Preventing Visual Loss From Chronic Eye Disease in Primary Care

Scientific Review

Susannah Rowe, MD, MPH
Catherine H. MacLean, MD, PhD
Paul G. Shekelle, MD, PhD

VISUAL DISABILITY IS COMMON IN the United States and can have profound consequences for function and quality of life. Most causes of visual impairment are readily diagnosed and at least 40% of blindness and visual impairment is treatable or preventable.1,2 Nevertheless, many people living in the United States, especially elderly persons3 and minorities4,5 do not receive necessary eye care.6 As a consequence many of these individuals develop visual disability or blindness needlessly.2 The problem of undiagnosed visual disorders is growing, with the number of blind and visually impaired elderly individuals expected to double in the next 3 decades.3

Clinicians in primary care settings play a critical role in reducing visual disability by managing systemic disease with ocular consequences and ensuring that patients receive timely specialty eye care. They may be the only health care professionals to recognize the need for an eye examination because of a new-onset visual disability. They also may be uniquely aware of risk factors, such as diabetes mellitus (DM) or a family history of glaucoma. Clinicians can educate patients about their need for eye care services and can advocate for their patients in obtaining access to such care.

Context  Vision loss is common in the United States and its prevalence increases with age. Visual disability significantly impacts quality of life and increases the risk of injury. Although at least 40% of blindness in the United States is either preventable or treatable with timely diagnosis and intervention, many people with vision loss are undiagnosed and untreated.

Objective  To review the evidence regarding screening and management of eye disorders and visual disability among adults in the primary care setting.

Data Sources and Study Selection  MEDLINE, HealthSTAR, EMBASE, The Cochrane Database of Systematic Reviews, and the National Guidelines Clearinghouse were searched for articles and practice guidelines about screening and management of eye diseases and vision loss among adults in the primary care setting using key words and free-text terms, such as vision screening, glaucoma prevention and control, from 1985 to 2003. References in these articles and those suggested by experts in eye care, vision loss, and vision screening were reviewed as well.

Data Extraction  Articles were searched for the most clinically important information and emphasized randomized controlled trials where available.

Data Synthesis  Most major guidelines recommend periodic referral of older adults to an eye care professional for comprehensive evaluation to detect eye diseases and visual disability. The value of routine screening for vision loss in the primary care setting has not been established. Timely identification and treatment of eye diseases can substantially reduce the incidence and prevalence of visual disability among older adults. Optimizing management of systemic diseases, such as diabetes, hypertension, and hyperlipidemia, significantly reduces the risk of related eye disorders.

Conclusions  Primary care clinicians can play a vital role in preserving vision in their patients by managing systemic diseases that impact eye health and by ensuring that patients undergo periodic evaluations by eye care professionals and receive needed eye care.

METHODS

Data Sources

We performed a systematic review of the literature regarding the diagnosis and management of vision impairment in adults and concentrated on those aspects of care that are within the domain of a typical primary care practice. A content expert (S.R.) worked with experts in systematic reviews (P.G.S. and C.H.M.). In general, our procedures followed those recommended by the Cochrane collaboration. With the assistance of a reference librarian, we electronically searched MEDLINE, EMBASE, The Cochrane Database of Systematic Reviews, and HealthSTAR between 1985 and 2003 using key words and free-text terms (eg, vision screening, glaucoma prevention and control) to identify potentially relevant studies. We identified additional citations through reference lists and expert consultation. In addition to these strategies, we sought relevant clinical practice guidelines by searching the Internet, including Web sites for clinical societies and the database maintained by the National Guidelines Clearinghouse (http://www.guidelines.gov). Searches were updated periodically throughout the preparation of the manuscript.

Study Selection and Data Extraction

The content expert (S.R.) reviewed all citations with the inclusion criterion being that a study assessed the relationship between a specific health process and health outcomes in humans; studies were included regardless of the magnitude or direction of the reported effect. Those studies with the strongest possible research design for the question of interest (eg, the use of randomized controlled trials [RCTs] for questions of efficacy and prospective cohort studies for questions of risk and prognosis) earned the highest priority. If such studies were rare or absent, we reviewed articles using other study designs. We included prior systematic reviews and meta-analyses when relevant. The clinical practice guidelines yielded additional citations for original literature and the expert opinions summarized in the recommendations.

RESULTS

Major Causes of Visual Disability Among Adults

The major causes of visual disability among US adults are age-related or worsen with advanced age. These causes include refractive error, cataract, diabetic retinopathy, glaucoma, and macular degeneration (Table 1). The incidence of blindness and vision impairment increases with age, especially rapidly in adults older than 75 years. A population-based study of US adults identified subjective functional visual impairment in up to 7% of people aged 71 to 74 years, rapidly increasing to 39% of those adults 90 years or older. Using measured visual acuity as an outcome, the Beaver Dam Eye Study found visual impairment with worse than 20/40 visual acuity among 5% of individuals aged 65 to 74 years and 21% of individuals 75 years or older.

Prevention and Management of Visual Impairment in Primary Care

Control Glucose in Patients With DM.

There is abundant evidence that patients with DM have improved visual outcomes when serum glucose is well controlled. Two RCTs and 2 decision analyses have addressed the effects of tight glycemic control in patients with type 2 DM, and 1 study has addressed this issue in patients with type 1 DM.

The Diabetes Control and Complications Trial established that tight glycemic control in patients with type 1 DM leads to significant reductions in the risk of early microvascular complications. Another RCT, United Kingdom Prospective Diabetes Study 33 (UKPDS 33), extended these findings to patients with type 2 DM. This RCT randomly assigned 3876 patients newly diagnosed with type 2 DM (median age, 54 years) to either tight glycemic control or to usual care. During 10 years of follow-up, hemoglobin (Hb)A1C levels averaged 7.0% in the tight control group compared with 7.9% in the usual care group. The tight control group experienced a statistically significant 12% lower relative risk for any diabetes-related end point, which was mainly due to a reduction in the number of microvascular events (primarily photocoagulation for diabetic retinopathy).

The Kaplan-Meier method curves published with UKPDS 33 show that at least 2 to 3 years of tight glycemic control are needed before its benefits become apparent. However, this level of control was associated with an increase from 0.7% to about 1.5% in the annual incidence of major hypoglycemic episodes. These outcomes are in general agreement with a smaller RCT from Japan.

The first of the decision analyses we identified used a Markov model to estimate the benefits of glycemic control on microvascular complications in type 2 DM. The results indicated that most of the benefit of glucose control was achieved by decreasing very elevated levels of HbA1C to 9% and that comparatively little was achieved by further reducing the HbA1C level from 9% to 7%. The second decision analysis, using a different set of assumptions, concluded that tight control of noninsulin-dependent DM was far less cost-effective for patients who developed DM...
at age 75 years (> $200 000 per quality-adjusted life-year) compared with patients who developed DM before age 50 years ($20 000 per quality-adjusted life-year). This model also concluded that the cost per quality-adjusted life-year increased greatly for HbA1C values of less than 9%.

Very high levels of blood glucose can have immediate visual consequences. Fluctuations in blood glucose levels can be associated with dynamic shifts in the refractive power of the eye, resulting in blurry vision that is theoretically correctable with new lenses.34-36 Although a change in glasses prescription might temporarily restore clear vision, this approach can be impractical and expensive because the refractive power of the lens often is not stable during these episodes and may not return to baseline for weeks following normalization of serum glucose.34 Thus, glycemic control remains the mainstay of therapy for these patients.

Control Hypertension. Hypertension in Patients With DM. In patients with type 2 DM, the risk of diabetic retinopathy is strongly associated with higher blood pressure.10 Recent data indicate that tight control of hypertension reduces the risk of diabetic retinopathy, as well as all other major diabetes outcomes. In UKPDS 38, 1148 patients with hypertension and type 2 DM (mean age, 56 years; mean blood pressure, 160/94 mm Hg) were randomly assigned to either tight control of blood pressure (<150/85 mm Hg) or less tight control (<180/105 mm Hg).38 Despite relatively small differences in mean blood pressures (144/82 mm Hg vs 154/87 mm Hg), the outcomes between the 2 groups began to diverge between 2 and 3 years after initiation of therapy, and were pronounced by 5 years. After 9 years of follow-up, the treatment group had a 34% reduced risk of retinopathy worsened by 2 steps (worsening by 2 steps often heralds the need for laser photocoagulation treatment) (99% confidence interval [CI], 11%-50%; P = .001). Patients who were treated had a 47% reduced risk of significant deterioration in visual acuity (loss of 3 lines on a standard eye chart from 20/30 to 20/70) (95% CI, 7%-70%; P = .004).38

The UKPDS 38 further showed that the greater the reduction in blood pressure, the greater the reduction in microvascular complications, such as retinopathy. In fact, for each 10-mm Hg decrease in mean systolic blood pressure, there was a 13% reduction in the risk of microvascular complications, such as diabetic retinopathy (95% CI, 10%-16%; P < .001).38 Within this study, there was no threshold of systolic blood pressure below which this benefit began to wane.

These data suggest that the previously recommended blood pressure target of 140/90 mm Hg among middle-aged patients with type 2 DM may be unnecessarily lenient. However, although evidence exists that lower blood pressure is better, the appropriate target for optimal blood pressure in older persons with DM has not been evaluated in randomized trials.

Table 1. Most Common Causes of Blindness and Visual Impairment in Adults: Features and Recommended Follow-up*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Prevalence</th>
<th>Important Risk and/or Modifying Factors (Definitive or Likely)</th>
<th>Common Signs</th>
<th>Common Symptoms</th>
<th>Treatment</th>
<th>Minimum Frequency of Examinations With Eye Care Professional†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractive error‡</td>
<td>25%-35% of adults aged 40-80 y17</td>
<td>Heredity9,23</td>
<td>Defocus correctable with refractive lenses</td>
<td>Blurry vision without glasses or contacts</td>
<td>Glasses, contacts, refractive surgery</td>
<td>As needed for decreased vision or visual function17</td>
</tr>
<tr>
<td>Cataract</td>
<td>About 17% of adults aged &gt;40 y (not all symptomatic)11</td>
<td>Age,19 race,19 Heredity,19 Opacification of the crystalline lens</td>
<td>Blur, glare, haze</td>
<td>Surgery when symptomatic</td>
<td></td>
<td>As needed for decreased visual acuity or function16</td>
</tr>
<tr>
<td>Diabetic retinopathy</td>
<td>2.5% of US individuals aged ≥18 y21</td>
<td>Hyperglycemia,10 worse with hypertension10</td>
<td>Retinal edema, hemorrhages, exudates</td>
<td>Asymptomatic, gradual vision loss, or sudden vision loss</td>
<td>Glycemic and hypertensive control Laser</td>
<td>Yearly (see Table 3 for other recommendations)13</td>
</tr>
<tr>
<td>Primary open-angle glaucoma</td>
<td>Black patients aged &gt;40 y; 1.2%-11.3%;21,24 white patients aged &gt;40 y; 0.9%-2.1%;21,24</td>
<td>African descent, age, family history, high intraocular pressure29</td>
<td>optic nerve cupping, visual field changes</td>
<td>Asymptomatic initially; peripheral, then central visual field loss with progression</td>
<td>Pressure-lowering treatments: medications, laser, surgery</td>
<td>Yearly14</td>
</tr>
<tr>
<td>Age-related macular degeneration</td>
<td>Late (symptomatic): 1.6 million US individuals aged &gt;50 y11</td>
<td>Age, race, cigarette smoking,11 and other possible factors26 (data are less conclusive)16; hypertension, atherosclerosis, low levels of antioxidants, dietary fat (especially saturated), UV light</td>
<td>Macular retinal changes</td>
<td>Early: asymptomatic Late: central vision loss (gradual or sudden)</td>
<td>Laser treatment, photodynamic therapy</td>
<td>Yearly15</td>
</tr>
</tbody>
</table>

*Resource: American Academy of Ophthalmology Referenced Practice Patterns Series.13-17
†In the absence of new signs or symptoms.
‡Estimates do not include presbyopia.
Hypertension in Other Patients. Control of hypertension can be expected to benefit the visual health of patients without DM as well, although this has not been studied directly in RCTs. Prolonged hypertension leads to decreased vision from hypertensive retinopathy, and has been implicated in central retinal artery and vein occlusions, ischemic optic neuropathy, and macular degeneration. The optimal threshold for blood pressure control in patients without DM also has not been established.

Control Hyperlipidemia, Especially in Patients With DM. Diabetes Mellitus. Although there is a lack of experimental evidence supporting lipid-lowering interventions aimed at diabetic vision loss, most observational studies suggest an association between elevated serum lipid levels and diabetic retinopathy. The Early Treatment Diabetic Retinopathy Study evaluated the relationship between elevated serum lipids and diabetic retinopathy. The optimal threshold for blood pressure control in patients with DM has not been established.

Other Eye Diseases. Hyperlipidemia and lipid-related atherosclerotic disease have been implicated as risk factors in a variety of ophthalmic diseases, including retinal artery and vein occlusions, ischemic optic neuropathy, cataract, and even dry eye. One possible explanation for this disparity may be that the optimal threshold for blood pressure control in patients with AMD is approximately 120 mmHg. The OR for male smokers compared with women who never smoked was 3.21 (95% CI, 1.09-9.45). The OR for male smokers compared with women who never smoked was 3.21 (95% CI, 1.09-9.45).

Advocate Smoking Cessation. Age-Related Macular Degeneration. Cigarette smoking is one of the few known modifiable risk factors for AMD. Evidence suggests that smoking cessation may reduce the likelihood of cataract formation. In 1 case-control study among 450 patients with AMD, the OR for male smokers was 3.21 (95% CI, 1.09-9.45). The OR for male smokers compared with women who never smoked was 3.21 (95% CI, 1.09-9.45).

Cataract. Associations between cataract formation and smoking appear in multiple observational studies. Evidence suggests that smoking cessation may reduce the likelihood of cataract formation. However, this benefit may not accrue, at least measurably, for many years following cessation. Diabetic Retinopathy. Smoking is linked to incidence and progression of diabetic retinopathy in multiple studies. The effect may be dose-related. Smoking cessation is generally encouraged by diabetic retinopathy experts.

Thyroid Eye Disease. Smoking significantly increases the risk for Graves ophthalmopathy and worsens the condition among those who already have it. In 1 case-control study among 450 patients with Graves disease, the odds of developing ophthalmopathy was 7.7 (95% CI, 4.3-13.7) for smokers relative to nonsmokers. There is some evidence that these effects are longstanding and may be irreversible.

Assess the Ocular Effects of Systemic Medications. Many systemic medications are associated with ocular symptoms, complications, or both. Table 2 summarizes the most common culprits, including their signs and symptoms, and strategies to address each.

Consider the Role of Antioxidants and Protection Against UV Light. Patients who have been diagnosed by an eye care professional with specific types of macular degeneration may benefit from taking certain antioxidants. Recently released data from the Age-Related Eye Disease Study indicate that a daily high-dose antioxidant supplement reduces the chance of further vision loss for selected patients with macular degeneration. In this RCT, 3640 patients who had intermediate macular degeneration in 1 or both eyes, and those with advanced AMD or AMD-related vision loss in 1 eye only, showed a 6% reduction in absolute risk of vision loss over 6.3 years (23% vs 29%; OR, 0.73; 99% CI, 0.54-0.99). Vision loss was defined as at least a doubling of the visual angle, equivalent to a change from 20/20 to 20/40 or worse, or a change from 20/50 to 20/100 or worse. Based on data in this study, we estimated that 11 patients would need to be treated for 5 years for 1 patient to benefit from high-dose antioxidants. No benefit was detected for patients with early AMD in this time frame, although the study was not powered to detect small benefits. The study dosages were vitamin C (500 mg), vitamin E (400 IU), beta carotene (15 mg), zinc (80 mg as zinc oxide), and copper (2 mg as cupric oxide). (Cop-
Table 2. Common Systemic Medications With Ocular Adverse Effects†

<table>
<thead>
<tr>
<th>Medication</th>
<th>Risk Factors</th>
<th>Symptoms and Signs</th>
<th>Treatment and Referral</th>
<th>Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amiodarone</td>
<td>All patients, or &lt;10% are asymptomatic</td>
<td>Halos, blurred vision, corneal changes, optic neuropathy</td>
<td>Discontinue medication and refer to ophthalmologist for visual changes</td>
<td>Generally reversible with discontinuation of medication</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>Younger patients who are still able to accommodate (usually those persons aged &lt;50 y)</td>
<td>Blurry near vision from loss of accommodation, better with reading glasses</td>
<td>Warn patients aged &lt;50 years about difficulty focusing at near, and about possible need for reading glasses</td>
<td>Accommodative insufficiency: generally reversible with discontinuation</td>
</tr>
<tr>
<td></td>
<td>Patients with narrow-angle glaucoma or anatomic narrow angles (angle-closure glaucoma)</td>
<td>Angle-closure glaucoma (rare)</td>
<td>Refer emergently to ophthalmologist for acute vision loss, eye redness or pain, cloudy cornea</td>
<td>Angle-closure glaucoma: usually long-term damage can be minimized with appropriate emergent laser treatment by ophthalmologist (within hours)</td>
</tr>
<tr>
<td>Cisplatin</td>
<td>Women aged &gt;50 y receiving 200 mg/m² per day</td>
<td>Decreased central vision and color vision</td>
<td>Discontinue medication and refer to ophthalmologist for visual changes</td>
<td>Variable</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>Cataracts: 25% develop cataracts after 1 y receiving dose equivalent to prednisone, 15 mg/d</td>
<td>Cataracts: glare, reduced visual acuity, halos</td>
<td>If long-term systemic steroids anticipated: Check visual acuity and visual symptoms periodically</td>
<td>Cataract: symptoms generally stabilize after withdrawing medication and improve with cataract extraction</td>
</tr>
<tr>
<td></td>
<td>Glaucoma from increased intraocular pressure can develop at any dose of systemic or inhaled steroids after 3 wk</td>
<td>Glaucoma: loss of peripheral vision (usually asymptomatic until advanced damage has occurred)</td>
<td>Check intraocular pressure every 6 mo (by eye care professional)</td>
<td>Intraocular pressure usually stabilizes after withdrawing medication</td>
</tr>
<tr>
<td></td>
<td>People with glaucoma or high risk for glaucoma (family history, race) may have greater chance of elevated intraocular pressure</td>
<td></td>
<td>Consider comprehensive eye evaluation and consultation with ophthalmologist to assess risk factors for glaucoma and to develop appropriate follow-up schedule</td>
<td>Glaucomatous damage: irreversible</td>
</tr>
<tr>
<td>Digoxin</td>
<td>25% of patients whose digoxin levels are in moderately toxic range Can occur with levels in normal range</td>
<td>Xanthopsia (yellowish orange vision) Snowy, flickering vision</td>
<td>Maintain dose in therapeutic range</td>
<td>Usually resolves when dose restored to therapeutic range</td>
</tr>
<tr>
<td>Ethambutol or isoniazid</td>
<td>Ethambutol: daily doses &gt;15 mg/d Isoniazid: maintenance dose &gt;5 mg/kg Lower doses in renal failure or when combining both drugs</td>
<td>Loss of color vision, visual acuity, visual field</td>
<td>Discontinue medication and refer to ophthalmologist for visual changes</td>
<td>Reversible if detected early Usually stabilizes with discontinuation of drug</td>
</tr>
<tr>
<td>Hydroxychloroquine and chloroquine85</td>
<td>Hydroxychloroquine dose &gt;6.5 mg/kg per day Chloroquine dose &gt;3 mg/kg per day &gt;5 y use Overweight habitus Renal or hepatic disease Retinal disease Age &gt;60 y</td>
<td>Loss of color vision, visual field, visual acuity “Bull’s eye retinopathy”: characteristic ring-like atrophy around fovea</td>
<td>Baseline ophthalmologic examination before initiation If any risk factors, yearly examination If aged 40-50 y with no risk factors: examination every 2-4 y</td>
<td>Visual deficits generally irreversible but stabilize with discontinuation of drug</td>
</tr>
<tr>
<td>Niacin</td>
<td>Male sex</td>
<td>Decreased visual acuity Maculopathy</td>
<td>Discontinue medication and refer to ophthalmologist for visual changes</td>
<td>(continued)</td>
</tr>
</tbody>
</table>

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Table 2. Common Systemic Medications With Ocular Adverse Effects* (cont)

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<th>Symptoms and Signs</th>
<th>Treatment and Referral</th>
<th>Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenytion and</td>
<td>Serum levels in moderately toxic range</td>
<td>Nystagmus (can occur at upper-normal therapeutic levels)</td>
<td>Adjust dosage downward if possible</td>
<td>Usually resolves when dose restored to therapeutic range</td>
</tr>
<tr>
<td>carbamazepine</td>
<td></td>
<td>Diplopia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blurred vision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tamoxifen citrate</td>
<td>Usually only with high doses (cumulative dose of &gt;100 g or maintenance dose of 120 mg twice daily) Has been reported with normal doses (daily doses as small as 20 mg/d) after a total cumulative dose of 7 g</td>
<td>Decreased visual acuity Cystoid macular edema Perimacular retinal deposits</td>
<td>Baseline ophthalmologic examination before initiation if high doses anticipated Test visual acuity every 6 mo Discontinue or reduce dosage of medication and refer to ophthalmologist for visual changes</td>
<td>Vision generally returns to normal range within months Retinal deposits are usually permanent</td>
</tr>
<tr>
<td>Thioridazine</td>
<td>Maintenance dose &gt;800 mg/d</td>
<td>Brownish discoloration of vision Reduced visual acuity Constricted peripheral visual fields Decreased night vision Pigmentary retinopathy</td>
<td>Baseline ophthalmologic examination before initiation Test visual acuity every 6 mo Describe possible symptoms to patient Advise to immediately report any visual changes Discontinue medication immediately and refer to ophthalmologist for visual changes</td>
<td>Visual deficits are irreversible Deficits may be progressive even after discontinuation of drug</td>
</tr>
<tr>
<td>Vincristine</td>
<td>Reported after mean total dose of 17.7 mg during 10-wk period</td>
<td>Phthisis Diplopia Abduction deficits</td>
<td>Discontinue medication if possible Assess eyelids and ophtalmic motility if diplopia, phthisis noted Consider referral to ophthalmologist for symptoms</td>
<td>90% Resolves Resolution occurs an average of 11 wk after discontinuation</td>
</tr>
</tbody>
</table>

*Resource: The Physician’s Guide to Eye Care.62

in the risk of certain types of cataract.88-91 A recent comprehensive literature review concluded that there is sufficient evidence of increased risk of cataract with exposure to UV light to justify public health messages advocating simple measures such as sunglasses to decrease ocular exposure.92 However, few data unequivocally support protection against UV light in preventing or treating visual loss other than cataract.

Eye Care for Patients With DM

A systematic review performed for the American College of Physicians concluded that both screening for retinopathy and subsequent treatment are clearly beneficial for patients with DM.93 Decision analytic models have concluded that screening for diabetic retinopathy is highly cost-effective and even cost-saving when payments for disability due to blindness are included, although the cost-effectiveness of screening decreases with increasing age.94,95

There is widespread agreement among most major authorities that patients with adult-onset DM should undergo delayed retinal evaluation at least every 2 years and that patients with poorly controlled DM need yearly examinations.73,93,96-100 Most major authorities recommend annual retinal examinations for all patients with adult-onset DM regardless of how successfully their disease has been controlled.73,93,96-100 Table 3 summarizes specific recommendations by major authorities.

Recommendations for annual examinations are based in part on the finding that 5% to 10% of patients with no retinopathy will progress to retinopathy within 1 year.104-105 However, some authorities believe that patients with well-controlled DM may not require retinal examinations as frequently. In the Wisconsin Epidemiologic Study of Diabetic Retinopathy,104,105 a large prospective study of 1990 predominantly white patients, the subset of patients with type 2 DM with no retinopathy on skilled reading of standard 7-field stereoscopic color fundus photographs, no gross proteinuria, and glycemic control within 2 standard deviations of the nondiabetic population, generally did not require follow-up retinal examinations for 4 years. These data suggest that for selected low-risk patients who have excellent glucose control (as measured by HbA1C <8.0%), and healthy eye examinations (as determined by gold standard methods), the interval between retinal evaluations may extend to 2 years with little increased morbidity. A recent cost-utility analysis highlights the potential cost-effectiveness of this strategy;96 the National Committee for Quality Assurance and Veterans Affairs acknowledge these findings in their current diabetes quality measures for Health Employer Data and Information Set (HEDIS)107 and Veterans Affairs performance measures. Nevertheless, many experts express concern that a 2-year target would increase the rate of needless blindness, because gold standard evaluations such as those performed by the Wisconsin Epidemiologic Study of Diabetic Retinopathy may not be representative of the screening techniques avail-

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able to most patients, and because preventable blindness occurs due to poor compliance even when the goal is annual screening.\textsuperscript{89}

Most major guidelines concur that diabetic retinopathy screening should be performed by an eye care professional who is knowledgeable regarding diabetic retinopathy or by stereoscopic fundus photography.\textsuperscript{75,93-100} Studies have reported that either ophthalmologists or diabetologists are more sensitive at detecting early diabetic retinopathy than are general internists or family physicians.\textsuperscript{108} Although 7-field dilated stereoscopic fundus photography remains the gold standard for detection of diabetic retinopathy, clinical examination by a skilled practitioner is more sensitive in detecting certain features of the disease.\textsuperscript{75,109}

There is evidence and professional consensus that a dilated pupil is necessary to ensure optimal examination of the retina.\textsuperscript{13,75} In 2 studies, retinal examination through undilated pupils failed to correctly classify the presence and severity of retinopathy 50% of the time compared with the standard 7-field stereo photographs.\textsuperscript{110,111} In contrast, examination through a dilated pupil correlated with photographs approximately 80% of the time.

There is increasing evidence that some systems of retinal photoscreening may have comparable sensitivity and specificity to dilated retinal examination in the detection of treatable diabetic eye disease,\textsuperscript{112-114} although experts have not reached consensus on this point.\textsuperscript{13,75}

### Table 3. Summary of Recommendations for Periodic Vision Evaluation in Adults With DM

<table>
<thead>
<tr>
<th>Organization</th>
<th>Document Title, Most Recent Update</th>
<th>Population</th>
<th>Frequency</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Association of Clinical Endocrinologists/ American College of Endocrinology</td>
<td>Diabetes Guidelines,\textsuperscript{101} 2002</td>
<td>Patients with DM</td>
<td>At diagnosis of DM and yearly thereafter</td>
<td>Dilated eye examination performed by person skilled in management of diabetic retinopathy only</td>
</tr>
<tr>
<td>American Diabetes Association</td>
<td>Clinical Practice Recommendations,\textsuperscript{75} 2002</td>
<td>Patients with DM diagnosed after 30 y</td>
<td>At diagnosis, then yearly</td>
<td>Comprehensive examination by ophthalmologist or optometrist with experience managing diabetic retinopathy or 7-Standard field stereoscopic 30° fundus photography through a dilated pupil</td>
</tr>
<tr>
<td>American Academy of Ophthalmology</td>
<td>Preferred Practice Patterns: Diabetic Retinopathy,\textsuperscript{13} 2003</td>
<td>Patients with DM</td>
<td>At diagnosis, then yearly</td>
<td>Comprehensive examination, including dilated retinal examination</td>
</tr>
<tr>
<td>American Optometric Association</td>
<td>Care of the Patient With Diabetes Mellitus,\textsuperscript{46} 2002</td>
<td>Patients with DM</td>
<td>At diagnosis, then at least yearly</td>
<td>Comprehensive examination, including dilated retinal examination</td>
</tr>
<tr>
<td>The National Committee for Quality Assurance, American Medical Association, and the Joint Commission on Accreditation of Healthcare Organizations</td>
<td>Common Measures for Diabetes Care Consensus Statements: Diabetes Quality Improvement Project Initial Measure Set (final version), 2001</td>
<td>Low-risk patients with DM\textsuperscript{†} High-risk patients with DM</td>
<td>Every 2 y At diagnosis and annually</td>
<td>Dilated eye examination</td>
</tr>
<tr>
<td>Veterans Administration</td>
<td>The Management of Diabetes Mellitus in the Primary Care Setting,\textsuperscript{76} 1999</td>
<td>Low-risk patients with DM\textsuperscript{†} Patients with DM</td>
<td>Every 2 y Annually</td>
<td>Not specified</td>
</tr>
<tr>
<td>Canadian Task Force on the Periodic Health Examination</td>
<td>Screening for Visual Problems Among Elderly Patients,\textsuperscript{102} 1995</td>
<td>Adults aged &gt;64 y</td>
<td>During periodic health examination</td>
<td>Funduscopy or retinal photography</td>
</tr>
<tr>
<td>International Diabetes Center</td>
<td>Type 2 Diabetes Practice Guidelines,\textsuperscript{103} 2001</td>
<td>Patients with type 2 DM</td>
<td>Yearly</td>
<td>Dilated eye examination</td>
</tr>
</tbody>
</table>

Abbreviation: DM, diabetes mellitus.

\textsuperscript{†}Low-risk patients are defined as meeting any 2 of the following 3 conditions: the patient is not taking insulin, the patient has an HbA\textsubscript{1C} of less than 8.0% (the most recent test result within the reporting period will be used), and the patient did not have any evidence of retinopathy on the previous year’s examination.

\textsuperscript{1}Low-risk patients are defined as having type 2 DM with HbA\textsubscript{1C} of less than 8.0% and treated with oral agents.
SCREENING FOR GLAUCOMA IN VETERANS ADMINISTRATION NATIONAL EYE INSTITUTE

Canadian Task Force on the Periodic Health Examination

American Academy of Family Physicians

National Eye Institute

American Optometric Association

American Academy of Ophthalmology

American College of Obstetricians and Gynecologists

Institute for Clinical Systems Improvement

Veterans Administration

Table 4. Summary of Recommendations for Periodic Vision Evaluation of Asymptomatic Adults Without Diabetes Mellitus or Known Eye Disease

<table>
<thead>
<tr>
<th>Organization</th>
<th>Document Title, Most Recent Update</th>
<th>Population</th>
<th>Frequency</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Preventive Services Task Force</td>
<td>Guide to Clinical Preventive Services, 2nd Edition: Screening for Visual Impairment, 116 1996</td>
<td>Patients aged ≥65 y, Black patients aged &gt;40 y, White patients aged &gt;65 y</td>
<td>Routine (frequency left to physician’s discretion)</td>
<td>Snellen Visual Acuity; selected questions may be helpful Referral to eye specialist for glaucoma evaluation</td>
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<td>Canadian Task Force on the Periodic Health Examination</td>
<td>Screening for Visual Problems Among Elderly Patients, 118, 119, 120 1995</td>
<td>Adults aged &gt;64 y</td>
<td>During periodic health examination</td>
<td>Snellen Visual Acuity</td>
</tr>
<tr>
<td>American Academy of Family Physicians</td>
<td>Summary of AAFP Policy Recommendations for Periodic Health Examination Revision S.1, 117 2001</td>
<td>Elderly patients</td>
<td>Not specified</td>
<td>Snellen Visual Acuity</td>
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<tr>
<td>National Eye Institute</td>
<td>National Eye Institute Statement: Vision Screening in Adults, 118 1996</td>
<td>Adults aged &gt;59 y, Black patients aged &gt;40 y, Patients with visual acuity worse than 20/30</td>
<td>Every 2 y</td>
<td>Comprehensive eye examination by eye care professional</td>
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<td>American Optometric Association</td>
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<td>Older patients</td>
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<td>American Academy of Ophthalmology</td>
<td>Comprehensive Adult Medical Eye Evaluation, 122 2000</td>
<td>All people aged &gt;64 y, Black patients aged &gt;40 y, People aged &gt;40 y with family history of glaucoma</td>
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<tr>
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<td>Women aged &gt;64 y</td>
<td>Yearly or as appropriate</td>
<td>Snellen Visual Acuity Test</td>
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</tr>
<tr>
<td>Institute for Clinical Systems Improvement</td>
<td>Health Care Guideline: Preventive Services for Adults, 123 2001</td>
<td>All people aged &gt;74 y</td>
<td>Every 1-2 y</td>
<td>Objective Visual Acuity Testing</td>
</tr>
<tr>
<td>Veterans Administration</td>
<td>Screening for Glaucoma in the Primary Care Setting, 121 2000</td>
<td>Adults aged &gt;65 y or black race or family history of glaucoma, ≥2 of above risk factors</td>
<td>Every 2 y</td>
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**COMMENT**

Visual impairment is common and debilitating, especially in elderly persons. Many patients suffer needlessly from preventable or treatable visual disorders. Primary care physicians have unique opportunities to help prevent visual impairment and blindness through patient education, medical therapy, and specialty referral. They can play a critical role by educating patients about the importance of treatment and prevention of eye diseases, by optimizing systemic treatment for illnesses, such as diabetes and hypertension, and by recognizing the need for specialty referral when there is visual impairment or risk factors for common eye diseases.

The value of routine screening for vision impairments has yet to be proven

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VISUAL LOSS FROM CHRONIC EYE DISEASE


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