Glaucoma testing

Clinical Policy ID: CCP.1285

Recent review date: 1/2023

Next review date: 5/2024

Policy contains: genetic testing; glaucoma testing; optical coherence tomography; tonometry.

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Coverage policy

Glaucoma testing is clinically proven and, therefore, medically necessary every 12 months, as part of a complete eye examination, when the following criteria are met (American Academy of Ophthalmology, 2020):

- There is concern for the presence of glaucoma based on concurrent disease, family history or ethnicity, and age (e.g., diabetes, a family history of glaucoma, African American age 50 years or older, or Hispanic American age 65 years or older).
- The member presents to an eye care professional for specialty evaluation and management of eye-related complaints (e.g., visual field defect).

Concurrent diseases that pose risk for glaucoma include:

- High intraocular pressure.
- Thinner central cornea.
- Low ocular perfusion pressure.
- Myopia.
- Lower systolic and diastolic blood pressure.
- Disc hemorrhage.
- Larger cup-to-disc ratio.
- Higher pattern standard deviation on threshold visual field testing (American Academy of Ophthalmology, 2020).

Limitations

None.

Alternative covered services

Routine in-network primary and eye specialty health care provider evaluation and management.

Background

Glaucoma is a painless, symptomless condition that can cause blindness. With one exception, narrow-angle glaucoma, it is associated with increased intraocular pressure within the eye. Inside the eye, fluid is constantly being manufactured and has to drain from inside the eye. High eye pressure is always related to some increased resistance or obstruction of the normal outflow of the intraocular fluid. The chronic sustained high eye pressure leads to degenerative optic neuropathy, loss of retinal ganglion cells and axons, and ultimately to blindness if not treated.

A meta-analysis of 50 studies (n = 198,259) estimated the worldwide prevalence of primary open-angle glaucoma to be 2.4%, or over 68 million persons. Rates are 28% higher among males ($P < .01$), with the highest prevalence in Africa (Zhang, 2021). About half of worldwide glaucoma cases are undetected (Soh, 2021).

Glaucoma is an incurable disease, and all humans are at risk. Open-angle glaucoma, its most common form, has no symptoms, increasing the importance of early detection. An estimated three million Americans have the disease, but only half are aware of it. About 120,000 Americans are blind from glaucoma. African Americans are 15 times more likely to be visually impaired, and six to eight times more likely to be blind from glaucoma than American whites (Glaucoma Research Foundation, 2022d). A family history of glaucoma increases risk of the disorder by four to nine times (Glaucoma Research Foundation, 2022a).

Children (typically under age one) and adults may develop glaucoma. In general, glaucoma testing is performed with hand-held instruments or during a slit-lamp examination in the outpatient setting. Traditional approaches to glaucoma testing include:

- Tonometry.
- Gonioscopy.
- Ophthalmoscopy.
- Perimetry.
- Pachymetry (Glaucoma Research Foundation, 2022b).

A more recent technology to perform glaucoma testing is optical coherence tomography, a digital-imaging technique that produces accurate and detailed reproductions of the retina and optic nerve. It is very useful for assessing retinal nerve fiber layers and evaluating the optic nerve. With optical coherence tomography, eye specialists can determine the severity of damage from glaucoma and monitor treatment. Similar useful technologies include scanning laser ophthalmoscopy and scanning laser polarimetry.

Causes of glaucoma may be related to defects in the genome, and a body of information is emerging to support this theory. Genetic linkage reports have acknowledged a common gene mutation which explains a tiny segment of glaucoma incidence. On a daily basis, genome-wide association studies are finding more genes associated

with glaucoma but even when incorporated into rigorous family history analyses are unable to explain more than a fraction of the heritable cases of the condition.

Glaucoma is treated using multiple approaches, all of which aim to reduce intraocular pressure. One approach is eye drops. Medications, used singly or in combination, include alpha agonists, beta blockers, carbonic anhydrase inhibitors, cholinergics (miotics), and prostaglandin analogs. Procedures include selective laser trabeculoplasty, other laser surgeries, and incisional surgery (Glaucoma Research Foundation, 2022c).

Findings

A preferred practice pattern guideline from the American Academy of Ophthalmology (2020) includes information on screening, along with diagnosis and treatment. The Academy states that screening is useful and cost-effective when targeted at high-risk populations. Established and important risk factors for glaucoma include age, race/ethnicity, level of intraocular pressure, family history of glaucoma, low ocular perfusion pressure, type 2 diabetes mellitus, myopia, and thin central cornea. The guideline asserts only a complete eye examination, not just a check of eye pressure, is the only way to test for glaucoma (Boyd, 2022).

The American Academy of Ophthalmology supports a complete eye examination for asymptomatic persons under age 40 every 5-10 years, which includes a test for glaucoma. For those at risk for glaucoma, the Academy recommends testing every every 2-5 years (under age 40), 1-3 years (age 40-54), and 1-2 years (age 55 and older) (Chuck, 2021).

The American Academy of Ophthalmology practice guideline on glaucoma outlines the standard methods of differential diagnosis, enumerating abnormalities of the optic disc, retina, and central nervous system that predispose the patient to having the disease (Prum, 2016). The National Institute for Health and Care Excellence also offers a guideline recommending testing for individuals suspected to have glaucoma (National Institute for Health and Care Excellence, 2022).

An assessment of the value of screening of the general population for glaucoma from the U.S. Preventive Services Task Force (Moyer, 2013) found no direct evidence of the benefits of screening. In addition, the evidence was inadequate that screening for or treatment of increased intraocular pressure or early asymptomatic primary open-angle glaucoma reduces the number of persons who will develop impaired vision or health-related quality of life. However, the Task Force found convincing evidence that treatment of intraocular pressure and early glaucoma detection reduces the number of persons who develop small, clinically unnoticeable visual field defects and that treatment of early asymptomatic primary open-angle glaucoma decreases the number of persons whose visual field defects worsen.

In 2022, the Task Force issued an updated final recommendation statement. The consensus was that current evidence was insufficient to assess the balance of benefits and harms for glaucoma screening in asymptomatic persons over age 40 (U.S. Preventive Services Task Force, 2022). The Task Force based its conclusions on a review of 83 studies (n = 75,887) that found glaucoma screening showed no association with benefits; evidence from studies showed no improvement in visual outcomes, quality of life, and function in screened subjects (Chou, 2022).

Between 2.4% and 18.1% of children with low vision problems have glaucoma (Garzon-Rodriguez, 2022). A review of the medical literature identified three practice guidelines, none of which were specific to childhood

glaucoma screening. The guidelines did agree that children should undergo an annual eye screening or comprehensive eye assessment, and that at-risk children should undergo additional screening (Lingham, 2022).

Standard automated perimetry has commonly been used to diagnose glaucoma (Turalba, 2010). The procedure has limits, as retinal ganglion cell loss precedes defects detected by the test. Perimetry is also prone to inter-test variability, making the evaluation of disease progression problematic. New devices for glaucoma screening have been developed.

The Agency for Healthcare Research and Quality (Ervin, 2012) reviewed 83 studies on the accuracy of glaucoma screening tests. Sensitivities and specificities varied by device. No evidence was found linking glaucoma screening with visual field loss, visual impairment, optic nerve damage, intraocular pressure, or patient-reported outcomes, despite improvements in screening devices.

An expert panel in Sweden conducted a systematic review of 106 studies (n = 16,260 eyes, assigned as cases and controls) assessing accuracy of confocal scanning laser ophthalmoscopy, optical coherence tomography, and scanning laser polarimetry (as used by the GDx device) for diagnosing glaucoma in people who are at risk (Michelessi, 2015; Swedish Council on Health Technology Assessment, 2008). In persons referred by primary eye care, such as in those who have already undergone some functional or anatomic testing by optometrists, the best measures would miss 30% of cases (sensitivity 70%) and would incorrectly refer 5% without glaucoma (specificity 95%). Accuracy was relatively consistent by device.

A meta-analysis of relatively new techniques of glaucoma testing included 357 articles. The greatest accuracy was found with frequency doubling technology (diagnostic odds ratio 57.7) followed by blue on yellow perimetry (46.7), optical coherence tomography (41.8), GDx (32.4), and Heidelberg retina tomography (17.8) (Ahmed, 2016). A meta-analysis of 86 articles calculated that odds ratios for detection of glaucoma were 29.5 for optical coherence tomography, 18.6 for GDx, and 13.9 for Heidelberg retinal tomography (Fallon, 2017).

A systematic review/meta-analysis of eight studies (n = 829) assessed the accuracy of computerized pupillary light reflex assessment devices to detect glaucoma. Based on sensitivity and specificity rates of 81% and 83%, authors conclude that this technique is accurate in diagnosis and useful in future clinical decisions (Suo, 2020).

A meta-analysis (Kansal, 2018) of 150 studies included 16,104 glaucomatous and 11,543 normal control eyes. A comparison of five optical coherence tomography devices that test for glaucoma (Zeiss Stratus, Zeiss Cirrus, Heidelberg Spectralis®, Optovue RTVue, and Topcon 3D-optical coherence tomography) found that each had similar classification capability.

Teleglaucoma is a method of detecting the disease, using stereoscopic digital imaging to take ocular images, which are transmitted electronically to an ocular specialist. A systematic review (Thomas, 2014) of 45 studies concluded teleglaucoma was more specific and less sensitive than in-person examination, and more likely to detect the disease than through in-person testing. The pooled estimates of sensitivity and specificity through teleglaucoma were 83.2% and 79.0%.

There is no conclusive medical evidence that genetic testing for glaucoma is effective in influencing treatment outcomes or reducing glaucoma-related blindness. The scientific research for a link between genetics and glaucoma is an emerging body of work (Al-Shahrani, 2016; Khawaja, 2016; Liu, 2016; Mauri, 2016; Verma, 2016; Waksmunski, 2022) that may develop into a coherent diagnostic and treatment approach in the future but are not sufficiently understood at present to create hard and fast statements regarding their diagnostic utility or

therapeutic potential. As such, these methods are not included in any contemporary specialty society or international health body guidelines for the diagnosis and treatment of glaucoma.

A Cochrane review of 47 studies (n = 26,151) compared the accuracy of various noncontact tests for glaucoma. Tests included limbal anterior chamber depth, oblique flashlight; scanning peripheral anterior chamber depth analyzer, Scheimpflug photography, and anterior segment optical coherence tomography. Authors note that sensitivity and specificity for limbal anterior chamber depth, which is less sophisticated than the others, had comparable sensitivity and specificity, at 83% and 88% (Jindal, 2020).

A systematic review/meta-analysis of six studies (n = 241) found multifocal visual evoked potential to be effective in evaluating visual field defects in glaucoma patients; pooled sensitivity and specificity were 93% and 89%, respectively (Liu, 2021).

A review (n = 19,365) screened individuals in China over age 65 for glaucoma over a 15-year period, aided by artificial intelligence. The screening reduced patients with primary angle closure (suspect and actual) and visual blindness, but excess costs of screening could never be offset by reduced disease progression (Xiao, 2021).

References

On December 14, 2022, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were “glaucoma testing” and “glaucoma screening.” We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

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Policy updates

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12/2017: Policy references updated.

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