Quality Indicators for the Care of Vision Impairment in Vulnerable Elders

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Vision impairment is common in elderly people, and it increases with age. Population-based studies report functional visual impairment1,2 in 4% to 7% of persons aged 71 to 74, 16% of persons aged 80 and older, and 39% of persons aged 90 and older.3 Similarly, the Beaver Dam Eye Study found visual impairment worse than 20/40 vision in 5% of individuals aged 65 to 74 and 21% of individuals aged 75 and older.4

Approximately 90% of the population aged 65 and older requires refractive lenses to optimize vision.5 It is estimated that more than half of these individuals would experience better vision from alteration of refractive lenses or other appropriate treatment.6,7

Decreased vision is debilitating for elderly people. Of those aged 60 and older, distance visual acuity of 20/25 or worse is associated with greater risk of falls and fractures than for those with 20/20 or better vision.8 Reduced useful visual field has been associated with greater risk of motor vehicle crashes in older drivers.9 Worse visual function has been shown to be associated with limitations in mobility, activities of daily living (ADLs), and physical performance.10 Declines in subjective visual function have major negative effects on cognitive, affective, and functional status and increase the probability of nursing home residence.11 Functional-status and quality-of-life measurements in ophthalmic patients are lower than for controls with normal vision and no known ocular disease.12 Quality-of-life studies specific to cataract, glaucoma, diabetic retinopathy, and macular degeneration have all shown significantly poorer vision-related quality of life associated with vision loss from these diseases.13–18 Studies have shown that distance visual impairment worse than 20/40 is associated with a decrease across all self-reported measures of functional status in those aged 65 and older.2

Effective treatment or prevention is available for much of the visual disability due to common eye disorders. For example, although no randomized trials or case-control studies have proven the benefit of eyeglasses for refractive error, there is widespread consensus that functional disability due to refractive error is largely resolved using corrective lenses. Cataract extraction is also highly effective in patients with visual loss due to cataracts. Studies of patients undergoing cataract surgery showed that, by 1 year after surgery, 95% to 96% of the patients experienced improved Snellen visual acuity, and 80% to 89% experienced improved ability to perform vision-related ADLs.19,20 These patients also experienced fewer declines in overall health-related quality of life than expected. An observational evaluation of Medicare beneficiaries representative of the U.S. population demonstrated that patients with more-regular eye examinations were less likely to experience a decline in visual function or functional status over a 5-year period.21

Patients with advanced eye disease also can benefit from intervention. For example, for patients with diabetic retinopathy, laser treatment has been shown to reduce vision loss 50% or more,22,23 whereas many individuals with glaucomatous vision loss who undergo appropriate pressure-lowering treatments are able to reduce progression of their disease 20% to 40%.24,25 Of patients with treatable macular degeneration, antioxidant supplementation and laser treatment can retard loss of vision up to 25%.26,27 Moreover, early recognition of symptoms increases the likelihood of detecting new lesions at a treatable stage.28

Patients with permanent functional vision loss may benefit from vision rehabilitation programs and assistive devices. Although there are no randomized, controlled trials (RCTs) or case-control studies that directly assess the benefit of these interventions, expert consensus, as reflected in the American Academy of Ophthalmology (AAO) guidelines and prominent textbooks, indicates that these interventions increase independence and quality of life.29

In summary, there is abundant evidence that appropriate treatment for visual conditions can significantly reduce the overall prevalence of visual disability and improve quality of life in a large proportion of vulnerable elders (VEs). Therefore, these indicators focus on the five major causes of visual disability in elderly people: uncorrected...
refractive error, cataract, glaucoma, diabetic retinopathy, and macular degeneration.

**METHODS**

A total of 119 articles were considered in this review: 41 identified through a Web search and 77 through reference mining. One additional article was included after peer review.

**RESULTS**

Eleven quality indicators (QIs) were proposed, and the expert panel process judged all 11 to be valid (see the QIs on pages S464–S487 of this supplement). One QI was moved to Diabetes Mellitus. The literature summaries that support each of the indicators judged to be valid in the expert panel process are described.

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**Comprehensive Eye Evaluation**

1. **ALL VEs should have a comprehensive eye examination every 2 years,** BECAUSE this evaluation is necessary to detect potentially treatable eye disease.

**Supporting Evidence**

The literature search identified no RCTs or cohort studies that directly assessed the optimal process or frequency of adult eye examinations in the absence of eye symptoms or signs or diagnosed eye disease. Nevertheless, nearly every major clinical authority recommends a periodic vision evaluation of asymptomatic adults, particularly in older populations (Table 1). These recommendations are made recognizing the high prevalence of undetected visual impairment, especially in elderly people (up to 50% of older people have undetected reduced vision), the fact

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**Table 1. Summary of Recommendations for Periodic Vision Evaluation Asymptomatic Adults without Diabetes Mellitus or Known Eye Disease**

<table>
<thead>
<tr>
<th>Organization</th>
<th>Document Title</th>
<th>Most-Recent Update</th>
<th>Population</th>
<th>Frequency</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Academy of Ophthalmology</td>
<td>Comprehensive Adult Medical Eye Evaluation (abstracted recommendations pertaining to people aged ≥65)</td>
<td>2005</td>
<td>All people aged ≥65 People aged ≥65 with risk factors (African-American descent, history of elevated intraocular pressure or family history of glaucoma)</td>
<td>Every 1–2 years Every 6–12 months</td>
<td>Comprehensive eye examination</td>
</tr>
<tr>
<td>American Optometric Association</td>
<td>Comprehensive Adult Eye and Vision Examination</td>
<td>Older patients</td>
<td>Yearly</td>
<td></td>
<td>Comprehensive eye examination</td>
</tr>
<tr>
<td>National Eye Institute <a href="http://www.nei.nih.gov/news/statements/vision-screen.asp">http://www.nei.nih.gov/news/statements/vision-screen.asp</a></td>
<td>NEI Statement: Vision Screening in Adults</td>
<td>Web page last modified October 2004</td>
<td>Adults aged &gt;60 Blacks aged &gt;40 People with a family history of glaucoma People with visual acuity worse than 20/30</td>
<td>Every 2 years</td>
<td>Comprehensive eye examination by eye care professional</td>
</tr>
<tr>
<td>Department of Veterans Affairs</td>
<td>Screening for Glaucoma in the Primary Care Setting</td>
<td>2001</td>
<td>Adult aged ≥65 African American Family history of glaucoma Two or more of above risks factors</td>
<td>Every 2 years</td>
<td>Eye examination with optometrist or ophthalmologist</td>
</tr>
<tr>
<td>Health Plan Employer Data and Information Set</td>
<td>Glaucoma Screening in Older Adults</td>
<td>2005</td>
<td>Medicare members aged ≥65 without a prior diagnosis of glaucoma or glaucoma suspect</td>
<td>Every 2 years</td>
<td>Glaucoma eye examination by eye care professional</td>
</tr>
<tr>
<td>Canadian Task Force on Preventive Health Care (Formerly Canadian Task Force on the Periodic Health Examination)</td>
<td>Systematic Reviews and Recommendations Screening for Visual Problems Among Elderly Patients</td>
<td>1995</td>
<td>Adults aged ≥65</td>
<td>Every periodic health examination</td>
<td>Snellen Visual Acuity Test</td>
</tr>
<tr>
<td>American Academy of Family Physicians</td>
<td>Summary of Policy Recommendations for Periodic Health Examination Revision 5.6</td>
<td>2004</td>
<td>Elderly adults</td>
<td>Not specified</td>
<td>Snellen Visual Acuity Testing</td>
</tr>
<tr>
<td>Institute for Clinical Systems Improvement</td>
<td>Health Care Guideline: Preventive Services for Adults 11th Update</td>
<td>October 2005</td>
<td>Asymptomatic elderly adults</td>
<td>Every 1–2 years</td>
<td>Objective Snellen Visual Acuity Testing</td>
</tr>
<tr>
<td>U.S. Preventive Services Task Force</td>
<td>Screening for Primary Open Angle Glaucoma in the Primary Care Setting</td>
<td>2005</td>
<td>Asymptomatic patients</td>
<td>NA</td>
<td>No evidence for or against screening</td>
</tr>
</tbody>
</table>

NA = not applicable.
that most causes of visual impairment are readily diagnosed and are either treatable or preventable,3,38 and the evidence that many treatments sustain or improve quality of life.30,42–46 The 2005 Preferred Practice Patterns from the AAO (AAO-PPP) recommend comprehensive eye evaluations every 1 to 2 years for asymptomatic persons aged 65 and older for identification of major eye diseases such as glaucoma, macular degeneration, diabetic retinopathy, and cataract.30 An expert panel made this recommendation after reviewing the available literature despite a previous update by the United States Preventive Service Task Force that failed to find evidence for or against screening for glaucoma in asymptomatic patients in the primary care setting.47 The justification for this recommendation is that older age is associated with a higher incidence of the most prevalent and potentially asymptomatic eye diseases (glaucoma, macular degeneration, and diabetic retinopathy) and that a comprehensive eye evaluation is necessary to detect such conditions.3,6,38 According to these recommendations, to adequately detect all major causes of preventable or treatable eye disease, a comprehensive eye evaluation should include a complete ocular history and relevant family history, social history, medications, and review of systems; measurement of near and distance visual acuity; refraction, when appropriate; pupillary examination; dilation of the pupil; extra-ocular motility examination; intraocular pressure (IOP) measurement; visual fields by confrontation when indicated; external examination; slit lamp examination; and examination of the vitreous humor, retina, vasculature, and optic nerve.

The literature search found scant evidence supporting the use of less-extensive eye evaluations for the detection of treatable eye disease. One cohort study specifically addressed the utility of various vision screening tests to detect visually disabling or vision-threatening eye conditions.48 In this study, 317 new patients (mean age ± standard deviation 44 ± 17) in a large, urban, general ophthalmology clinic were assessed using four commonly available visual function tests; they also underwent a comprehensive eye evaluation. Near visual acuity of 20/40 or worse and distance visual acuity of 20/30 or worse were significantly associated with ocular disease. These tests had sensitivities and specificities between 0.73 and 0.75 and likelihood ratios of 2.8 for the near vision test (95% confidence interval (CI) = 1.7–4.9) to 2.7 for the distance vision test (95% CI = 1.8–4.3).

2. IF a VE has sudden-onset severe visual changes, THEN he or she should see an eye care professional within 24 hours, and
3. IF a VE has new-onset eye pain, grossly visible corneal lesions, or severe purulent discharge, THEN he or she should undergo a basic eye examination within 72 hours,

BECAUSE these symptoms and signs are commonly associated with potentially treatable vision-threatening eye diseases whose outcomes may depend on early diagnosis and treatment and that can be diagnosed only through history and physical examination by a person skilled at ophthalmic assessment.

Supporting Evidence

The literature search identified no direct evidence in the form of randomized clinical trials or cohort studies that addressed the process or timing of eye examination for sudden-onset visual changes, eye pain, corneal lesions, or severe purulent discharge, but there is consensus among ophthalmic textbooks and manuals that these are common symptoms and signs of potentially treatable vision-threatening eye diseases whose outcomes may depend on diagnosis and treatment within hours to days.49,50 Examples of such diseases, which occur in elderly people, include angle-closure glaucoma, corneal ulcers, herpetic eye disease, inflammatory eye disease, retinal detachment, choroidal neovascularization, and temporal (giant cell) arteritis.

The AAO further recommends referral to an ophthalmologist if the patient with conjunctivitis has visual loss; moderate or severe eye pain; severe or chronic redness; severe, purulent discharge; recurrent episodes; or lack of response to therapy.51

Glaucoma Follow-Up

4. IF a VE has primary open-angle glaucoma, THEN he or she should have an eye examination annually that includes measurements of visual acuity and IOP, documentation of optic nerve examination, slit lamp evaluation, visual field testing, and documentation of target IOP, BECAUSE these evaluations are necessary to identify progression of the disease and the need for further treatment.

Note: Visually asymptomatic patients who have had well-controlled IOP for more than 6 months and who have had no progression of optic nerve damage according to optic nerve and visual field evaluations may extend the interval between visual field examinations up to 2 years and the interval between optic nerve evaluations up to 18 months.

Supporting Evidence

The literature search identified no RCTs or cohort studies that directly assessed the optimal process or timing of follow-up examinations for primary open-angle glaucoma, but the AAO-PPP recommendations advocate visual acuity testing, IOP measurement with comparison with target IOP, and slit lamp examination at least yearly for patients with primary open-angle glaucoma and more frequently for patients with progressive disease. The AAO-PPP also makes specific recommendations regarding the frequency of visual field and optic nerve evaluations based in part on target IOP.43

The recommendation to use these specific examinations (visual acuity, IOP, slit lamp examination, optic nerve and visual field examinations, and target IOP) at the specified intervals is based on consensus of expert opinion in the absence of appropriately controlled case studies and sufficient statistical analysis demonstrating the benefit of these procedures. Indirect evidence supports these recommendations as follows. Appropriate treatment for open-angle glaucoma requires knowledge of visual acuity, IOP, optic nerve, and visual field findings to guide therapeutic decisions.43,49 Assessing appropriateness of treatment requires knowledge of a target IOP (20–30% lower than untreated IOP) below which further optic nerve damage is deemed approximately half as likely to occur.24,43,49,52 Additional
treatment may be required when IOP is not stable in the target range or when there are progressive visual field or optic nerve changes. In addition, reduction in treatment may sometimes be considered when the optic nerve, visual field, and IOP have been stable over a prolonged period of time. Therefore, follow-up examinations, visual field assessments, optic nerve evaluations, and comparison of actual IOP to target IOP are likely to lead to better treatment of primary open-angle glaucoma.

The AAO expert panel ranked evaluations of IOP, optic nerve changes, and visual field at the highest level of importance.

Diabetic Retinopathy

Diabetes Mellitus #6. IF a VE with diabetes mellitus has a retinal examination, THEN the presence and degree of diabetic retinopathy should be documented, BECAUSE the degree of diabetic retinopathy determines the likelihood of benefit from laser treatment.

Supporting Evidence

Based on review of the available literature, the AAO-PPP made explicit recommendations regarding follow-up examinations for patients with diabetic retinopathy, with follow-up periods ranging from 2 to 4 months for clinically significant macular edema to 1 to 6 months for high-risk proliferative retinopathy. These recommendations for follow-up are based on the natural history of progression in diabetic retinopathy and evidence that correct diagnosis and timely treatment of advanced diabetic retinopathy significantly improves patient outcomes. These recommendations are in general agreement with consensus statements by the American Diabetes Association, the Veterans Affairs Clinical Practice Guidelines, and published evidence-based medicine guidelines for diabetic retinopathy. Direct studies have established that the risk of severe visual loss in patients with some categories of diabetic retinopathy increases roughly linearly over time and that treatment at least halves the risk of severe vision loss at any given time point for these patients. Because visual loss from proliferative diabetic retinopathy is largely irreversible, earlier treatment, where appropriate, leads to better long-term visual outcomes.

The literature search identified no studies that specifically addressed laser treatment for diabetic retinopathy in VEs.

Age-Related Macular Degeneration Evaluation

5. IF a VE with age-related macular degeneration (AMD) has an eye examination, THEN the degree of maculopathy (number and size of macular drusen, presence of geographic atrophy or choroidal neovascular membranes) should be documented, BECAUSE the degree of maculopathy determines the likelihood of benefit from antioxidant therapy or laser treatment and other treatments, as well as the appropriate time frame for follow-up.

Supporting Evidence

Based on review of the available literature, the AAO-PPP made explicit recommendations regarding follow-up examinations for patients with AMD, as summarized in Table 1. These recommendations for follow-up are based on the natural history of progression in AMD and evidence that correct diagnosis and timely treatment of some categories of AMD significantly improves patient outcomes. Results from the Age-Related Eye Disease Study, an 11-center, randomized, double-masked study of 3,640 participants aged 55 to 80, indicate that patients with intermediate AMD and those with advanced AMD in only one eye can significantly reduce the risk of developing severe vision loss (loss of visual acuity score of ≥15 letters) over 5 years with a combination of antioxidant therapy (odds ratio (OR) = 0.63, 99% confidence interval (CI) = 0.44–0.92, P = .001). The study was not sufficiently powered to make conclusions regarding the benefit of antioxidant supplementation for participants with fewer and smaller drusen. There is further evidence from other multicenter RCTs of thermodynamic therapy and photodynamic therapy with verteporfin that individuals with certain categories of advanced AMD can significantly reduce their risk of severe vision loss with appropriate treatment. In one study, the Treatment of Age-Related Macular Degeneration with Photodynamic Therapy, of the 242 participants with classic subfoveal neovascular lesions from AMD, only 31% developed severe vision loss over 2 years, compared with 59% of the placebo group (P < .001). Based on an open-label extension of this trial, these benefits appear to be largely sustainable over 4 years.

Cataract Extraction

6. IF a VE is diagnosed with a cataract that limits his or her ability to carry out needed or desired activities, THEN cataract extraction should be offered, BECAUSE extraction of visually significant cataracts significantly improves quality of life.

Supporting Evidence

Two major consensus statements based on extensive review of the available scientific evidence address indications for cataract surgery. The Agency for Health Care Policy and Research (AHCPR; now called Agency for Healthcare Quality and Research) Clinical Practice Guideline for Cataract states: “Cataract surgery is indicated when the cataract reduces visual function to a level that interferes with the everyday activities of the patient.” The AAO-PPP for cataract states, “The primary indication for cataract surgery is when vision impaired by cataract no longer meets the patient’s needs and surgery provides a reasonable likelihood of improved visual function.” The literature search identified numerous studies demonstrating improvements in quality of life associated with removing visually significant cataracts. Removal of cataract in the second eye resulted in additional benefits to the patient. In these studies, higher postoperative satisfaction with visual function was strongly associated with poorer preoperative visual function. Cataract surgery improved virtually every measure of quality of life. In one study, patients aged 65 and older who had significant functional limitations due to cataracts, but no concomitant eye disease limiting their visual potential, experienced up to an 85% likelihood of significant functional improvement after cataract extraction. Functional improvements in this study included improved night vision, ability to drive, and ability to perform ADLs.
Cataract Surgery Follow-Up

7. IF a VE has cataract surgery, THEN there should be a follow-up ocular examination within 48 hours, BECAUSE follow-up examination is necessary to ensure rapid identification of postoperative complications and the need for additional postoperative treatment.

Supporting Evidence
The AHCPR-sponsored report, Developing Quality and Utilization Review Criteria for Management of Cataract in Adults, made the following recommendations, which were based on the AHCPR Clinical Practice Guideline for Cataract in Adults (bracketed text added for clarity):61,69

- The ophthalmologist who performs the [cataract] surgery has the responsibility and ethical obligation to the patient for care during the postoperative period.
- The frequency of normal follow-up for a patient without signs and symptoms of complications is: the day after surgery, approximately 1 week after surgery, approximately 3 weeks after surgery, and approximately 6 to 8 weeks after surgery.
- The components of postoperative examination include the following: visual acuity, IOP measurement, slit lamp examination, patient counseling, and education.

The AAO-PPP for Cataract in the Adult Eye makes the following recommendations for postoperative care after uncomplicated cataract extraction:70

- first postoperative visit with the operating ophthalmologist within 48 hours
- second postoperative visit with the operating ophthalmologist within 4 to 7 days after surgery
- dilated ophthalmic examination within 90 days
- at every visit: visual acuity, IOP, slit lamp examination, patient counseling and education, management plan, patient assessment of visual function

The recommendations for the timing of follow-up are based in part on evidence that postoperative infectious endophthalmitis, a potentially devastating but treatable postoperative complication of cataract surgery, occurs most frequently within 1 week after cataract surgery.71,72 Three studies showing that eyes that have undergone cataract surgery may be up to six times as likely to develop a retinal detachment as unoperated eyes further support these recommendations.73–76 Furthermore, patients with diabetes mellitus have been shown to have even greater risks of postoperative complications of the retina and posterior segment than those without diabetes mellitus.77 Finally, there is evidence that the sensitivity and specificity of retinal examinations for diabetic eye disease is significantly greater when performed through a dilated pupil,78 particularly in older individuals.79

Ocular Therapy

8. IF a VE who has been prescribed an ocular therapeutic regime (e.g., topical ophthalmological medications) is hospitalized or in a nursing home, THEN there should be documentation that the therapeutic regime was administered as prescribed, BECAUSE adherence to ocular therapeutic regimes improves the likelihood of achieving the desired therapeutic effect.

Supporting Evidence
Major textbooks and the AAO-PPP reflect widespread consensus that adherence to ocular therapeutic regimes results in better patient outcomes.49,80

Uncorrected Refractive Error

9. IF a VE with functional visual deficits has subjective improvement on refraction, THEN he or she should receive a primary or updated prescription for corrective lenses, BECAUSE refractive correction may improve visual function and thereby improve overall function and quality of life.

10. IF a VE who uses corrective lenses for any ADLs (for near or distance vision) is hospitalized or in a nursing home, and the corrective lenses are at the hospital or nursing home, THEN the corrective lenses should be accessible, BECAUSE corrective lenses improve visual function in patients with refractive error.

Supporting Evidence
The literature search identified no studies that directly assessed the effect of correction with refractive lenses on visual function or quality of life, but it is the widely accepted ophthalmic standard of care, as documented by the AAO-PPP for Refractive Error, that patients be provided with optimal refractive correction to improve visual acuity and thereby improve visual function.44

Although there are no studies that specifically address refractive error, several large studies have demonstrated the association between poor visual acuity from various ophthalmic conditions and poor overall function.2,5,11,19,81,82 In a recent longitudinal study of household survey data of 6,234 participants aged 70 and older in the Assets and Health Dynamics Among the Oldest Old Study and the Health and Retirement Study, people who reported new-onset visual declines had associated declines in ADLs and instrumental ADLs.11 In this study, worsening of self-rated visual function from excellent or good vision to fair or poor near and distance vision was associated with statistically significant reductions in driving (OR for no limitations = 0.55, P = .003), managing money (OR = 0.61, P < .001), and preparing hot meals (OR = 0.61, P < .001). Studies indicate that reductions in visual acuity are associated with greater risks of accidents as well as limitations in ADLs. In a cohort study of 3,722 participants in the Beaver Dam Eye Study who were aged 60 and older, those with distance visual acuity worse than 20/20 reported more than twice the rate of falls since age 40 as those with visual acuity of 20/20 (10.7% vs 4.4%) and more than three times the rate of hip fractures (4.6% vs 1.3%),8 although this study relied on best-corrected visual acuity, and therefore it specifically excluded poor vision due to refractive error. Two other cohort studies of visual impairment in older adults relied on presenting visual acuity and therefore encompassed visual deficits due to refractive error. In these studies (N = 2,520 and 222), poorer distance visual acuity was associated with greater difficulty across multiple measures of function. The adjusted ORs ranged from 1.07 for difficulty with any ADL (95% CI = 1.07–1.09) to 3.05 for overall visual function (95% CI = 1.91–4.09).
Multiple studies have documented the relationship between better visual function and better quality of life, although none has specifically addressed refractive error. One longitudinal study of 464 patients undergoing cataract surgery demonstrated this relationship, demonstrating that more than 80% of patients with better visual acuity experienced better vision-targeted quality of life and a 10% to 59% lower decline in health-related quality of life.19

Based on these findings, it is possible to make an indirect argument that patients experience quality-of-life effects from poor vision due to refractive error and that they experience benefits from better vision after refractive correction. The degree of benefit can be expected to vary with the degree of refractive error, the presence of other vision-limiting eye conditions, and the patients’ visual requirements.

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REFERENCES