

Medical Policy



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Professional

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Populations	Interventions	Comparators	Outcomes
Individuals: <ul style="list-style-type: none"> • With glaucoma or suspected glaucoma 	Interventions of interest are: <ul style="list-style-type: none"> • Imaging of the optic nerve and retinal nerve fiber layer 	Comparators of interest are: <ul style="list-style-type: none"> • Clinical assessment alone 	Relevant outcomes include: <ul style="list-style-type: none"> • Test accuracy • Symptoms • Morbid events • Functional outcomes • Medication use
Individuals: <ul style="list-style-type: none"> • With glaucoma or suspected glaucoma 	Interventions of interest are: <ul style="list-style-type: none"> • Evaluation of ocular blood flow 	Comparators of interest are: <ul style="list-style-type: none"> • Clinical assessment alone 	Relevant outcomes include: <ul style="list-style-type: none"> • Test accuracy • Symptoms • Morbid events • Functional outcomes • Medication use

DESCRIPTION

Several techniques have been developed to measure the thickness of the optic nerve/retinal nerve fiber layer (RNFL) as a method to diagnose and monitor glaucoma. Measurement of ocular blood flow is also being evaluated as a diagnostic and management tool for glaucoma.

OBJECTIVE

The objective of this policy is to assess whether methods that evaluate the optic nerve and nerve fiber layer or that evaluate retinal blood flow improve the net health outcome in individuals with glaucoma or who are suspected to have glaucoma.

BACKGROUND

Glaucoma

Glaucoma is a disease characterized by degeneration of the optic nerve (optic disc). Elevated intraocular pressure (IOP) has long been thought to be the primary etiology, but the relationship between IOP and optic nerve damage varies among patients, suggesting a multifactorial origin. For example, some patients with clearly elevated IOP will show no optic nerve damage, while others with marginal or no pressure elevation will, nonetheless, show optic nerve damage. The association between glaucoma and other vascular disorders such as diabetes or hypertension suggests vascular factors may play a role in glaucoma. Specifically, it has been hypothesized that reductions in blood flow to the optic nerve may contribute to the visual field defects associated with glaucoma.

Diagnosis and Management

A comprehensive ophthalmologic exam is required for the diagnosis of glaucoma, but no single test is adequate for establishing the diagnosis. A comprehensive ophthalmologic examination includes an examination of the optic nerve by funduscopy, evaluation of visual fields, and measurement of ocular pressure. The presence of

characteristic changes in the optic nerve or abnormalities in visual field, together with increased IOP, is sufficient for a definitive diagnosis. However, some patients will show ophthalmologic evidence of glaucoma with normal IOPs. These cases of normal tension glaucoma (NTG) are considered to be a type of primary open-angle glaucoma (POAG). Angle-closure glaucoma is another type of glaucoma associated with an increase in IOP. The increased IOP in angle-closure glaucoma arises from a reduction in aqueous outflow from the eye due to a closed angle in the anterior chamber.

Conventional management of the patient with glaucoma principally involves drug therapy, to control elevated IOPs, and serial evaluation of the optic nerve to follow disease progression. Standard methods of evaluation include careful direct examination of the optic nerve using ophthalmoscopy or stereophotography, or evaluation of visual fields. There is interest in developing more objective, reproducible techniques both to document optic nerve damage and to detect early changes in the optic nerve and RNFL before the development of permanent visual field deficits. Specifically, evaluating changes in the thickness of the RNFL has been investigated as a technique to diagnose and monitor glaucoma. However, IOP reduction is not effective in decreasing disease progression in a significant number of patients, and in patients with NTG, there is never an increase in IOP. It has been proposed that vascular dysregulation is a significant cause of damage to the RNFL, and there is interest in measuring ocular blood flow as both a diagnostic and a management tool for glaucoma. Changes in blood flow to the retina and choroid may be particularly relevant for diagnosis and treatment of NTG. A variety of techniques have been developed, as described below.

Techniques to Evaluate the Optic Nerve and RNFL

Confocal Scanning Laser Ophthalmoscopy

Confocal scanning laser ophthalmoscopy (CSLO) is an image acquisition technique intended to improve the quality of the examination compared with standard ophthalmologic examination. A laser is scanned across the retina along with a detector system. Only a single spot on the retina is illuminated at any time, resulting in a high-contrast image of great reproducibility that can be used to estimate the thickness of the RNFL. In addition, this technique does not require maximal mydriasis, which may be a problem in patients with glaucoma. The Heidelberg Retinal Tomography is a commonly used technology.

Scanning Laser Polarimetry

The RNFL is birefringent, causing a change in the state of polarization of a laser beam as it passes. A 780-nm diode laser is used to illuminate the optic nerve. The polarization state of the light emerging from the eye is then evaluated and correlated with RNFL thickness. Unlike CSLO, SLP can directly measure the thickness of the RNFL. GDx is a common example of an SLP. GDx contains a normative database and statistical software package to allow comparison with age-matched normal subjects of the same ethnic origin. The advantages of this system are that images can be obtained without pupil dilation, and evaluation can be done in approximately 10 minutes. Current

instruments have added enhanced and variable corneal compensation technology to account for corneal polarization.

Optical Coherence Tomography

Optical coherence tomography (OCT) uses near-infrared light to provide direct cross-sectional measurement of the RNFL. The principles employed are similar to those used in B-mode ultrasound except light, not sound, is used to produce the 2-dimensional images. The light source can be directed into the eye through a conventional slit-lamp biomicroscope and focused onto the retina through a typical 78-diopter lens. This system requires dilation of the patient's pupil. OCT is an example of this technology. OCT analysis software is being developed to include optic nerve head parameters with spectral domain OCT, analysis of macular parameters, and hemodynamic parameters with Doppler OCT and OCT angiography.

Pulsatile Ocular Blood Flow

The pulsatile variation in ocular pressure results from the flow of blood into the eye during cardiac systole. Pulsatile ocular blood flow can thus be detected by the continuous monitoring of IOP. The detected pressure pulse can then be converted into a volume measurement using the known relationship between ocular pressure and ocular volume. Pulsatile blood flow is primarily determined by the choroidal vessels, particularly relevant to patients with glaucoma, because the optic nerve is supplied in large part by choroidal circulation.

Techniques to Measure Ocular Blood Flow

A number of techniques have been developed to assess ocular blood flow. They include laser speckle flowgraphy, color Doppler imaging, Doppler Fourier domain OCT, laser Doppler velocimetry, confocal scanning laser Doppler flowmetry, and retinal functional imaging.¹

Laser Speckle Flowgraphy

Laser speckle is detected when a coherent light source such as laser light is dispersed from a diffusing surface such as retinal and choroidal vessels and the circulation of the optic nerve head. The varying patterns of light can be used to determine red blood cell velocity and retinal blood flow. However, due to differences in the tissue structure in different eyes, flux values cannot be used for comparisons between eyes. This limitation may be overcome by subtracting background choroidal blood flow results from the overall blood flow results in the region of interest.

Color Doppler

Color Doppler imaging has also been investigated as a technique to measure the blood velocity in the retinal and choroidal arteries. This technique delivers ultrasound in pulsed Doppler mode with a transducer set on closed eyelids. The examination takes 30 to 40 minutes, and is most effective for the mean velocity of large ophthalmic vessels such as the ophthalmic artery, the central retinal artery, and the short posterior ciliary

arteries. However, total blood flow cannot be determined with this technique, and imaging is highly dependent on probe placement.

Doppler Fourier Domain OCT: Doppler Fourier domain OCT is a noncontact imaging technique that detects the intensity of the light scattered back from erythrocytes as they move in the vessels of the ocular tissue. This induces a frequency shift that represents the velocity of the blood in the ocular tissue.

Laser Doppler Velocimetry: Laser Doppler velocimetry compares the frequency of reflected laser light from a moving particle to stationary tissue.

Confocal Scanning Laser Doppler Flowmetry: Confocal scanning laser Doppler flowmetry combines laser Doppler flowmetry with confocal scanning laser tomography. Infrared laser light is used to scan the retina, and the frequency and amplitude of Doppler shifts are determined from the reflected light. Determinations of blood velocity and blood volume are used to compute the total blood flow and create a physical map of retinal flow values.

REGULATORY STATUS

A number of confocal scanning laser ophthalmoscopy, scanning laser polarimetry, and optical coherence tomography (OCT) devices have been cleared by the U.S. Food and Drug Administration (FDA) through the 510(k) process for imaging the posterior eye segment. For example, the RTVue XR OCT Avanti™ (Optovue) is an OCT system indicated for the in vivo imaging and measurement of the retina, retinal nerve fiber layer, and optic disc as a tool and aid in the diagnosis and management of retinal diseases by a clinician. The RTVue XR OCT Avanti™ with Normative Database is a quantitative tool for the comparison of retina, retinal nerve fiber layer, and optic disk measurements in the human eye to a database of known normal subjects. It is intended for use as a diagnostic device to aid in the detection and management of ocular diseases. In 2016, the RTVue XR OCT with Avanti™ with AngioVue™ Software was cleared by FDA through the 510(k) process (K153080) as an aid in the visualization of vascular structures of the retina and choroid. FDA product code: HLI, OBO.

In 2012, the iExaminer™ (Welch Allyn) received marketing clearance by FDA through the 510(k) process. The iExaminer consists of a hardware adapter and associated software (iPhone® App) to capture, store, send and retrieve images from the Welch Allyn PanOptic™ Ophthalmoscope using an iPhone®. FDA product code: HKI.

POLICY

- A. Scanning Laser Ophthalmoscopy (SLO) test is allowable for the diagnosis and the monitoring of the optic nerve, retinal conditions and glaucoma. Testing may be allowed every year. If the testing is done more frequently than every year, consultant review will be required.
- B. Optical Coherence Tomography (OCT) test is allowed for the diagnoses, listed below, monitoring for retinal conditions, and ocular toxicity secondary to high-risk medications (ie, chloroquine [Aralen], hydroxychloroquine [Plaquenil], Interferon alpha-2b, Amiodarone, tamoxifen citrate [Nolvadex], fingolimod [Gilenya], Seroquel).

Repeat testing:

1. If Exudative Age-Related Macular Degeneration (AMD):
Repeat OCT will significantly help guide the need for retreatment (with photodynamic therapy [PDT] or intravitreal injection treatments) in conjunction with intravenous fluorescein angiography (IVF) / indocyanine green (ICG). Maximum of 8 per year linked to intravitreal injections.
2. If Macular Drusen:
Repeat annually, only if subjective visual changes or suspicion of choroidal neovascularization: if more than 2 studies per year, then documentation is required
3. If Diabetic Macular Edema (DME):
Maximum of 8 per year linked to intravitreal injections or laser treatment.
4. If Retinal Detachment (RD):
Repeat pre-treatment and post-surgical at 2 months (maximum of 2).
5. If Epiretinal Membrane (ERM):
Repeat pre-treatment and post-surgical (maximum of 4 per year) if with macular edema.
6. If Macular Hole:
Repeat pre-treatment and post-treatment (maximum of 4 per year) in cases of partially closed hole.
7. If Cystoid Macular Edema:
Repeat every 2 months during acute treatment.
8. If Branch Retinal Vein Occlusion (BRVO):
Maximum of 8 per year linked to intravitreal injections.

9. If Central Retinal Vein Occlusion (CRVO):
Maximum of 8 per year linked to intravitreal injections.
 10. If Vitreomacular Traction / Adhesion:
Maximum of 4 per year.
- C. OCT is also allowed for diagnosing and monitoring glaucoma, nerve fiber layer, and optic nerve conditions. Testing may be allowed every year. If the testing is done more frequently than every year, consultant review will be required.

RATIONALE

This policy has been updated regularly with searches of the MEDLINE database. The most recent literature update was performed through January 8, 2018.

Evidence reviews assess whether a medical test is clinically useful. A useful test provides information to make a clinical management decision that improves the net health outcome. That is, the balance of benefits and harms is better when the test is used to manage the condition than when another test or no test is used to manage the condition.

The first step in assessing a medical test is to formulate the clinical context and purpose of the test. The test must be technically reliable, clinically valid, and clinically useful for that purpose. Evidence reviews assess the evidence on whether a test is clinically valid and clinically useful. Technical reliability is outside the scope of these reviews, and credible information on technical reliability is available from other sources.

The use of various techniques of retinal nerve fiber layer (RNFL) analysis (confocal scanning laser ophthalmoscopy [CSLO], scanning laser polarimetry [SLP], optical coherence tomography [OCT]) for the diagnosis and management of glaucoma was addressed by 2 TEC Assessments (2001, 2003).^{2,3}

Imaging of the Optic Nerve and RNFL

Clinical Context and Test Purpose

The diagnosis and monitoring of optic nerve damage are essential for evaluating the progression of glaucoma and determining appropriate treatment.

The question addressed in this evidence review is: Do imaging techniques for the optic nerve and RNFL improve diagnosis and monitoring of glaucoma?

The following PICOTS were used to select literature to inform this review.

Patients

The relevant populations are patients with glaucoma or who are suspected to have glaucoma and are being evaluated for diagnosis and monitoring of glaucoma progression.

Interventions

The tests being considered for assessment of the optic nerve and RNFL include CLSO, SLP, and OCT. These tests are considered add-on to the standard clinical evaluation.

Comparators

There is no single criterion standard for the diagnosis of glaucoma. This diagnosis is made from a combination of visual field testing, intraocular pressure (IOP) measurement, and optic nerve and RNFL assessment by an ophthalmologist.

Outcomes

Relevant outcomes include the clarity of the images and how reliable the test is at evaluating the optic nerve and nerve fiber layer changes. Demonstration that the information can be used to improve patient outcomes is essential for determining the utility of an imaging technology. Although direct evidence on the impact of the imaging technology from controlled trials would be preferred, in most cases, a chain of evidence needs to be constructed to determine whether there is a tight linkage between the technology and improved health outcomes. The outcomes relevant to this evidence review are IOP, loss of vision, and changes in IOP-lowering medications used to treat glaucoma.

Timing

For patients with manifest glaucoma, the relevant period of follow-up is the immediate diagnosis of glaucoma. For patients with suspected glaucoma, longer term follow-up would be needed to detect changes in visual field or RNFL. Clinical utility might be demonstrated by a change in the management and reduction in glaucoma progression across follow-up.

Setting

Patients may be self-referred, referred by optometrists, or referred by a general ophthalmologist to a glaucoma specialist. These procedures can be performed in an ophthalmologist's office.

Simplifying Test Terms

There are 3 core characteristics for assessing a medical test. Whether imaging, laboratory, or other, all medical tests must be:

- Technically reliable
- Clinically valid
- Clinically useful

Because different specialties may use different terms for the same concept, we are highlighting the core characteristics. The core characteristics also apply to different uses of tests, such as diagnosis, prognosis, and monitoring treatment.

Diagnostic tests detect presence or absence of a condition. Surveillance and treatment monitoring are essentially diagnostic tests over a time frame. Surveillance to see whether a condition develops or progresses is a type of detection. Treatment monitoring is also a type of detection because the purpose is to see if treatment is associated with the disappearance, regression, or progression of the condition.

Prognostic tests predict the risk of developing a condition in the future. Tests to predict response to therapy are also prognostic. Response to therapy is a type of condition and can be either a beneficial response or adverse response. The term predictive test is often used to refer to response to therapy. To simplify terms, we use prognostic to refer both to predicting a future condition or to predicting a response to therapy.

Technically Reliable

Assessment of technical reliability focuses on specific tests and operators and requires review of unpublished and often proprietary information. Review of specific tests, operators, and unpublished data are outside the scope of this evidence review and alternative sources exist. This evidence review focuses on the clinical validity and clinical utility.

Clinically Valid

A test must detect the presence or absence of a condition, the risk of developing a condition in the future, or treatment response (beneficial or adverse).

In 2012, the Agency for Healthcare Research and Quality published a comparative effectiveness review of screening for glaucoma.⁴ Included were randomized controlled trials (RCTs), quasi-RCTs, observational cohort and case-control studies, and case series with more than 100 participants. The interventions evaluated included ophthalmoscopy, fundus photography or computerized imaging (OCT, retinal tomography, SLP), pachymetry (corneal thickness measurement), perimetry, and tonometry. No evidence was identified that addressed whether an open-angle glaucoma screening program led to a reduction in IOP, less visual impairment, reduction in visual field loss or optic nerve damage, or improvement in patient-reported outcomes. No evidence was identified on harms of a screening program. Over 100 studies were identified on the diagnostic accuracy of screening tests. However, due to the lack of a definitive diagnostic reference standard and heterogeneity in study designs, synthesis of results could not be completed.

A Cochrane review (2015) assessed the diagnostic accuracy of optic nerve head and RNFL imaging for glaucoma.⁵ Included were 103 case-control studies and 3 cohort studies (total N=16,260 eyes) that evaluated the accuracy of recent commercial versions of OCT (spectral domain), Heidelberg Retinal Tomograph (HRT) III, or SLP (GDx VCC or ECC) for diagnosing glaucoma. The population was patients referred for suspected glaucoma, typically due to an elevated IOP, abnormal optic disc appearance, and/or an abnormal visual field identified in primary eye care. Population-based screening studies were excluded. Most comparisons examined different parameters within the 3 tests, and the parameters with the highest diagnostic odds ratio were compared. The 3 tests (OCT, HRT, SLP) had similar diagnostic accuracy. Specificity was close to 95%, while sensitivity was 70%. Because a case-control design with healthy participants and glaucoma patients was used in nearly all studies, concerns were raised about the potential for bias, overestimation of accuracy, and applicability of the findings to clinical practice.

Clinically Useful

A test is clinically useful if the use of the results informs management decisions that improve the net health outcome of care. The net health outcome can be improved if patients receive correct therapy, or more effective therapy, or avoid unnecessary therapy, or avoid unnecessary testing.

Direct Evidence

Direct evidence of clinical utility is provided by studies that have compared health outcomes for patients managed with and without the test. Because these are intervention studies, the preferred evidence would be from randomized controlled trials.

A technology assessment, conducted by Lin et al (2007) for the American Academy of Ophthalmology, reviewed 159 studies, published between 2003 and 2006, evaluating optic nerve head and RNFL devices used to diagnose or detect glaucoma progression.⁶ The assessment concluded: "The information obtained from imaging devices is useful in clinical practice when analyzed in conjunction with other relevant parameters that define glaucoma diagnosis and progression." Management changes for patients diagnosed with glaucoma may include the use of IOP-lowering medications, monitoring for glaucoma progression, and potentially surgery to slow the progression of glaucoma.

Section Summary: Imaging of the Optic Nerve and RNFL

Numerous studies and systematic reviews have described findings from patients with glaucoma using CSLO, SLP, and OCT. Although the specificity in these studies was high, it is likely that accuracy was overestimated due to the case-control designs used in the studies. The literature and specialty society guidelines have indicated that optic nerve analysis using CSLO, SLP, and OCT are established add-on tests that can be used with other established tests to improve the diagnosis and direct management of patients with glaucoma and those who are glaucoma suspects. Management changes for patients diagnosed with glaucoma may include the use of IOP-lowering medications, monitoring for glaucoma progression, and potentially surgery.

Evaluation of Ocular Blood Flow

Clinical Context and Test Purpose

The diagnosis and monitoring of optic nerve damage are essential for evaluating the progression of glaucoma and determining appropriate treatment. Measurement of ocular blood flow has been studied as a technique to evaluate patients with glaucoma or suspected glaucoma.

The question addressed in this evidence review is: Do various techniques (eg, color Doppler imaging [CDI], Doppler Fourier domain OCT, laser Doppler velocimetry, confocal scanning laser Doppler flowmetry, retinal functional imager) for assessing ocular blood flow improve diagnosis and monitoring of glaucoma? One potential application is the early detection of normal tension glaucoma (NTG).⁷

The following PICOTS were used to select literature to inform this review.

Patients

The relevant patient populations are patients with glaucoma or suspected glaucoma and are being evaluated for diagnosis and monitoring of glaucoma progression. These tests may have particular utility for NTG.

Interventions

The tests being considered for assessment of the optic nerve and optic nerve layer include CDI, Doppler Fourier domain OCT, laser Doppler velocimetry, confocal scanning laser Doppler flowmetry, and retinal functional imager.

Comparators

There is no criterion standard for the diagnosis of glaucoma. The diagnosis of glaucoma is made using a combination of visual field testing, IOP measurements, and optic nerve and RNFL assessment.

Outcomes

Relevant outcomes include the reliability of the test for evaluating ocular blood flow and the association between ocular blood flow parameters and glaucoma progression. Demonstration that the information can be used to improve patient outcomes is essential to determining the utility of a diagnostic technology. Although direct evidence on the impact of the imaging technology from controlled trials would be preferred, in most cases, a chain of evidence is needed to determine whether there is a tight linkage between the technology and improved health outcomes. The outcomes relevant to this evidence review are IOP, loss of vision, and changes in IOP-lowering medications used to treat glaucoma.

Timing

For patients with manifest glaucoma, the relevant period of follow-up is the immediate diagnosis of glaucoma. For patients with suspected glaucoma, longer term follow-up would be needed to detect changes in IOP and loss of vision. Clinical utility might be demonstrated by a change in the management and reduction in glaucoma progression across follow-up.

Setting

Many of these procedures are performed with specialized equipment. While reports of use are longstanding (eg, Bafa et al [2001]⁸), investigators have commented on the complexity of these parameters⁹ and have noted that many of these technologies are not commonly used in clinical settings.¹⁰

Technically Reliable

Assessment of technical reliability focuses on specific tests and operators and requires review of unpublished and often proprietary information. Review of specific tests, operators, and unpublished data are outside the scope of this evidence review and alternative sources exist. This evidence review focuses on the clinical validity and clinical utility.

Clinically Valid

A test must detect the presence or absence of a condition, the risk of developing a condition in the future, or treatment response (beneficial or adverse).

Abegao Pinto et al (2016) reported on the results from the prospective, cross-sectional, case-control, Leuven Eye Study, which included 614 individuals who had primary open-angle glaucoma (n=214), NTG (n=192), ocular hypertension (n=27), suspected glaucoma (n=41), or healthy controls (n=140).¹¹ The study objective was to identify the blood flow parameters most highly associated with glaucoma using technology commonly available in an ophthalmologist's office or hospital radiology department. Assessment of ocular blood flow included CDI, retinal oximetry, dynamic contour tonometry, and OCT enhanced-depth imaging of the choroid. The glaucoma groups had higher perfusion pressure than controls (p<0.001), with lower velocities in both central retinal vessels (p<0.05), and choroidal thickness asymmetries. The NTG group, but not the primary open-angle glaucoma group, had higher retinal venous saturation than

healthy controls ($p=0.005$). There were no significant differences in macular scans. The diagnostic accuracy and clinical utility were not addressed.

Kurysheva et al (2017) compared ocular blood flow with choroidal thickness to determine which had a higher diagnostic value for detecting early glaucoma.¹² Thirty-two patients with pre-perimetric glaucoma were matched with 30 control patients. Using OCT, RNFL thickness between groups was found to be comparable; the ganglion cell complex was thicker in the control patients, and there was no significant difference between groups for choroid foveal loss volume. Mean blood flow velocity in the vortex veins had the highest area under the receiver operating characteristic curve ROC (1.0) and z-value (5.35). Diastolic blood flow velocity in the central retinal artery had a diagnostic value of 2.74 and area under the receiver operating characteristic curve of 0.73. The authors concluded that this study suggested a diagnostic benefit in measuring blood flow velocities.

Witkowska et al (2017) investigated blood flow regulation using laser speckle flowgraphy in 27 individuals.¹³ In this prospective study, the authors specifically looked at mean blur rate blood flow in the optic nerve head and a peripapillary region. First, participants' blood flow was measured when they were in a sitting position; then, participants were asked to perform an isometric "squatting" exercise for 6 minutes. Compared with baseline (sitting), exercise significantly increased ocular perfusion blood pressure (78.5%), mean blur rate in the tissue of the optic nerve head (18.1%), and mean blur rate in the peripapillary region (21.18.3%) ($p<0.001$). Few studies have used laser speckle flowgraphy to study autoregulation of ocular blood flow during a change in blood pressure, and this study is limited to Japanese populations. Despite the lack of literature and limited population, the authors noted laser speckle flowgraphy could be a valuable tool to study the regulation of blood flow in the optic nerve head, particularly in patients suspected of having glaucoma or patients who have glaucoma.

Rusia et al (2011) reported on use of CDI in normal and glaucomatous eyes.¹⁴ Using data from other studies, a weighted mean was derived for the peak systolic velocity, end-diastolic velocity, and Pourcelot Resistive Index in the ophthalmic, central retinal, and posterior ciliary arteries. Data from 3061 glaucoma patients and 1072 controls were included. Mean values for glaucomatous eyes were within 1 standard deviation of the values for controls for most CDI parameters. Methodologic differences created interstudy variance in CDI values, complicating the construction of a normative database and limiting its utility. The authors noted that because the mean values for glaucomatous and normal eyes had overlapping ranges, caution should be used when classifying glaucoma status based on a single CDI measurement.

Clinically Useful

A test is clinically useful if the use of the results informs management decisions that improve the net health outcome of care. The net health outcome can be improved if patients receive correct therapy, or more effective therapy, or avoid unnecessary therapy, or avoid unnecessary testing.

Direct Evidence

Direct evidence of clinical utility is provided by studies that have compared health outcomes for patients managed with and without the test. Because these are intervention studies, the preferred evidence would be from randomized controlled trials.

The clinical utility of techniques to evaluate ocular blood flow is similar to that for other imaging techniques. The objective is to improve the diagnosis and direct management of patients with glaucoma or suspected glaucoma. Measures of ocular blood flow may have particular utility for the diagnosis and monitoring of NTG.

The only longitudinal study identified is a study by Calvo et al (2012) on the predictive value of retrobulbar blood flow velocities in a prospective series of 262 who were glaucoma suspect.¹⁵ At baseline, all participants had normal visual field, increased IOP (mean, 23.56 mm Hg), and glaucomatous optic disc appearance. Blood flow velocities were measured by CDI during the baseline examination, and conversion to glaucoma was assessed at least yearly according to changes observed with CSLO. During the 48-month follow-up, 36 (13.7%) patients developed glaucoma and 226 did not. Twenty (55.5%) of those who developed glaucoma also showed visual field worsening (moderate agreement, $\kappa=0.38$). Mean end-diastolic and mean velocity in the ophthalmic artery were significantly reduced at baseline in subjects who developed glaucoma compared with subjects who did not.

Chain of Evidence

Indirect evidence on clinical utility rests on clinical validity. If the evidence is insufficient to demonstrate test performance, no inferences can be made about clinical utility.

The evidence does not permit any inferences about the utility of ocular blood flow evaluation in the evaluation of glaucoma.

Section Summary: Evaluation of Ocular Blood Flow

Techniques to measure ocular blood flow or ocular blood velocity are being evaluated for the diagnosis of glaucoma. Data for these techniques remain limited. Current literature focuses on which technologies are most reliably associated with glaucoma. Literature reviews have not identified studies that suggest whether these technologies improve the diagnosis of glaucoma or whether measuring ocular blood flow in patients with glaucoma or suspected glaucoma improves health outcomes.

SUMMARY OF EVIDENCE

For individuals who have glaucoma or suspected glaucoma who receive imaging of the optic nerve and retinal nerve fiber layer, the evidence includes studies on diagnostic accuracy. Relevant outcomes are test accuracy, symptoms, morbid events, functional outcomes, and medication use. Confocal scanning laser ophthalmoscopy (CSLO), scanning laser polarimetry (SLP), and optical coherence tomography (OCT) can be used to evaluate the optic nerve and retinal nerve fiber layer in patients with glaucoma and suspected glaucoma. Numerous articles have described findings from patients with known and suspected glaucoma using CSLO, SLP, and OCT. These studies have reported that abnormalities may be detected on these examinations before functional changes are noted. The literature and specialty society guidelines have indicated that optic nerve analysis using CSLO, SLP, and OCT are established add-on tests that may be used to diagnose and manage patients with glaucoma and suspected glaucoma. These results are often considered along with other findings to make diagnostic and therapeutic decisions about glaucoma care, including use of topical medication, monitoring, and surgery to lower intraocular pressure. Thus, accurate diagnosis of glaucoma would be expected to reduce the progression of glaucoma.

For individuals who have glaucoma or suspected glaucoma who receive evaluation of ocular blood flow, the evidence includes association studies. Relevant outcomes are test accuracy, symptoms, morbid events, functional outcomes, and medication use. Techniques to measure ocular blood flow or ocular blood velocity are used to determine appropriate glaucoma treatment options. The data for these techniques remain limited. Literature reviews have not identified studies on the technical performance of these tests (eg, test-retest reliability), whether these technologies improve diagnostic accuracy, or whether they improve health outcomes in patients with glaucoma. Some have suggested that these parameters may inform understanding of the variability in visual field changes in patients with glaucoma, ie, they may help explain why patients with similar levels of intraocular pressure develop markedly different visual impairments. However, data on use of ocular blood flow, pulsatile ocular blood flow, and/or blood flow velocity are currently lacking.

CLINICAL INPUT FROM PHYSICIAN SPECIALTY SOCIETIES AND ACADEMIC MEDICAL CENTERS

While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process, through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted.

In response to requests, input was received from 1 physician specialty society and 3 academic medical centers while this policy was under review in 2009. Most reviewers supported use of these techniques (confocal scanning laser ophthalmoscopy, scanning laser polarimetry, optical coherence tomography) in the care of patients with glaucoma and those with suspected glaucoma suspect. Reviewers provided data to demonstrate that this testing is equivalent to expert assessment of optic disc photography for both detecting glaucoma and showing disease progression. Reviewers also commented on favorable aspects of this testing. For example, unlike other glaucoma testing, these tests can be done more easily (eg, testing does not always need to be done with dilated pupils) and ambient light level may be (is) less critical. In addition, while serial stereophotographs of the optic nerves are considered by many as the criterion standard, they are not always practical, especially for general ophthalmologists. This testing also requires less cooperation from the patient, which can help when evaluating some older patients.

PRACTICE GUIDELINES AND POSITION STATEMENTS

American Academy of Ophthalmology

The American Academy of Ophthalmology's (AAO) 2015 primary open-angle glaucoma (POAG) suspect and POAG preferred practice patterns recommend evaluating the optic nerve and retinal nerve fiber layer.^{16,17} The documents state that "Although they are distinctly different methodologies, stereoscopic disc photographs and computerized images of the nerve are complementary with regard to the information they provide the clinician who must manage the patient." The guidelines describe 3 types of computer-based imaging devices (CSLO, OCT, SLP) that are currently available for glaucoma, which are similar in their ability to distinguish glaucoma from controls and state that "computer-based digital imaging of the ONH and RNFL is routinely used to provide quantitative information to supplement the clinical examination of the optic nerve.... One rationale for using computerized imaging is to distinguish glaucomatous damage from eyes without glaucoma when thinning of the RNFL is measured, thereby facilitating earlier diagnosis and detection of optic nerve damage". In addition, AAO concluded

that, as device technology evolves the performance of diagnostic imaging devices is expected to improve.

U.S. PREVENTIVE SERVICES TASK FORCE RECOMMENDATIONS

Not applicable.

ONGOING AND UNPUBLISHED CLINICAL TRIALS

Some currently unpublished trials that might influence this review are listed in Table 1.

Table 1. Summary of Key Trials

NCT No.	Trial Name	Planned Enrollment	Completion Date
Ongoing			
NCT02178085	Ocular Blood-flow Assessment by Magnetic Resonance Angiography in Glaucoma	62	Sep 2018
NCT01957267	Longitudinal Observational Study Using Functional and Structural Optical Coherence Tomography to Diagnose and Guide Treatment of Glaucoma	150	Oct 2018

NCT: national clinical trial.

CODING

The following codes for treatment and procedures applicable to this policy are included below for informational purposes. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

CPT/HCPCS

92133	Scanning computerized ophthalmic diagnostic imaging, posterior segment, with interpretation and report, unilateral or bilateral; optic nerve
92134	Scanning computerized ophthalmic diagnostic imaging, posterior segment, with interpretation and report, unilateral or bilateral; retina
0198T	Measurement of ocular blood flow by repetitive intraocular pressure sampling, with interpretation and report

ICD-10 Diagnoses

A18.53	Tuberculous chorioretinitis
B39.4	Histoplasmosis capsulati, unspecified
B39.9	Histoplasmosis, unspecified
C69.31	Malignant neoplasm of right choroid
C69.32	Malignant neoplasm of left choroid
D31.31	Benign neoplasm of right choroid
D31.32	Benign neoplasm of left choroid
E08.311	Diabetes mellitus due to underlying condition with unspecified diabetic retinopathy with macular edema
E08.3211	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, right eye

- E08.3212 Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, left eye
- E08.3213 Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, bilateral
- E08.3291 Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, right eye
- E08.3292 Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, left eye
- E08.3293 Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, bilateral
- E08.3311 Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, right eye
- E08.3312 Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, left eye
- E08.3313 Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
- E08.3391 Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, right eye
- E08.3392 Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, left eye
- E08.3393 Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
- E08.3411 Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, right eye
- E08.3412 Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, left eye
- E08.3413 Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, bilateral
- E08.3491 Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, right eye
- E08.3492 Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, left eye
- E08.3493 Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, bilateral
- E08.3511 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, right eye
- E08.3512 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, left eye
- E08.3513 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, bilateral
- E08.3521 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
- E08.3522 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
- E08.3523 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
- E08.3531 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye

- E08.3532 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
- E08.3533 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
- E08.3541 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
- E08.3542 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
- E08.3543 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
- E08.3551 Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, right eye
- E08.3552 Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, left eye
- E08.3553 Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, bilateral
- E08.3591 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, right eye
- E08.3592 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, left eye
- E08.3593 Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, bilateral
- E08.37X1 Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, right eye
- E08.37X2 Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, left eye
- E08.37X3 Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, bilateral
- E09.311 Drug or chemical induced diabetes mellitus with unspecified diabetic retinopathy with macular edema
- E09.3211 Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
- E09.3212 Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
- E09.3213 Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
- E09.3291 Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
- E09.3292 Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
- E09.3293 Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
- E09.3311 Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye

- E09.3312 Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
- E09.3313 Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
- E09.3391 Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
- E09.3392 Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
- E09.3393 Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
- E09.3411 Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
- E09.3412 Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
- E09.3413 Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
- E09.3491 Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
- E09.3492 Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
- E09.3493 Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
- E09.3511 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
- E09.3512 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
- E09.3513 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
- E09.3521 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
- E09.3522 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
- E09.3523 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
- E09.3531 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
- E09.3532 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
- E09.3533 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
- E09.3533 Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
- E09.3541 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
- E09.3542 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye

- E09.3543 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
- E09.3551 Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, right eye
- E09.3552 Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, left eye
- E09.3591 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
- E09.3592 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
- E09.3593 Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
- E09.37X1 Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
- E09.37X2 Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
- E09.37X3 Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
- E10.311 Type 1 diabetes mellitus with unspecified diabetic retinopathy with macular edema
- E10.3211 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
- E10.3212 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
- E10.3213 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
- E10.3291 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
- E10.3292 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
- E10.3293 Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
- E10.3311 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
- E10.3312 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
- E10.3313 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
- E10.3391 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
- E10.3392 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
- E10.3393 Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
- E10.3411 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye

- E10.3412 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
- E10.3413 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
- E10.3491 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
- E10.3492 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
- E10.3493 Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
- E10.3511 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
- E10.3512 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
- E10.3513 Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
- E10.3521 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
- E10.3522 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
- E10.3523 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
- E10.3531 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
- E10.3532 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
- E10.3533 Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
- E10.3541 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
- E10.3542 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
- E10.3543 Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
- E10.3551 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, right eye
- E10.3552 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, left eye
- E10.3553 Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
- E10.3591 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
- E10.3592 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
- E10.3593 Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
- E10.37X1 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
- E10.37X2 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, left eye

- E10.37X3 Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
- E11.311 Type 2 diabetes mellitus with unspecified diabetic retinopathy with macular edema
- E11.3211 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
- E11.3212 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
- E11.3213 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
- E11.3291 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
- E11.3292 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
- E11.3293 Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
- E11.3311 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
- E11.3312 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
- E11.3313 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
- E11.3391 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
- E11.3392 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
- E11.3393 Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
- E11.3411 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
- E11.3412 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
- E11.3413 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
- E11.3491 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
- E11.3492 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
- E11.3493 Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
- E11.3511 Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
- E11.3512 Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
- E11.3513 Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
- E11.3521 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye

- E11.3522 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
- E11.3523 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
- E11.3531 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
- E11.3532 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
- E11.3533 Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
- E11.3541 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
- E11.3542 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
- E11.3543 Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
- E11.3551 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, right eye
- E11.3552 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, left eye
- E11.3553 Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
- E11.3591 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
- E11.3592 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
- E11.3593 Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
- E11.37X1 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
- E11.37X2 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
- E11.37X3 Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
- E13.311 Other specified diabetes mellitus with unspecified diabetic retinopathy with macular edema
- E13.3211 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
- E13.3212 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
- E13.3213 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
- E13.3291 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
- E13.3292 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
- E13.3293 Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
- E13.3311 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye

- E13.3312 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
- E13.3313 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
- E13.3391 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
- E13.3392 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
- E13.3393 Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
- E13.3411 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
- E13.3412 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
- E13.3413 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
- E13.3491 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
- E13.3492 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
- E13.3493 Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
- E13.3511 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
- E13.3512 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
- E13.3513 Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
- E13.3521 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
- E13.3522 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
- E13.3523 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
- E13.3531 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
- E13.3532 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
- E13.3533 Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
- E13.3541 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
- E13.3542 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye

- E13.3543 Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
- E13.3551 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, right eye
- E13.3552 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, left eye
- E13.3553 Other specified diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
- E13.3591 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
- E13.3592 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
- E13.3593 Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
- E13.37X1 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
- E13.37X2 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
- E13.37X3 Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
- H21.551 Recession of chamber angle, right eye
- H21.552 Recession of chamber angle, left eye
- H21.553 Recession of chamber angle, bilateral
- H30.001 Unspecified focal chorioretinal inflammation, right eye
- H30.002 Unspecified focal chorioretinal inflammation, left eye
- H30.003 Unspecified focal chorioretinal inflammation, bilateral
- H30.011 Focal chorioretinal inflammation, juxtapapillary, right eye
- H30.012 Focal chorioretinal inflammation, juxtapapillary, left eye
- H30.013 Focal chorioretinal inflammation, juxtapapillary, bilateral
- H30.021 Focal chorioretinal inflammation of posterior pole, right eye
- H30.022 Focal chorioretinal inflammation of posterior pole, left eye
- H30.023 Focal chorioretinal inflammation of posterior pole, bilateral
- H30.031 Focal chorioretinal inflammation, peripheral, right eye
- H30.032 Focal chorioretinal inflammation, peripheral, left eye
- H30.033 Focal chorioretinal inflammation, peripheral, bilateral
- H30.041 Focal chorioretinal inflammation, macular or paramacular, right eye
- H30.042 Focal chorioretinal inflammation, macular or paramacular, left eye
- H30.043 Focal chorioretinal inflammation, macular or paramacular, bilateral
- H30.101 Unspecified disseminated chorioretinal inflammation, right eye
- H30.102 Unspecified disseminated chorioretinal inflammation, left eye
- H30.103 Unspecified disseminated chorioretinal inflammation, bilateral
- H30.111 Disseminated chorioretinal inflammation of posterior pole, right eye
- H30.112 Disseminated chorioretinal inflammation of posterior pole, left eye
- H30.113 Disseminated chorioretinal inflammation of posterior pole, bilateral
- H30.121 Disseminated chorioretinal inflammation, peripheral right eye
- H30.122 Disseminated chorioretinal inflammation, peripheral, left eye
- H30.123 Disseminated chorioretinal inflammation, peripheral, bilateral

H30.131	Disseminated chorioretinal inflammation, generalized, right eye
H30.132	Disseminated chorioretinal inflammation, generalized, left eye
H30.133	Disseminated chorioretinal inflammation, generalized, bilateral
H30.141	Acute posterior multifocal placoid pigment epitheliopathy, right eye
H30.142	Acute posterior multifocal placoid pigment epitheliopathy, left eye
H30.143	Acute posterior multifocal placoid pigment epitheliopathy, bilateral
H30.21	Posterior cyclitis, right eye
H30.22	Posterior cyclitis, left eye
H30.23	Posterior cyclitis, bilateral
H30.811	Harada's disease, right eye
H30.812	Harada's disease, left eye
H30.813	Harada's disease, bilateral
H30.891	Other chorioretinal inflammations, right eye
H30.892	Other chorioretinal inflammations, left eye
H30.893	Other chorioretinal inflammations, bilateral
H30.91	Unspecified chorioretinal inflammation, right eye
H30.92	Unspecified chorioretinal inflammation, left eye
H30.93	Unspecified chorioretinal inflammation, bilateral
H31.101	Choroidal degeneration, unspecified, right eye
H31.102	Choroidal degeneration, unspecified, left eye
H31.103	Choroidal degeneration, unspecified, bilateral
H31.111	Age-related choroidal atrophy, right eye
H31.112	Age-related choroidal atrophy, left eye
H31.113	Age-related choroidal atrophy, bilateral
H31.121	Diffuse secondary atrophy of choroid, right eye
H31.122	Diffuse secondary atrophy of choroid, left eye
H31.123	Diffuse secondary atrophy of choroid, bilateral
H31.321	Choroidal rupture, right eye
H31.322	Choroidal rupture, left eye
H31.323	Choroidal rupture, bilateral
H31.401	Unspecified choroidal detachment, right eye
H31.402	Unspecified choroidal detachment, left eye
H31.403	Unspecified choroidal detachment, bilateral
H31.411	Hemorrhagic choroidal detachment, right eye
H31.412	Hemorrhagic choroidal detachment, left eye
H31.413	Hemorrhagic choroidal detachment, bilateral
H31.421	Serous choroidal detachment, right eye
H31.422	Serous choroidal detachment, left eye
H31.423	Serous choroidal detachment, bilateral
H32	Chorioretinal disorders in diseases classified elsewhere
H33.001	Unspecified retinal detachment with retinal break, right eye
H33.002	Unspecified retinal detachment with retinal break, left eye
H33.003	Unspecified retinal detachment with retinal break, bilateral
H33.011	Retinal detachment with single break, right eye
H33.012	Retinal detachment with single break, left eye
H33.013	Retinal detachment with single break, bilateral
H33.021	Retinal detachment with multiple breaks, right eye
H33.022	Retinal detachment with multiple breaks, left eye

H33.023	Retinal detachment with multiple breaks, bilateral
H33.031	Retinal detachment with giant retinal tear, right eye
H33.032	Retinal detachment with giant retinal tear, left eye
H33.033	Retinal detachment with giant retinal tear, bilateral
H33.041	Retinal detachment with retinal dialysis, right eye
H33.042	Retinal detachment with retinal dialysis, left eye
H33.043	Retinal detachment with retinal dialysis, bilateral
H33.051	Total retinal detachment, right eye
H33.052	Total retinal detachment, left eye
H33.053	Total retinal detachment, bilateral
H33.21	Serous retinal detachment, right eye
H33.22	Serous retinal detachment, left eye
H33.23	Serous retinal detachment, bilateral
H33.41	Traction detachment of retina, right eye
H33.42	Traction detachment of retina, left eye
H33.43	Traction detachment of retina, bilateral
H34.8110	Central retinal vein occlusion, right eye, with macular edema
H34.8111	Central retinal vein occlusion, right eye, with retinal neovascularization
H34.8112	Central retinal vein occlusion, right eye, stable
H34.8120	Central retinal vein occlusion, left eye, with macular edema
H34.8121	Central retinal vein occlusion, left eye, with retinal neovascularization
H34.8122	Central retinal vein occlusion, left eye, stable
H34.8130	Central retinal vein occlusion, bilateral, with macular edema
H34.8131	Central retinal vein occlusion, bilateral, with retinal neovascularization
H34.8132	Central retinal vein occlusion, bilateral, stable
H34.8310	Tributary (branch) retinal vein occlusion, right eye, with macular edema
H34.8311	Tributary (branch) retinal vein occlusion, right eye, with retinal neovascularization
H34.8312	Tributary (branch) retinal vein occlusion, right eye, stable
H34.8320	Tributary (branch) retinal vein occlusion, left eye, with macular edema
H34.8321	Tributary (branch) retinal vein occlusion, left eye, with retinal neovascularization
H34.8322	Tributary (branch) retinal vein occlusion, left eye, stable
H34.8330	Tributary (branch) retinal vein occlusion, bilateral, with macular edema
H34.8331	Tributary (branch) retinal vein occlusion, bilateral, with retinal neovascularization
H34.8332	Tributary (branch) retinal vein occlusion, bilateral, stable
H35.051	Retinal neovascularization, unspecified, right eye
H35.052	Retinal neovascularization, unspecified, left eye
H35.053	Retinal neovascularization, unspecified, bilateral
H35.31	Nonexudative age-related macular degeneration
H35.3110	Nonexudative age-related macular degeneration, right eye, stage unspecified
H35.3111	Nonexudative age-related macular degeneration, right eye, early dry stage
H35.3112	Nonexudative age-related macular degeneration, right eye, intermediate dry stage
H35.3113	Nonexudative age-related macular degeneration, right eye, advanced atrophic without subfoveal involvement
H35.3114	Nonexudative age-related macular degeneration, right eye, advanced atrophic with subfoveal involvement
H35.3120	Nonexudative age-related macular degeneration, left eye, stage unspecified
H35.3121	Nonexudative age-related macular degeneration, left eye, early dry stage

- H35.3122 Nonexudative age-related macular degeneration, left eye, intermediate dry stage
- H35.3123 Nonexudative age-related macular degeneration, left eye, advanced atrophic without subfoveal involvement
- H35.3124 Nonexudative age-related macular degeneration, left eye, advanced atrophic with subfoveal involvement
- H35.3130 Nonexudative age-related macular degeneration, bilateral, stage unspecified
- H35.3131 Nonexudative age-related macular degeneration, bilateral, early dry stage
- H35.3132 Nonexudative age-related macular degeneration, bilateral, intermediate dry stage
- H35.3133 Nonexudative age-related macular degeneration, bilateral, advanced atrophic without subfoveal involvement
- H35.3134 Nonexudative age-related macular degeneration, bilateral, advanced atrophic with subfoveal involvement
- H35.3210 Exudative age-related macular degeneration, right eye, stage unspecified
- H35.3211 Exudative age-related macular degeneration, right eye, with active choroidal neovascularization
- H35.3212 Exudative age-related macular degeneration, right eye, with inactive choroidal neovascularization
- H35.3213 Exudative age-related macular degeneration, right eye, with inactive scar
- H35.3220 Exudative age-related macular degeneration, left eye, stage unspecified
- H35.3221 Exudative age-related macular degeneration, left eye, with active choroidal neovascularization
- H35.3222 Exudative age-related macular degeneration, left eye, with inactive choroidal neovascularization
- H35.3223 Exudative age-related macular degeneration, left eye, with inactive scar
- H35.3230 Exudative age-related macular degeneration, bilateral, stage unspecified
- H35.3231 Exudative age-related macular degeneration, bilateral, with active choroidal neovascularization
- H35.3232 Exudative age-related macular degeneration, bilateral, with inactive choroidal neovascularization
- H35.3233 Exudative age-related macular degeneration, bilateral, with inactive scar
- H35.33 Angioid streaks of macula
- H35.341 Macular cyst, hole, or pseudohole, right eye
- H35.342 Macular cyst, hole, or pseudohole, left eye
- H35.343 Macular cyst, hole, or pseudohole, bilateral
- H35.351 Cystoid macular degeneration, right eye
- H35.352 Cystoid macular degeneration, left eye
- H35.353 Cystoid macular degeneration, bilateral
- H35.361 Drusen (degenerative) of macula, right eye
- H35.362 Drusen (degenerative) of macula, left eye
- H35.363 Drusen (degenerative) of macula, bilateral
- H35.371 Puckering of macula, right eye
- H35.372 Puckering of macula, left eye
- H35.373 Puckering of macula, bilateral
- H35.50 Unspecified hereditary retinal dystrophy
- H35.51 Vitreoretinal dystrophy
- H35.53 Other dystrophies primarily involving the sensory retina
- H35.54 Dystrophies primarily involving the retinal pigment epithelium
- H35.711 Central serous chorioretinopathy, right eye

H35.712	Central serous chorioretinopathy, left eye
H35.713	Central serous chorioretinopathy, bilateral
H35.81	Retinal edema
H35.89	Other specified retinal disorders
H40.001	Preglaucoma, unspecified, right eye
H40.002	Preglaucoma, unspecified, left eye
H40.003	Preglaucoma, unspecified, bilateral
H40.011	Open angle with borderline findings, low risk, right eye
H40.012	Open angle with borderline findings, low risk, left eye
H40.013	Open angle with borderline findings, low risk, bilateral
H40.021	Open angle with borderline findings, high risk, right eye
H40.022	Open angle with borderline findings, high risk, left eye
H40.023	Open angle with borderline findings, high risk, bilateral
H40.031	Anatomical narrow angle, right eye
H40.032	Anatomical narrow angle, left eye
H40.033	Anatomical narrow angle, bilateral
H40.041	Steroid responder, right eye
H40.042	Steroid responder, left eye
H40.043	Steroid responder, bilateral
H40.051	Ocular hypertension, right eye
H40.052	Ocular hypertension, left eye
H40.053	Ocular hypertension, bilateral
H40.10X1	Unspecified open-angle glaucoma, mild stage
H40.10X2	Unspecified open-angle glaucoma, moderate stage
H40.10X3	Unspecified open-angle glaucoma, severe stage
H40.10X4	Unspecified open-angle glaucoma, indeterminate stage
H40.1110	Primary open-angle glaucoma, right eye, stage unspecified
H40.1111	Primary open-angle glaucoma, right eye, mild stage
H40.1112	Primary open-angle glaucoma, right eye, moderate stage
H40.1113	Primary open-angle glaucoma, right eye, severe stage
H40.1114	Primary open-angle glaucoma, right eye, indeterminate stage
H40.1120	Primary open-angle glaucoma, left eye, stage unspecified
H40.1121	Primary open-angle glaucoma, left eye, mild stage
H40.1122	Primary open-angle glaucoma, left eye, moderate stage
H40.1123	Primary open-angle glaucoma, left eye, severe stage
H40.1124	Primary open-angle glaucoma, left eye, indeterminate stage
H40.1130	Primary open-angle glaucoma, bilateral, stage unspecified
H40.1131	Primary open-angle glaucoma, bilateral, mild stage
H40.1132	Primary open-angle glaucoma, bilateral, moderate stage
H40.1133	Primary open-angle glaucoma, bilateral, severe stage
H40.1134	Primary open-angle glaucoma, bilateral, indeterminate stage
H40.1210	Low-tension glaucoma, right eye, stage unspecified
H40.1211	Low-tension glaucoma, right eye, mild stage
H40.1212	Low-tension glaucoma, right eye, moderate stage
H40.1213	Low-tension glaucoma, right eye, severe stage
H40.1214	Low-tension glaucoma, right eye, indeterminate stage
H40.1220	Low-tension glaucoma, left eye, stage unspecified
H40.1221	Low-tension glaucoma, left eye, mild stage

H40.1222	Low-tension glaucoma, left eye, moderate stage
H40.1223	Low-tension glaucoma, left eye, severe stage
H40.1224	Low-tension glaucoma, left eye, indeterminate stage
H40.1231	Low-tension glaucoma, bilateral, mild stage
H40.1232	Low-tension glaucoma, bilateral, moderate stage
H40.1233	Low-tension glaucoma, bilateral, severe stage
H40.1234	Low-tension glaucoma, bilateral, indeterminate stage
H40.1311	Pigmentary glaucoma, right eye, mild stage
H40.1312	Pigmentary glaucoma, right eye, moderate stage
H40.1313	Pigmentary glaucoma, right eye, severe stage
H40.1314	Pigmentary glaucoma, right eye, indeterminate stage
H40.1321	Pigmentary glaucoma, left eye, mild stage
H40.1322	Pigmentary glaucoma, left eye, moderate stage
H40.1323	Pigmentary glaucoma, left eye, severe stage
H40.1324	Pigmentary glaucoma, left eye, indeterminate stage
H40.1331	Pigmentary glaucoma, bilateral, mild stage
H40.1332	Pigmentary glaucoma, bilateral, moderate stage
H40.1333	Pigmentary glaucoma, bilateral, severe stage
H40.1334	Pigmentary glaucoma, bilateral, indeterminate stage
H40.1411	Capsular glaucoma with pseudoexfoliation of lens, right eye, mild stage
H40.1412	Capsular glaucoma with pseudoexfoliation of lens, right eye, moderate stage
H40.1413	Capsular glaucoma with pseudoexfoliation of lens, right eye, severe stage
H40.1414	Capsular glaucoma with pseudoexfoliation of lens, right eye, indeterminate stage
H40.1421	Capsular glaucoma with pseudoexfoliation of lens, left eye, mild stage
H40.1422	Capsular glaucoma with pseudoexfoliation of lens, left eye, moderate stage
H40.1423	Capsular glaucoma with pseudoexfoliation of lens, left eye, severe stage
H40.1424	Capsular glaucoma with pseudoexfoliation of lens, left eye, indeterminate stage
H40.1431	Capsular glaucoma with pseudoexfoliation of lens, bilateral, mild stage
H40.1432	Capsular glaucoma with pseudoexfoliation of lens, bilateral, moderate stage
H40.1433	Capsular glaucoma with pseudoexfoliation of lens, bilateral, severe stage
H40.1434	Capsular glaucoma with pseudoexfoliation of lens, bilateral, indeterminate stage
H40.151	Residual stage of open-angle glaucoma, right eye
H40.152	Residual stage of open-angle glaucoma, left eye
H40.153	Residual stage of open-angle glaucoma, bilateral
H40.20X1	Unspecified primary angle-closure glaucoma, mild stage
H40.20X2	Unspecified primary angle-closure glaucoma, moderate stage
H40.20X3	Unspecified primary angle-closure glaucoma, severe stage
H40.20X4	Unspecified primary angle-closure glaucoma, indeterminate stage
H40.211	Acute angle-closure glaucoma, right eye
H40.212	Acute angle-closure glaucoma, left eye
H40.213	Acute angle-closure glaucoma, bilateral
H40.2211	Chronic angle-closure glaucoma, right eye, mild stage
H40.2212	Chronic angle-closure glaucoma, right eye, moderate stage
H40.2213	Chronic angle-closure glaucoma, right eye, severe stage
H40.2214	Chronic angle-closure glaucoma, right eye, indeterminate stage
H40.2221	Chronic angle-closure glaucoma, left eye, mild stage
H40.2222	Chronic angle-closure glaucoma, left eye, moderate stage
H40.2223	Chronic angle-closure glaucoma, left eye, severe stage

H40.2224	Chronic angle-closure glaucoma, left eye, indeterminate stage
H40.2231	Chronic angle-closure glaucoma, bilateral, mild stage
H40.2232	Chronic angle-closure glaucoma, bilateral, moderate stage
H40.2233	Chronic angle-closure glaucoma, bilateral, severe stage
H40.2234	Chronic angle-closure glaucoma, bilateral, indeterminate stage
H40.231	Intermittent angle-closure glaucoma, right eye
H40.232	Intermittent angle-closure glaucoma, left eye
H40.233	Intermittent angle-closure glaucoma, bilateral
H40.241	Residual stage of angle-closure glaucoma, right eye
H40.242	Residual stage of angle-closure glaucoma, left eye
H40.243	Residual stage of angle-closure glaucoma, bilateral
H40.31X1	Glaucoma secondary to eye trauma, right eye, mild stage
H40.31X2	Glaucoma secondary to eye trauma, right eye, moderate stage
H40.31X3	Glaucoma secondary to eye trauma, right eye, severe stage
H40.31X4	Glaucoma secondary to eye trauma, right eye, indeterminate stage
H40.32X1	Glaucoma secondary to eye trauma, left eye, mild stage
H40.32X2	Glaucoma secondary to eye trauma, left eye, moderate stage
H40.32X3	Glaucoma secondary to eye trauma, left eye, severe stage
H40.32X4	Glaucoma secondary to eye trauma, left eye, indeterminate stage
H40.33X1	Glaucoma secondary to eye trauma, bilateral, mild stage
H40.33X2	Glaucoma secondary to eye trauma, bilateral, moderate stage
H40.33X3	Glaucoma secondary to eye trauma, bilateral, severe stage
H40.33X4	Glaucoma secondary to eye trauma, bilateral, indeterminate stage
H40.41X1	Glaucoma secondary to eye inflammation, right eye, mild stage
H40.41X2	Glaucoma secondary to eye inflammation, right eye, moderate stage
H40.41X3	Glaucoma secondary to eye inflammation, right eye, severe stage
H40.41X4	Glaucoma secondary to eye inflammation, right eye, indeterminate stage
H40.42X1	Glaucoma secondary to eye inflammation, left eye, mild stage
H40.42X2	Glaucoma secondary to eye inflammation, left eye, moderate stage
H40.42X3	Glaucoma secondary to eye inflammation, left eye, severe stage
H40.42X4	Glaucoma secondary to eye inflammation, left eye, indeterminate stage
H40.43X1	Glaucoma secondary to eye inflammation, bilateral, mild stage
H40.43X2	Glaucoma secondary to eye inflammation, bilateral, moderate stage
H40.43X3	Glaucoma secondary to eye inflammation, bilateral, severe stage
H40.43X4	Glaucoma secondary to eye inflammation, bilateral, indeterminate stage
H40.51X1	Glaucoma secondary to other eye disorders, right eye, mild stage
H40.51X2	Glaucoma secondary to other eye disorders, right eye, moderate stage
H40.51X3	Glaucoma secondary to other eye disorders, right eye, severe stage
H40.51X4	Glaucoma secondary to other eye disorders, right eye, indeterminate stage
H40.52X1	Glaucoma secondary to other eye disorders, left eye, mild stage
H40.52X2	Glaucoma secondary to other eye disorders, left eye, moderate stage
H40.52X3	Glaucoma secondary to other eye disorders, left eye, severe stage
H40.52X4	Glaucoma secondary to other eye disorders, left eye, indeterminate stage
H40.53X1	Glaucoma secondary to other eye disorders, bilateral, mild stage
H40.53X2	Glaucoma secondary to other eye disorders, bilateral, moderate stage
H40.53X3	Glaucoma secondary to other eye disorders, bilateral, severe stage
H40.53X4	Glaucoma secondary to other eye disorders, bilateral, indeterminate stage
H40.61X1	Glaucoma secondary to drugs, right eye, mild stage

H40.61X2	Glaucoma secondary to drugs, right eye, moderate stage
H40.61X3	Glaucoma secondary to drugs, right eye, severe stage
H40.61X4	Glaucoma secondary to drugs, right eye, indeterminate stage
H40.62X1	Glaucoma secondary to drugs, left eye, mild stage
H40.62X2	Glaucoma secondary to drugs, left eye, moderate stage
H40.62X3	Glaucoma secondary to drugs, left eye, severe stage
H40.62X4	Glaucoma secondary to drugs, left eye, indeterminate stage
H40.63X1	Glaucoma secondary to drugs, bilateral, mild stage
H40.63X2	Glaucoma secondary to drugs, bilateral, moderate stage
H40.63X3	Glaucoma secondary to drugs, bilateral, severe stage
H40.63X4	Glaucoma secondary to drugs, bilateral, indeterminate stage
H40.811	Glaucoma with increased episcleral venous pressure, right eye
H40.812	Glaucoma with increased episcleral venous pressure, left eye
H40.813	Glaucoma with increased episcleral venous pressure, bilateral
H40.821	Hypersecretion glaucoma, right eye
H40.822	Hypersecretion glaucoma, left eye
H40.823	Hypersecretion glaucoma, bilateral
H40.831	Aqueous misdirection, right eye
H40.832	Aqueous misdirection, left eye
H40.833	Aqueous misdirection, bilateral
H40.89	Other specified glaucoma
H40.9	Unspecified glaucoma
H42	Glaucoma in diseases classified elsewhere
H43.811	Vitreous degeneration, right eye
H43.812	Vitreous degeneration, left eye
H43.813	Vitreous degeneration, bilateral
H43.821	Vitreomacular adhesion, right eye
H43.822	Vitreomacular adhesion, left eye
H43.823	Vitreomacular adhesion, bilateral
H44.21	Degenerative myopia, right eye
H44.22	Degenerative myopia, left eye
H44.23	Degenerative myopia, bilateral
H44.2A1	Degenerative myopia with choroidal neovascularization, right eye
H44.2A2	Degenerative myopia with choroidal neovascularization, left eye
H44.2A3	Degenerative myopia with choroidal neovascularization, bilateral eye
H44.2B1	Degenerative myopia with macular hole, right eye
H44.2B2	Degenerative myopia with macular hole, left eye
H44.2B3	Degenerative myopia with macular hole, bilateral eye
H44.2C1	Degenerative myopia with retinal detachment, right eye
H44.2C2	Degenerative myopia with retinal detachment, left eye
H44.2C3	Degenerative myopia with retinal detachment, bilateral eye
H44.2D1	Degenerative myopia with foveoschisis, right eye
H44.2D2	Degenerative myopia with foveoschisis, left eye
H44.2D3	Degenerative myopia with foveoschisis, bilateral eye
H44.2E1	Degenerative myopia with other maculopathy, right eye
H44.2E2	Degenerative myopia with other maculopathy, left eye
H47.031	Optic nerve hypoplasia, right eye
H47.032	Optic nerve hypoplasia, left eye

H47.033	Optic nerve hypoplasia, bilateral
H47.20	Unspecified optic atrophy
H47.211	Primary optic atrophy, right eye
H47.212	Primary optic atrophy, left eye
H47.213	Primary optic atrophy, bilateral
H47.22	Hereditary optic atrophy
H47.231	Glaucomatous optic atrophy, right eye
H47.232	Glaucomatous optic atrophy, left eye
H47.233	Glaucomatous optic atrophy, bilateral
H47.291	Other optic atrophy, right eye
H47.292	Other optic atrophy, left eye
H47.293	Other optic atrophy, bilateral
H47.321	Drusen of optic disc, right eye
H47.322	Drusen of optic disc, left eye
H47.323	Drusen of optic disc, bilateral
H47.331	Pseudopapilledema of optic disc, right eye
H47.332	Pseudopapilledema of optic disc, left eye
H47.333	Pseudopapilledema of optic disc, bilateral
H47.391	Other disorders of optic disc, right eye
H47.392	Other disorders of optic disc, left eye
H47.393	Other disorders of optic disc, bilateral
H53.411	Scotoma involving central area, right eye
H53.412	Scotoma involving central area, left eye
H53.413	Scotoma involving central area, bilateral
Q15.0	Congenital glaucoma
Z79.899	Other long term (current) drug therapy

REVISIONS

04-19-2007 effective 07-01-2007	<ul style="list-style-type: none"> Added the indications for OCT use for diagnosing and monitoring glaucoma, nerve fiber, and optic nerve conditions.
05-09-2007 effective 11-01-2007	<ul style="list-style-type: none"> The policy section was updated to split the first bullet under B. to create two bullets, one for age-related macular degeneration and one for diabetic macular edema and to set a maximum number of OCT services per year for each.
04-30-2010	<p>In Policy Section:</p> <ul style="list-style-type: none"> Revised repeat testing For Diabetic Macular Edema (DME), from "Repeat every 2 or 3 months" to "Repeat every 3 or 4 months" Revised repeat testing For Epiretinal Membrane (ERM) from "pre-treatment and post-surgical at 3 months, 6 months" to "pre-treatment and post-surgical after 6 weeks, 6 months". Added "If Cystoid Macular Edema: Repeat every 2 months during acute treatment." Added "If Branch Retinal Vein Occlusion: Repeat every 3 or 4 months indefinitely." Added "If Central Retinal Vein Occlusion: Repeat every 3 or 4 months for approximately 2 years" Added "If Macular Drusen: Repeat annually, allowing one study by treating MD / DO per year." Corrected wording of "treating MD / OD" to "treating MD / DO"

	<p>In Coding Section:</p> <ul style="list-style-type: none"> ▪ Updated wording for CPT code 92135. ▪ Confirmed no diagnosis codes listed for OCT for the rhegmatogenous retinal detachment (361.00-361.07) ▪ Added diagnosis code 362.51.
10-26-2010	<p>In Policy Section:</p> <ul style="list-style-type: none"> ▪ Item A, inserted ", retinal conditions" to read "Scanning Laser Ophthalmoscopy (SLO) test is allowable for the diagnoses and the monitoring of the optic nerve, retinal conditions, and glaucoma." ▪ Item B, #1 through #3, removed "by treating MD/DO" to read: <ol style="list-style-type: none"> 1. If Exudative Age-related Macular Degeneration (AMD): Repeat OCT will significantly help guide the need for retreatment (with photodynamic therapy [PDT] or intravitreal injections) in conjunction with intravenous fluorescein angiography (IVF) / indocyanine green (ICG). Maximum of 8 per year linked to intravitreal injections. 2. If Diabetic Macular Edema (DME): Repeat 3 or 4 months (maximum of 4 per year linked to intravitreal injections / or laser treatment. 3. If Retinal Detachment (RD): Repeat pre-treatment and post-surgical at 2 months (maximum of 2). 4. If Epiretinal Membrane (ERM): Repeat pre-treatment and post-surgical after 6 weeks, 6 months (maximum of 3) if with macular edema. ▪ Item B, #7, replaced "indefinitely," with "for approximately two years." To read "Repeat every 3 or 4 months for approximately two years." ▪ Item B, #9, replaced "allowing one study by treating MD/DO per year" with "if subjective visual changes or suspicion of choroidal neovascularization: if more than two studies per year, then documentation is required" to read "Repeat annually, if subjective visual changes or suspicion of choroidal neovascularization: if more than two studies per year, then documentation is required." <p>In the Medical Policy Title Section:</p> <ul style="list-style-type: none"> ▪ Replaced "Scanning Laser Ophthalmoscopy (SLO) for Glaucoma and Optical Coherence Tomography (OCT) for Retinal Conditions" with "Scanning Computerized Ophthalmic Diagnostic Imaging Devices."
02-16-2011	<p>In Coding section:</p> <ul style="list-style-type: none"> ▪ Added CPT codes: 92133, 92134, 92227, 92228. ▪ Removed CPT code: 92135.
01-01-2012	<p>In the Coding section:</p> <ul style="list-style-type: none"> ▪ Removed HCPCS code: S0625
01-15-2013	<p>In the Policy section:</p> <p>In Item B, revised the following statement, "<u>Optical Coherence (OCT)</u> test is allowed for the diagnoses and the monitoring for retinal conditions." to "<u>Optical Coherence (OCT)</u> test is allowed for the diagnoses, listed below, monitoring for retinal conditions, and ocular toxicity secondary to high-risk medications (i.e., chloroquine [Aralen], hydroxychloroquine [Plaquenil], Interferon alpha-2b, Amiodarone, tamoxifen citrate [Nolvadex], fingolimod [Gilenya], Seroquel).</p> <p>In Coding section:</p> <ul style="list-style-type: none"> ▪ Added Diagnosis codes: 362.57, 379.21, V58.69.
01-22-2013	<p>Corrections were made to the Current Effective Date and the Revision Date section.</p>
07-30-2013	<p>In Policy section:</p> <ul style="list-style-type: none"> ▪ Item B, 9 moved to become new #2. ▪ In new Item B, 2, inserted "only" to read "Repeat annually, only if subjective visual changes..." <p>In Coding section:</p>

	<ul style="list-style-type: none"> ▪ Added ICD-10 Diagnosis codes (<i>Effective October 1, 2014</i>)
	Updated Reference section.
04-28-2015	Updated Description section.
	Added Rationale section.
	In Coding section: <ul style="list-style-type: none"> ▪ Added 377.14 to ICD-9 Diagnosis codes ▪ Added H47.231-H47.233 to ICD-10 Diagnosis codes.
	Updated References section.
08-19-2015	In Policy section: <ul style="list-style-type: none"> ▪ In Item B 3, added "8" and removed "Repeat every 3 or 4 months" and "4", to read "Maximum of 8 per year linked to intravitreal injections or laser treatment." ▪ In Item B 5, removed "after 6 weeks, 6 months", and "3", to read "Repeat pre-treatment and post-surgical (maximum of 4 per year) if with macular edema." ▪ In Item B 6, removed "at 2 or 3 months" and added "maximum of 4 per year) in", to read "Repeat pre-treatment and post-treatment (maximum of 4 per yer) in cases of partially closed hole." ▪ In Item B 8, removed "Repeat every 3 or 4 months for approximately 2 years" and added "Maximum of 8 per year linked to intravitreal injections" ▪ In Item B 9, removed "Repeat every 3 or 4 months for approximately 2 years" and added "Maximum of 8 per year linked to intravitreal injections"
	Updated Rationale section.
10-01-2015	Policy published 11-25-2015. Effective 10-01-2015 with ICD-10 coding implementation.
	In Coding section: <ul style="list-style-type: none"> ▪ Removed ICD-10 diagnosis codes: H40.009, H40.141, H40.142, H40.143, H40.1511, H40.1512, H40.1513, H40.1514, H40.1521, H40.1522, H40.1523, H40.1524, H40.1531, H40.1532, H40.1533, H40.1534 ▪ Added ICD-10 diagnosis codes: H35.361, H35.362, H35.363, H40.1411, H40.1412, H40.1413, H40.1414, H40.1421, H40.1422, H40.1423, H40.1424, H40.1431, H40.1432, H40.1433, H40.1434, H40.151, H40.152, H40.153, Z79.899
10-01-2015	Policy published 05-25-2016. Retro-effective to 10-01-2015 with ICD-10 coding implementation.
	In Coding section: <ul style="list-style-type: none"> ▪ Added ICD-10 diagnosis codes: H40.021, H40.022, H40.023, H40.31X1, H40.31X2, H40.31X3, H40.31X4, H40.32X1, H40.32X2, H40.32X3, H40.32X4, H40.33X1, H40.33X2, H40.33X3, H40.33X4, H40.41X1, H40.41X2, H40.41X3, H40.41X4, H40.42X1, H40.42X2, H40.42X3, H40.42X4, H40.43X1, H40.43X2, H40.43X3, H40.43X4.
10-01-2016	In Coding section: <ul style="list-style-type: none"> ▪ Added ICD-10 codes effective 10-01-2016: E08.3211, E08.3212, E08.3213, E08.3291, E08.3292, E08.3293, E08.3311, E08.3312, E08.3313, E08.3391, E08.3392, E08.3393, E08.3411, E08.3412, E08.3413, E08.3491, E08.3492, E08.3493, E08.3511, E08.3512, E08.3513, E08.3521, E08.3522, E08.3523, E08.3531, E08.3532, E08.3533, E08.3541, E08.3542, E08.3543, E08.3551, E08.3552, E08.3553, E08.3591, E08.3592, E08.3593, E08.37X1, E08.37X2, E08.37X3, E09.3211, E09.3212, E09.3213, E09.3291, E09.3292, E09.3293, E09.3311, E09.3312, E09.3313, E09.3391, E09.3392, E09.3393, E09.3411, E09.3412, E09.3413, E09.3491, E09.3492, E09.3493, E09.3511, E09.3512, E09.3513, E09.3521, E09.3522, E09.3523, E09.3531, E09.3532, E09.3533, E09.3541, E09.3542, E09.3543, E09.3551, E09.3552, E09.3553, E09.3591, E09.3592, E09.3593, E09.37X1, E09.37X2, E09.37X3, E10.3211, E10.3212, E10.3213, E10.3291, E10.3292, E10.3293, E10.3311, E10.3312, E10.3313, E10.3391, E10.3392, E10.3393, E10.3411, E10.3412, E10.3413, E10.3491,

	<p>E10.3492, E10.3493, E10.3511, E10.3512, E10.3513, E10.3521, E10.3522, E10.3523, E10.3531, E10.3532, E10.3533, E10.3541, E10.3542, E10.3543, E10.3551, E10.3552, E10.3553, E10.3591, E10.3592, E10.3593, E10.37X1, E10.37X2, E10.37X3, E11.3211, E11.3212, E11.3213, E11.3291, E11.3292, E11.3293, E11.3311, E11.3312, E11.3313, E11.3391, E11.3392, E11.3393, E11.3411, E11.3412, E11.3413, E11.3491, E11.3492, E11.3493, E13.3411, E13.3412, E13.3413, E11.3491, E11.3492, E11.3493, E11.3511, E11.3512, E11.3513, E11.3521, E11.3522, E11.3523, E11.3531, E11.3532, E11.3533, E11.3541, E11.3542, E11.3543, E11.3551, E11.3552, E11.3553, E11.3591, E11.3592, E11.3593, E11.37X1, E11.37X2, E11.37X3, E13.3211, E13.3212, E13.3213, E13.3291, E13.3292, E13.3293, E13.3311, E13.3312, E13.3313, E13.3391, E13.3392, E13.3393, E13.3411, E13.3412, E13.3413, E13.3491, E13.3492, E13.3493, E13.3511, E13.3512, E13.3513, E13.3521, E13.3522, E13.3523, E13.3531, E13.3532, E13.3533, E13.3541, E13.3542, E13.3543, E13.3551, E13.3552, E13.3553, E13.3591, E13.3592, E13.3593, E13.37X1, E13.37X2, E13.37X3, H34.8110, H34.8111, H34.8112, H34.8120, H34.8121, H34.8122, H34.8130, H34.8131, H34.8132, H34.8310, H34.8311, H34.8312, H34.8320, H34.8321, H34.8322, H34.8330, H34.8331, H34.8332, H35.3110, H35.3111, H35.3112, H35.3113, H35.3114, H35.3120, H35.3121, H35.3122, H35.3123, H35.3124, H35.3130, H35.3131, H35.3132, H35.3133, H35.3134, H35.3210, H35.3211, H35.3212, H35.3213, H35.3220, H35.3221, H35.3222, H35.3223, H35.3230, H35.3231, H35.3232, H35.3233, H40.1110, H40.1111, H40.1112, H40.1113, H40.1114, H40.1120, H40.1121, H40.1122, H40.1123, H40.1124, H40.1130, H40.1131, H40.1132, H40.1133, H40.1134</p> <ul style="list-style-type: none"> ▪ Termed ICD-10 codes effective 09-30-2016: E08.321, E08.331, E08.341, E08.351, E08.359, E09.321, E09.331, E09.341, E09.351, E09.359, E10.321, E10.331, E10.339, E10.341, E10.349, E10.351, E10.359, E11.321, E11.331, E11.339, E11.341, E11.349, E11.351, E11.359, E13.321, E13.331, E13.339, E13.341, E13.349, E13.351, E13.359, H34.811, H34.812, H34.813, H34.831, H34.832, H34.833, H35.051, H35.32, H40.11X1, H40.11X2, H40.11X3, H40.11X4
	Updated References section.
10-12-2016	Updated Description section.
	Updated Rationale section.
	Updated References section.
05-12-2017	Updated Description section.
	<p>In Policy section:</p> <ul style="list-style-type: none"> ▪ In Item B, removed "diagnosis" and "and the" and added "diagnoses, listed below" and ", and ocular toxicity secondary to high-risk medications (ie, chloroquine [Aralen], hydroxychloroquine [Plaquenil], Interferon alpha-2b, Amiodarone, tamoxifen citrate [Nolvadex], fingolimod [Gilenya], Seroquel)" to read, "Optical Coherence Tomography (OCT) test is allowed for the diagnoses, listed below, and the monitoring for retinal conditions, and ocular toxicity secondary to high-risk medications (ie, chloroquine [Aralen], hydroxychloroquine [Plaquenil], Interferon alpha-2b, Amiodarone, tamoxifen citrate [Nolvadex], fingolimod [Gilenya], Seroquel)." <i>(These revisions to policy language were inadvertently removed in the revision of 07-30-2013.)</i>
	Updated Rationale section.
	<p>In Coding section:</p> <ul style="list-style-type: none"> ▪ Added CPT code: 0198T. ▪ Removed CPT codes: 92227, 92228. ▪ Added ICD-10 codes: H33.001, H33.002, H33.003, H33.011, H33.012, H33.013, H33.021, H33.022, H33.023, H33.031, H33.032, H33.033, H33.041, H33.042,

	H33.043, H33.051, H33.052, H33.053, H35.50, H35.51, H35.53, H35.54, H43.811, H43.812, H43.813, H47.031, H47.032, H47.033, H47.20, H47.211, H47.212, H47.213, H47.22, H47.291, H47.292, H47.293, H47.321, H47.322, H47.323, H47.331, H47.332, H47.333, H47.391, H47.392, H47.393.
	In Revision section, revision date was changed from "01-15-2012" to "01-15-2013."
	Updated References section.
10-01-2017	In Coding section: <ul style="list-style-type: none"> ▪ Added ICD-10 codes: H44.2A1, H44.2A2, H44.2A3, H44.2B1, H44.2B2, H44.2B3, H44.2C1, H44.2C2, H44.2C3, H44.2D1, H44.2D2, H44.2D3, H44.2E1, H44.2E2, H44.2E3.
04-11-2018	Updated Description section.
	Updated Rationale section.
	In Coding section: <ul style="list-style-type: none"> ▪ Removed ICD-9 codes.
	Updated References section.
08-01-2018	In Policy section: <ul style="list-style-type: none"> ▪ Added new Item B 10, "If Vitreomacular Traction / Adhesion: Maximum of 4 per year."
	In Coding section: <ul style="list-style-type: none"> ▪ Added ICD-10 codes: H43.821, H43.822, H43.823.
	Updated References section.
04-15-2019	Policy published to the bcbsks.com website on 03-27-2019 with an effective date of 04-15-2019.
	In Coding section: <ul style="list-style-type: none"> ▪ Added ICD-10 code: H35.051.

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