floor New York, NY 10013-1354 Telephone: (888) 245-8333 Web site: http://www.visionsvcb.org
American Optometric Association 243 N. Lindbergh Blvd. St. Louis, MO 63141 Telephone: (800) 365-2219 Web site: http://www.aoanet.org		

Table 2. Classification of Vision Loss

<i>Classification</i>	<i>Visual acuity</i>	<i>Level of disability</i>
Mild vision loss (partially sighted)	20/30 to 20/70 or a visual field of less than 30 degrees	No special aids needed; may require reading glasses
Moderate vision loss	20/80 to 20/160	Special aids needed for some tasks
Severe vision loss (legally blind)	20/200 to 20/400 or a visual field of less than 20 degrees	Can read only with special aids at reduced speed and endurance
Profound vision loss	20/500 to 20/1,000	Reading and mobility impaired; relies on other senses for some tasks
Near total blindness	Hand motion, light perception	Relies on other senses; cannot benefit from magnification
Total blindness	No light perception	No vision; relies completely on other senses

of daily living, with referral to physical or occupational therapists, if necessary. Visually impaired patients may also benefit from psychological evaluation for inadequate coping skills and concomitant anxiety or depression.

Common Causes of Low Vision

Low vision is not a diagnosis, but a result of an eye condition that causes reduced visual function. Normal visual changes occur with aging, including presbyopia (i.e., the inability to focus on close objects), decreased contrast sensitivity caused by retinal changes, decreased dark/light adaptation, and delayed glare recovery.⁷ These changes tend to aggravate other causes of low vision.¹⁰ In the United States, the most prevalent etiologies of vision loss in persons 40 years and older are AMD, glaucoma, cataracts, and diabetic retinopathy.¹¹

AGE-RELATED MACULAR DEGENERATION

AMD is divided into two classifications. Nonexudative or dry AMD (also known as geographic atrophy) is characterized by drusen (i.e., hyaline deposits) and areas of depigmentation in the retinal pigmented epithelium alternating with bands of hyperpigmentation. Exudative or wet AMD is distinguished by neovascularization.¹¹ Patients may be initially asymptomatic, progressing to a loss of central vision (reduced visual acuity causing difficulties with detail discrimination) accompanied by metamorphopsia (i.e., distortion of objects), central scotomas, increased glare sensitivity, decreased contrast sensitivity, and decreased color vision.^{7,10} Peripheral vision remains intact, and the patient does not progress to total blindness. Although the etiology of AMD is unclear, older age, smoking, hypertension,

hyperlipidemia, vascular insufficiency to the retina and the choroids, a history of ultraviolet (UV) light exposure, and a family history of AMD (which increases risk three- to fourfold) are known contributing factors.^{2,12} Persons with early disease who continue to smoke are at increased risk of vision loss compared with those who stop smoking.⁴ Patients with nonexudative AMD should be monitored by an eye care specialist; if neovascularization develops, retinal laser therapy has proved to be useful.

The Age-Related Eye Disease Study showed that patients with intermediate AMD or advanced AMD in one eye but not the other have a 25 percent lower risk of developing advanced AMD and a 19 percent lower risk of developing vision loss caused by advanced AMD when treated with a high-dose regimen (five to 15 times the Dietary Reference Intake) of vitamin C, vitamin E, beta carotene, and zinc; there was less benefit when using zinc or antioxidants alone.¹³ Patients without AMD and those with early AMD did not benefit from supplementation.¹³ Other strategies include control of vascular disease risk factors, exercise to increase circulation, and sunglasses for UV light protection.^{4,7} Photodynamic therapy and intravitreal injections of antivascular endothelial growth factor and corticosteroids have shown promise in treating subsets of patients with macular degeneration.

GLAUCOMA

Glaucoma causes increased ocular pressure that can damage the ganglion cell layer of the retina and cause vision loss. A family history of glaucoma increases a patient's risk fourfold.⁴ One person in 10 will develop open-angle glaucoma, and one half of these

persons will be unaware that they have it.⁴ There is an initial insidious loss of peripheral vision that eventually can lead to decreased central acuity. Other symptoms include difficulty functioning in dim light, decreased contrast sensitivity, glare disability, and decreased dark/light adaptation.¹¹

Early diagnosis and treatment is important because vision loss can be prevented. Persons older than 40 years are at increased risk, and the AAO recommends a baseline eye examination with follow-up comprehensive eye examinations every two to four years in this population.⁸ The AAO further recommends interval evaluations every one to three years in persons 55 to 64 years of age, then every one to two years after 65 years of age, even in the absence of symptoms. Blacks have a significantly higher risk of glaucoma and resultant blindness; therefore, the AAO recommends a baseline examination in these patients at 20 years of age with follow-up examinations every two to four years until age 40, every one to three years from age 40 to 54, and every one to two years from age 55 to 64, even in the absence of visual or ocular symptoms.⁸ In contrast, the USPSTF found insufficient evidence to recommend for or against screening adults for glaucoma because of the heterogeneous natural history of glaucoma and thus, the inability to predict which patients will have progressive disease.¹⁴

Glaucoma is managed with topical ocular medications (i.e., prostaglandins, beta blockers, adrenergics, carbonic anhydrase inhibitors, and, less commonly, miotics), oral medications, laser therapy, and filtering surgery.^{7,15}

CATARACTS

Cataracts are opacifications of the crystalline lens of the eye. Approximately 85 percent of cataract cases are considered age related.¹⁶ Other risk factors include female sex, corticosteroid use, and systemic disease (e.g., diabetes). Cigarette smoking and ocular UV-B light exposure are the two major modifiable risk factors.^{4,17} Common symptoms include decreased visual acuity, decreased color perception, decreased contrast sensitivity, and

glare disability. Patients may have a temporary enhancement of near vision (because of increased myopia resulting from the opacified lens) and may no longer need eyeglasses to see close objects. Cataracts are initially managed by altering prescriptions for eyeglasses or contacts, tobacco cessation, and UV protection. The use of good lighting and an adjustable lamp may help decrease glare when reading. When a patient experiences cataract-related functional impairment or unmanageable symptoms, such as excessive glare, surgical extraction of the cataract is recommended. Cataracts also may be removed if they hinder the treatment of other eye diseases (i.e., AMD or diabetic retinopathy) or if the lens causes inflammation or glaucoma.³

DIABETIC RETINOPATHY

The risk of retinopathy increases with duration of diabetes; however, early diagnosis and treatment of diabetes can prevent up to 98 percent of severe vision loss.^{4,16} The Diabetes Control and Complications Trial showed that there was a 76 percent reduction in retinopathy in patients with type 1 diabetes who had optimal glucose control compared with those receiving conventional therapy.¹⁸ Similarly, the U.K. Prospective Diabetes Study found a 25 percent risk reduction in microvascular complications (measured predominantly by retinopathy requiring photocoagulation, but also including vitreous hemorrhage and renal failure) in patients with type 2 diabetes who received intensive blood glucose control.¹⁹

Clinically, there are two types of diabetic retinopathy: nonproliferative (characterized by dilated retinal veins, intraretinal hemorrhages, microaneurysms, cotton wool spots, hard exudates, and macular edema) and proliferative (characterized by neovascularization, vascular fibrosis, and preretinal and vitreous hemorrhages). Patients with diabetic retinopathy have decreased visual acuity, contrast sensitivity, color perception, and dark/light adaptation. They may also have glare disability, distortion, and scotomas.^{7,11}

The American Diabetes Association recommends that children with diabetes have an initial ophthalmologic examination after

Table 3. Commonly Used Devices for Improving Low Vision

<i>Device</i>	<i>Uses</i>	<i>Benefits</i>	<i>Drawbacks</i>	<i>Cost</i>
Handheld magnifier	Reading, shopping, viewing pictures	Allows material to be held farther from the eyes, can be illuminated	Requires both hands, reduces reading speed, must hold material at the exact focal point	\$30 or more
High-powered prismatic spectacle	Reading, filling insulin syringes	Does not require hands, wide field of view	Must hold material close to the eyes, can obstruct illumination	\$80 or more
Stand magnifier	Reading and writing	Has a fixed focal distance, good for hand tremors, can be illuminated	Reduced field of view, difficult to transport, posture can be awkward	\$50 or more
Telemicroscope	Viewing distant and intermediate targets, watching television, painting, driving (in some states)	Can be handheld or spectacle mounted, can adjust for close work	Reduced illumination and field of view, handheld requires both hands and additional training	\$90 or more

10 years of age if they have had diabetes for three to five years, followed by annual examinations thereafter.²⁰ Five to 10 percent of patients with type 2 diabetes who have an initial normal retinal examination will develop diabetic retinopathy within one year; therefore, the AAO recommends that patients with a normal examination or minimal nonproliferative diabetic retinopathy be examined by an eye care specialist annually.²¹ Because disease progression is common in patients with mild to moderate nonproliferative diabetic retinopathy without macular edema, repeat examinations every six to 12 months are suggested. If clinically significant macular edema is present, the patient should be considered for laser photocoagulation surgery to stabilize visual acuity. Patients with severe nonproliferative diabetic retinopathy have a 50 to 75 percent chance of developing proliferative diabetic retinopathy within one year; therefore, examinations every two to four months are recommended.²¹ Photocoagulation is indicated in many of these patients, as it is in those with proliferative diabetic retinopathy.²¹

Vision-Enhancing Devices

In addition to specific disease prevention and treatment, some patients may benefit from vision-enhancing devices (Table 3). The devices are task specific, and physicians should consider the patients' needs and motivation to learn and practice using the device, as well as any physical limitations. Although these devices are not covered by most insurance companies, they may be provided free if patients meet the eligibility requirements of their state Commission for the Blind.

One of the more commonly prescribed devices is the high-powered prismatic spectacle. These eyeglasses enable a patient to read while providing a socially acceptable form of vision correction. Another aid is the handheld magnifier, which enables a patient to hold reading material farther from the eyes. Both are available in illuminated versions, which can be critical to patients with reduced contrast sensitivity. Stand magnifiers may be more beneficial to patients with physical limitations, such as hand tremors, that prevent them from holding a device or reading material.

Telemicroscopes are spectacle-mounted telescopes that are focused for reading or viewing material at arm's length. They are ideal for activities such as painting, reading music, and viewing a computer monitor. Telescopes, either handheld or spectacle mounted, are useful for viewing objects in the distance such as television screens and street signs. In some states, these devices may be used for driving if a patient meets certain visual requirements. Video magnifiers and closed circuit televisions use video cameras to enhance and magnify material on a monitor. These devices can magnify up to 60 times and allow space for writing. Large print computer software and voice synthesizers that speak the words that appear on the screen can allow visually impaired patients to use computers and access the Internet.

Nonoptical devices can be equally useful in low vision rehabilitation. Special filters can help reduce glare and enhance contrast, which are critical to reading. Bright reading lamps, check-writing guides, and wide point felt-tipped pens can help patients pay bills

and write. Large-print materials (e.g., books, telephone dials, clocks, watches), audio-books, and “talking” devices (e.g., clocks, glucometers) are also available.

A key factor in the use of vision-enhancing devices is that considerable practice is required to use them effectively. Reading with a vision-enhancing device is not the same as reading before the vision loss. If a patient is willing to relearn tasks, he or she will benefit by becoming more confident and functionally independent.²²

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REFERENCES

1. Burack-Weiss A. Psychological aspects of aging and vision loss. In: Faye E, Stuen CS, eds. *The Aging Eye and Low Vision: A Study Guide for Physicians*. New York, NY: Lighthouse; 1992:29-34.
2. National Eye Institute. Vision loss from eye diseases will increase as Americans age [press release]. April 12, 2004. <http://www.nei.nih.gov/news/pressreleases/041204.asp>. Accessed August 3, 2007.
3. Solomon R, Donnenfeld ED. Recent advances and future frontiers in treating age-related cataracts [published correction appears in *JAMA*. 2003;290(22):2943]. *JAMA*. 2003;290(2):248-251.
4. Taylor HR. Fred Hollows lecture. Eye care for the community. *Clin Experiment Ophthalmol*. 2002;30(3):151-154.
5. The Eye Diseases Prevalence Research Group. Statistics and data. Citations and abstracts from April 2004 Archives of Ophthalmology. Causes and prevalence of visual impairment among adults in the United States. <http://www.nei.nih.gov/eyedata/pbd1.asp>. Accessed January 25, 2008.
6. Kupfer C. The National Eye Institute's low vision education program: improving quality of life [editorial]. *Ophthalmology*. 2000;107(2):229-230.
7. Carter TL. Age-related vision changes: a primary care guide. *Geriatrics*. 1994;49(9):37-42,45.
8. American Academy of Ophthalmology. Policy Statement. Frequency of Ocular Examinations. http://www.aao.org/about/policy/upload/2006_Frequency.pdf. Accessed January 25, 2008.
9. Lord SR, Menz HB. Visual contributions to postural stability in older adults. *Gerontology*. 2000;46(6):306-310.
10. Fletcher DC. Low vision: the physician's role in rehabilitation and referral. *Geriatrics*. 1994;49(5):50-53.
11. Castor TD, Carter TL. Low vision: physician screening helps to improve patient function. *Geriatrics*. 1995;50(12):51-52,55-57.
12. de Jong PT. Age-related macular degeneration. *N Engl J Med*. 2006;355(14):1474-1485.
13. Age-Related Eye Disease Study Research Group. A randomized, placebo-controlled, clinical trial of high-dose supplementation with vitamins C and E, beta carotene, and zinc for age-related macular degeneration and vision loss: AREDS report no. 8. *Arch Ophthalmol*. 2001;119(10):1417-1436.
14. U.S. Preventive Services Task Force. Screening for glaucoma. <http://www.ahrq.gov/clinic/uspstf/uspstfglau.htm>. Accessed August 3, 2007.
15. Melton R, Thomas R. Glaucoma. In: 2006 Clinical Guide to Ophthalmic Drugs. *Rev Optometry*. 2006;(suppl): 12A-18A. <http://www.revoptom.com/drugguide/pdf/drugguide2006.pdf>. Accessed January 25, 2008.
16. Robinson B, Acorn CJ, Millar CC, Lyle WM. The prevalence of selected ocular diseases and conditions. *Optom Vis Sci*. 1997;74(2):79-91.
17. Asbell PA, Dualan I, Mindel J, Brocks D, Ahmad M, Epstein S. Age-related cataract. *Lancet*. 2005;365(9459): 599-609.
18. Bowyer NK. A primary care team approach to the prevention of ocular complications of diabetes: a program review. *J Am Optom Assoc*. 1997;68(4):233-242.
19. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group [published correction appears in *Lancet*. 1999;354(9178):602]. *Lancet*. 1998; 352(9131):837-853.
20. American Diabetes Association. Standards of medical care in diabetes—2006 [published correction appears in *Diabetes Care*. 2006;29(5):1192]. *Diabetes Care*. 2006; (29 suppl 1):S4-S42.
21. American Academy of Ophthalmology. Diabetic retinopathy. Preferred practice pattern guideline. http://www.aao.org/education/guidelines/ppp/dr_new.cfm. Accessed August 3, 2007.
22. Stelmack J. Quality of life of low-vision patients and outcomes of low-vision rehabilitation. *Optom Vis Sci*. 2001;78(5):335-342.