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## Quality Indicators for the Management of Visual Impairment in Vulnerable Older Persons

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**QUALITY INDICATORS FOR THE MANAGEMENT OF VISUAL IMPAIRMENT  
IN VULNERABLE OLDER PERSONS**

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Vision impairment is common among older adults and increases with age (1, 2). Population-based studies have reported visual impairment among 5% of persons 65 to 74 years of age and 21% of persons 75 years of age and older (3). As many as one third of patients in community-based geriatric centers have undiagnosed severe vision loss (4), and one in six nursing home residents is blind in both eyes (20/200 vision or worse) (5). Population-based studies suggest that the leading causes of visual impairment in elderly persons are uncorrected refractive error, cataract, macular degeneration, glaucoma, and diabetic retinopathy (6).

Impaired vision is debilitating for older adults. It is associated with limitations in mobility, activities of daily living, and physical performance (7--9). Furthermore, vision loss significantly reduces quality of life (8--14) and increases risk for falls and fractures (15) and motor vehicle accidents (16). Despite effective prevention and treatment strategies, many older adults do not receive needed eye care. In fact, as much as 40% of blindness in older adults is preventable or amenable to treatment (5). This paper describes a set of indicators that can be used to measure the quality of vision care provided to vulnerable elders.

## **Methods**

The methods for developing these quality indicators, including literature review and expert panel consideration, are detailed in a preceding paper (17). For vision impairment, the structured literature review yielded 19 625 titles from which relevant abstracts and articles were identified. On the basis of the literature and the authors' expertise, 26 potential quality indicators were proposed.

## **Results**

Of the 26 potential quality indicators considered by the expert panel, 15 were judged valid and 11 were not accepted. The literature supporting each of the indicators judged to be valid is summarized below.

#### Quality Indicator 1

##### *Comprehensive Eye Evaluation*

ALL vulnerable elders should be offered an eye evaluation every 2 years that includes the essential components of a comprehensive eye examination BECAUSE this evaluation is necessary to detect potentially treatable eye disease.

*Supporting Evidence.* The literature search found no evidence regarding the optimal frequency of adult eye examinations in the absence of eye symptoms or signs or diagnosed eye disease. The U.S. Preventive Services Task Force recommends routine vision screening with Snellen acuity testing for older adults but does not specify the frequency (18). The American Academy of Ophthalmology (AAO) recommends comprehensive eye evaluations every 1 to 2 years for persons 65 years of age and older (19).

A recent meta-analysis of the literature on screening older adults for visual impairment found no randomized, controlled trials that primarily addressed the effectiveness of vision screening among asymptomatic persons older than 65 years of age (20). However, the meta-analysis identified five trials (involving a total of 3394 patients) that used self-reported measures of visual function both as screening tools and as outcome measures in multicomponent health assessments of older patients. Self-reported measures showed no benefit when used to screen older patients for visual impairment, although a small difference (8%) between intervention and control groups could not be excluded.

Two cohort studies specifically addressed the utility of various vision screening tests to detect visually disabling or vision-threatening eye conditions (21, 22). In both studies, new adult patients in large urban general ophthalmology clinics were assessed with commonly available visual function tests and a comprehensive eye evaluation. In one study (21), near visual acuity of 20/40 or worse and distance visual acuity of 20/30 or worse were significantly associated with ocular disease (sensitivities and specificities, 73% to 75%; likelihood ratios, 2.8 for the near vision test [95% CI, 1.7 to 4.9] and 2.7 for the distance vision test [CI, 1.8 to 4.3]). In the second study (22), visual acuity testing detected only 61% of patients with eye disease.

Although direct evidence of the value of vision screening in elderly persons is lacking, a chain of abundant indirect evidence supports the benefit of regular eye examinations in this population.

This evidence includes the high prevalence of treatable visual impairment among elderly persons, the marked impact of vision impairment on many patient outcomes, and the existence of effective treatments and prevention strategies.

Vision loss is common. A large population-based study reported functional visual impairment in 4% to 7% of persons 71 to 74 years of age, 16% of those 80 years of age and older, and 9% of those 90 years of age and older (2). In a 1995 study of 499 nursing home residents, 19% had decreased vision (20/40 vision or worse); of these, 17% were blind in both eyes (20/200 vision or worse) (5). An estimated 40% of blindness in a population of nursing home residents was found to be preventable or amenable to treatment.

Many studies have shown that vision loss creates significant functional impairment. Persons with worse vision have limitations in mobility, activities of daily living, and physical performance (7-9) and are at increased risk for falls and fractures (15). Visual field loss has been associated with an increased risk for motor vehicle crashes in older drivers (16). Quality-of-life studies specific

to each of the major eye diseases affecting elderly persons (cataract, glaucoma, diabetic retinopathy, and macular degeneration) have all shown significantly decreased quality of life associated with vision loss from these diseases (10--13). Diminished vision is associated with decrements in general health status, even after adjustment for comorbid conditions and sociodemographic factors (23--25).

Effective treatment or prevention is available for much of the visual disability caused by common eye disorders. Cataract extraction is highly effective for vision loss from cataracts. Eighty percent to 90% of patients have had increased visual function after surgery (26, 27). Laser treatment reduces vision loss caused by advanced diabetic retinopathy by 50% or more (28, 29). Appropriate treatments for glaucoma reduce progression of vision loss by 20% to 40% (30). Laser treatment can slow loss of vision caused by treatable macular degeneration by up to 15% (31). Functional disability due to refractive error is largely resolvable with corrective lenses. Functional status and quality of life improve when patients receive needed eye care (26, 27, 32--34).

## Quality Indicator 2

### *Urgent Signs and Symptoms*

IF a vulnerable elder has sudden-onset visual changes, eye pain, corneal opacity, or severe purulent discharge, THEN the patient should be examined within 72 hours by an ophthalmologist BECAUSE these signs and symptoms are commonly associated with potentially treatable vision-threatening eye diseases with outcomes that may depend on early diagnosis and treatment, which can be diagnosed only through history and physical examination by a person skilled at ophthalmic assessment.

*Supporting Evidence.* No direct evidence in the form of randomized clinical trials or cohort studies addressed the process or timing of eye examination for sudden-onset visual changes, eye pain, corneal lesions, or severe purulent discharge. However, consensus exists among ophthalmic textbooks and manuals that these are common signs and symptoms of potentially treatable vision-threatening eye diseases whose outcomes may depend on diagnosis and treatment occurring within hours to days (35, 36). Examples of such diseases that occur in older adults include angle-closure glaucoma, herpetic eye disease, retinal detachment, choroidal neovascularization, and temporal (giant-cell) arteritis.

The AAO recommends referral to an ophthalmologist if a patient has the following (19): vision loss, moderate or severe eye pain, severe or chronic redness, severe purulent discharge, recurrent episodes of these signs or symptoms, or lack of response to therapy. The timing recommendation in this indicator is an estimate of a reasonable maximum interval between the onset of symptoms and urgent referral to an eye care professional.

### Quality Indicator 3

#### *Chronic Signs and Symptoms*

IF a vulnerable elder develops progression of a chronic visual deficit that now interferes with his or her ability to carry out needed or desired activities, THEN he or she should have an ophthalmic examination by a person skilled at ophthalmic examination within 2 months BECAUSE an ophthalmic examination by a skilled examiner is necessary to correctly diagnose or rule out treatable causes of visual impairment and to initiate and monitor appropriate treatment.

*Supporting Evidence.* Many cross-sectional prevalence studies suggest that up to 40% of blindness among elderly patients is treatable or preventable (5, 37--39). However, no randomized

clinical trials or cohort studies specifically addressed the optimal evaluation process for new-onset functional visual impairment. Widespread consensus was found among textbooks and guidelines regarding procedures that should be included in an ophthalmic examination to detect the most common causes of visual disability in older adult patients (refractive error, cataract, glaucoma, macular degeneration, and diabetic retinopathy) (19, 35, 36).

The literature search identified no studies or consensus statements that specifically addressed the timing of evaluation for visual impairment. The timing recommendation in this indicator is an estimate of a reasonable maximum interval between the onset of symptoms and non-urgent referral to an eye care professional.

#### Quality Indicator 4

##### *Function Evaluation for Cataract*

IF a vulnerable elder is diagnosed with a cataract, THEN assessment of visual function with respect to his or her ability to carry out needed or desired activities should be performed every 12 months BECAUSE preoperative visual functional deficits predict benefit from cataract surgery.

*Supporting Evidence.* Numerous studies support the importance of assessing visual function before cataract surgery. These studies addressed the impact of cataract surgery on subjective visual function and quality of life, as well as predictors of subjective improvement after cataract surgery. In three of these studies, postoperative satisfaction with vision correlated strongly with two well-validated functional indices, the Visual Function-14 questionnaire and the Activities of Daily Vision scale (40--42).

Two large observational cohort studies (involving 426 and 772 patients, respectively) prospectively assessed independent predictors of subjective improvement in visual function after

cataract surgery (40--42). In both studies, preoperative subjective visual function (as assessed by the Activities of Daily Vision scale or the Visual Function-14 questionnaire) was a strong independent predictor of postoperative visual function. One of these studies (40) specifically evaluated this relationship among patients 65 years of age and older. The group with lower preoperative visual function reported greater subjective improvement after cataract surgery than the group with higher visual function (odds ratio, 1.6 [CI, 1.4 to 1.9]).

Two recent summaries of expert opinion, based in part on the two studies described above, also address assessment of preoperative functional status. The 1996 AAO Preferred Practice Pattern 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" (43). The 1993 Agency for Health Care Policy and Research (AHCPR) Clinical Practice Guideline for cataract recommends that "the need for cataract surgery should be primarily determined by the functional status and the needs and preferences of the patient" (44).

#### Quality Indicator 5

##### *Macular Degeneration Evaluation*

IF a vulnerable elder with age-related macular degeneration has a new-onset change in vision,  
THEN he or she should have a dilated retinal examination of the affected eye within 3 days  
BECAUSE patients with these clinical states are at increased risk for first-time or recurrent  
choroidal neovascularization, which may be treatable and may be detected by dilated  
examination of the retina.

*Supporting Evidence.* No direct evidence (randomized trials or cohort studies) exists regarding the efficacy of dilated retinal examinations in detecting choroidal neovascularization. However,

the AAO Preferred Practice Pattern for macular degeneration recommends dilated retinal examinations to evaluate new-onset vision changes; to determine the presence, extent, and location of choroidal neovascularization; to guide laser treatment; and to assist in determining the cause of vision loss (45). These recommendations are supported by indirect evidence from many clinical studies indicating that knowledge of findings on retinal examination is required to correctly diagnose and initiate appropriate treatment for choroidal neovascularization (46--48). No studies directly addressed the optimal timing of evaluation for vision changes or suspicion of choroidal neovascularization in patients with age-related macular degeneration. However, the AAO Preferred Practice Pattern states that "promptness is essential" in evaluating new symptoms that suggest choroidal neovascularization in patients with age-related macular degeneration. This recommendation is based in part on many studies demonstrating that these lesions can grow rapidly over days (49, 50) and that early treatment improves visual outcomes. Eligibility for laser treatment has been shown to be significantly associated with shorter duration of visual symptoms ( $P \leq 0.006$ ) (46). One small retrospective study reported that a 2- to 4-week delay in the evaluation of choroidal neovascularization decreased the number of potentially treatable lesions from 83% to 43% (48). Results from the Macular Photocoagulation Study Group's multicenter randomized, controlled trial of 236 patients clearly indicated a benefit to detecting and treating new-onset choroidal neovascularization before rapid growth occurred (47). After 4 years, 50% of patients with larger prelaser lesions had experienced severe vision loss (six or more lines of vision lost), compared with 33% of those with smaller pretreatment lesions. Newer treatments based on photodynamic therapy may be even more effective when lesions are detected early (51).

Quality Indicator 6

### *Initial Glaucoma Evaluation*

IF a vulnerable elder has a new diagnosis of primary open-angle glaucoma, THEN the initial evaluation of each eye should include the essential components of a comprehensive eye examination AND documentation of the optic nerve appearance, visual field testing, and determination of an initial target pressure BECAUSE these evaluations are necessary to diagnose primary open-angle glaucoma correctly and to initiate appropriate treatment.

*Supporting Evidence.* No direct evidence shows that a comprehensive history and examination will improve patient outcomes in primary open-angle glaucoma. However, a convincing indirect chain of evidence supports the AAO recommendations regarding the components of an initial evaluation for primary open-angle glaucoma (Table 1) (52). To diagnose primary open-angle glaucoma, clinicians must know the status of the optic nerve, the visual field, and intraocular pressure. Such knowledge is gained through the described examinations (35, 52). Differential diagnosis requires fundus examination (35, 52). To initiate appropriate treatment, the clinician must know the patient's medical history, including allergies and pulmonary status (35, 52). For an initial treatment goal to be defined, a target intraocular pressure at least 20% lower than the pretreatment intraocular pressure must be determined, below which further optic nerve damage is deemed less likely (35, 52). Finally, appropriate treatment reduces the likelihood of visual field loss (see Indicator 12). This indirect evidence suggests that the elements of an initial glaucoma evaluation are likely to improve outcomes in patients with open-angle glaucoma.

Quality Indicators 7, 8, and 9

### *Diabetic Retinopathy*

IF a vulnerable elder with diabetes has a retinal examination, THEN the presence or degree of diabetic retinopathy should be documented BECAUSE the degree of diabetic retinopathy determines the likelihood of benefit from laser treatment.

IF a vulnerable elder is diagnosed with proliferative diabetic retinopathy, THEN a dilated eye examination should be performed at least every 4 months

IF a vulnerable elder with diabetes is diagnosed with macular edema, THEN a dilated eye examination should be performed at least every 6 months BECAUSE these clinical states are associated with increased risk for rapidly progressive but potentially treatable vision loss.

*Supporting Evidence.* The AAO expert panel makes explicit recommendations regarding follow-up examinations for patients with diabetic retinopathy (Table 2 [53]). These recommendations are based on the natural history of diabetic retinopathy and on evidence showing that correct diagnosis and timely treatment of advanced diabetic retinopathy significantly improve patient outcomes. Studies have shown that the risk for severe vision loss among some patients with diabetic retinopathy increases roughly linearly over time and that treatment at least halves this risk (54--59). Since vision loss from proliferative diabetic retinopathy is largely irreversible, earlier treatment, where appropriate, leads to better long-term visual outcomes.

#### Quality Indicator 10

##### *Cataract Extraction*

IF a vulnerable elder has 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 (43, 44). The AHCPR

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" (44).

The AAO Preferred Practice Pattern 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" (43).

Numerous studies have shown that quality of life improves when visually significant cataracts are removed (23, 32--34, 42). Removal of cataract in the second eye provides additional benefits to patients (33). Cataract surgery improves virtually every measure of quality of life. In one study, patients 65 years of age and older with significant functional limitations due to cataracts (but no concomitant eye disease limiting their visual potential) had an 85% likelihood of significant functional improvement after cataract extraction (23).

#### Quality Indicator 11

##### *Cataract Surgery Follow-up*

IF a vulnerable elder undergoes cataract surgery, THEN a follow-up ocular examination should occur within 48 hours and reexamination should occur within 3 months BECAUSE frequent follow-up examinations are necessary to ensure rapid identification of postoperative complications and the need for additional postoperative treatment.

*Supporting Evidence.* The AHCPR-sponsored RAND report "Developing Quality and Utilization Review Criteria for Management of Cataract in Adults" made the following recommendations (43), which an expert panel derived from the AHCPR Clinical Practice Guideline for Cataract (60). Bracketed text has been added for clarity.

1. "The ophthalmologist who performs the [cataract] surgery has the responsibility and ethical obligation to the patient for care during the post-operative period."

2. "The frequency of normal follow-up for a patient without signs and symptoms of complications is: the day after surgery, approximately one week after surgery, approximately three weeks after surgery, and approximately six--eight weeks after surgery."

3. "The components of post-operative examination include the following: visual acuity, IOP [intraocular pressure] measurement, slit lamp examination, patient counseling, and education."

The AAO recommends at least three postoperative follow-up visits after uncomplicated cataract extraction: within 48 hours, at 4 to 7 days, and within 3 months (43). The timing of these recommendations is based in part on evidence showing that postoperative infectious endophthalmitis, a potentially devastating but treatable complication of cataract surgery, occurs most frequently between 4 and 6 days postsurgery (61).

#### Quality Indicator 12

##### *Glaucoma Follow-up*

IF a vulnerable elder with glaucoma experiences progressive optic nerve damage on visual field tests or optic nerve examination, THEN treatment should be reassessed or advanced at least every 3 months until the intraocular pressure is lowered by at least 20% or documentation shows that the vision loss has stabilized BECAUSE a decrease in intraocular pressure is associated with a reduced risk for vision loss and consequent reduced risk for decreases in quality of life among patients with progressive glaucomatous vision loss.

*Supporting Evidence.* A multicenter randomized, controlled trial of 140 patients with normal-tension glaucoma (a subtype of glaucoma) demonstrated the effectiveness of glaucoma treatment (62). In this trial, one eye of each patient was randomly assigned to receive treatments that decreased the intraocular pressure by 30% and the other eye was assigned to watchful waiting. After 3 years, 20% of treated eyes and 40% of untreated eyes experienced progressive

glaucomatous visual field loss; after 5 years, 20% of treated eyes and 60% of untreated eyes experienced visual field loss ( $P < 0.002$ ). These results were adjusted for the increased incidence of cataract in the treatment group compared with the control group (a finding believed to be related to the cataractogenic effect of glaucoma surgery).

The value of preventing glaucomatous visual field loss can be inferred from numerous studies that assessed the effect of glaucoma on many subjective outcome measures. Two studies reported lower scores associated with glaucoma on general health status instruments, such as the Medical Outcomes Study Short Form-36 questionnaire (63, 64). In three cross-sectional cohort studies of patients with glaucoma, those with glaucomatous vision loss had lower vision-targeted quality-of-life scores (using the National Eye Institute Visual Functioning Questionnaire, the Visual Function-14 questionnaire, and the Activities of Daily Vision scale) than those with no vision loss (12, 64, 65). These studies concur that glaucomatous vision loss significantly affects patients' ability to function. Vision loss affects many domains, including peripheral vision, distance activities, vision-specific dependency, vision-specific mental health, color vision, vision-specific social functioning, near activities, vision-specific role difficulties, general vision, night vision, and driving (3, 4, 6, 7).

The 1996 AAO Preferred Practice Pattern for glaucoma recommends a 20% reduction in intraocular pressure for patients who are experiencing progressive glaucomatous optic nerve or visual field changes (52). The same document recommends follow-up at least every 3 months for patients who have uncontrolled intraocular pressure and progressive glaucomatous optic nerve damage.

Quality Indicator 13

*Continuity of Ocular Therapy*

IF a vulnerable elder who has been prescribed an ocular therapeutic regimen becomes hospitalized, THEN the regimen should be administered in the hospital unless discontinued by an ophthalmologic consultant BECAUSE adherence to ocular therapeutic regimens improves the likelihood of achieving the desired therapeutic effect.

*Supporting Evidence.* The effect of discontinuing ocular medications during hospitalizations for nonocular problems has not been assessed. However, as reflected by major textbooks and statements by the AAO, widespread consensus holds that adherence to ocular therapeutic regimens improves patient outcomes (35, 36).

Quality Indicators 14 and 15

*Refracton Correction*

IF a vulnerable elder 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.

*Inpatient Access to Corrective Lenses*

IF a vulnerable elder who uses corrective lenses for any activities of daily living is hospitalized (or in a nursing home) and his or her corrective lenses are at the hospital (or nursing home), THEN the corrective lenses should be readily accessible to the vulnerable elder BECAUSE corrective lenses improve visual function among patients with refractive error.

*Supporting Evidence.* No studies have directly assessed the effect of refractive correction on visual function or quality of life. However, as documented by the AAO, optimal refractive correction that improves visual acuity and thereby visual function is the widely accepted ophthalmic standard of care (66).

Although no studies specifically addressed the impact of refractive error on visual acuity and function, many studies have demonstrated an association between decreased visual acuity from various ophthalmic conditions and decreased overall function (8--14). Two cohort studies of visual impairment among older adults relied on presenting visual acuity and therefore encompassed visual deficits due to refractive error (2, 34). In these studies, reduced distance visual acuity was associated with increased difficulty in many measures of function. IN one study of 2520 participants, the adjusted odds ratio was 1.82 (CI, 1.18 to 2.83) for difficulty with any instrumental activity of daily living even after adjusting for age, race and gender (2).

Many studies have documented the relationship between improved visual function and improved quality of life, although none have specifically addressed correction of refractive error. Among patients with cataract, Mangione and colleagues (23) demonstrated that visual acuity was a leading predictor of vision-targeted quality of life and that more than 80% of patients with improved visual acuity experienced improved vision-targeted quality of life and fewer decreases in health-related quality of life. On the basis of these findings, an indirect argument can be made that patients experience similar quality-of-life effects from decreased vision due to refractive error and similar benefits from improved vision after refractive correction.

## **Discussion**

Visual impairment is a common and debilitating condition among elderly persons. Since many elders have preventable or treatable visual disability, improvements in processes of vision care may result in significant gains in quality of life and other patient outcomes. These indicators can potentially serve as a basis to compare the care provided by different health care delivery systems and the changes in care over time.

## **Table 1. Components of a Comprehensive Eye Exam**

[Adapted from the American Academy of Ophthalmology

Preferred Practice Pattern for Comprehensive Eye Exams in Adults (19)]

- 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
- Intra-ocular pressure measurement
- Visual fields by confrontation when indicated
- External examination
- Slit lamp examination
- Examination of the vitreous humor, retina, vasculature, and optic nerve

## **Table 2: Components of an Initial Glaucoma Evaluation**

[Adapted from the American Academy of Ophthalmology  
Preferred Practice Pattern for Primary Open Angle Glaucoma (52)]

- Family, ocular and systemic history
- Visual acuity measurement
- Pupillary exam
- Intra-ocular pressure (IOP) measurement
- Slit lamp examination
- Gonioscopy
- Evaluation and documentation of the optic disc and nerve fiber layer
- Evaluation of the fundus
- Evaluation of the visual field
- Determination of a target IOP at least 20% lower than the pre-treatment IOP
- Management plan

**Table 3: Follow-Up Examination for Patients with Diabetic Retinopathy**

[Adapted from the 1998 American Academy of Ophthalmology  
Preferred Practice Pattern for Diabetic Retinopathy, Table 2 (53)]

<b>Severity of Retinopathy</b>	<b>Follow-Up</b>	<b>Focal (Macular) Laser</b>	<b>Scatter (Panretinal) Laser</b>
Macular Edema	2 to 6 months	Consider	(n/a)
Severe to very severe non-proliferative diabetic retinopathy	2 to 4 months	(n/a)	Consider
Non-high-risk proliferative diabetic retinopathy	2 to 4 months	(n/a)	Consider
High-risk proliferative diabetic retinopathy	1 to 4 months	(n/a)	Without delay

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