Electroretinography

Clinical Policy ID: CCP.1523

Recent review date: 5/2026

Next review date: 9/2027

Policy contains: electroretinogram; macula; retina.

AmeriHealth Caritas VIP Care has developed clinical policies to assist with making coverage determinations. AmeriHealth Caritas VIP Care's clinical policies are based on guidelines from established industry sources, such as the Centers for Medicare & Medicaid Services (CMS), state regulatory agencies, the American Medical Association (AMA), medical specialty professional societies, and peer-reviewed professional literature. These clinical policies along with other sources, such as plan benefits and state and federal laws and regulatory requirements, including any state- or plan-specific definition of "medically necessary," and the specific facts of the particular situation are considered by AmeriHealth Caritas VIP Care, on a case by case basis, when making coverage determinations. In the event of conflict between this clinical policy and plan benefits and/or state or federal laws and/or regulatory requirements, the plan benefits and/or state and federal laws and/or regulatory requirements shall control. AmeriHealth Caritas VIP Care's clinical policies are for informational purposes only and not intended as medical advice or to direct treatment. Physicians and other health care providers are solely responsible for the treatment decisions for their patients. AmeriHealth Caritas VIP Care's clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, AmeriHealth Caritas VIP Care will update its clinical policies as necessary. AmeriHealth Caritas VIP Care's clinical policies are not guarantees of payment.

Coverage policy

Electroretinography is clinically proven and, therefore, may be medically necessary to localize and characterize retinocortical pathway dysfunction when performed as an adjunct to standard clinical assessment, subjective tests of visual function, and retinal imaging methods (American Academy of Ophthalmology, 2022, 2024a, 2024b; American Optometric Association, 2017; Dumitrescu, 2020; Modjtahedi, 2025). Medically necessary uses for electroretinography include:

- To detect loss of retinal function or to distinguish retinal from optic nerve lesions in the following conditions (not all-inclusive): hereditary eye diseases; retinal vascular disease (e.g., diabetic retinopathy); autoimmune retinopathy; congenital or acquired childhood nystagmus; or unexplained vision loss in children
- To detect chloroquine and hydroxychloroquine toxicity (using multifocal electroretinography only) (Marmor, 2025)

Limitations

All other uses of electroretinography are investigational/not clinically proven and, therefore, not medically necessary, including, but not limited to, diagnosis, early detection, or monitoring disease progression in members with suspected glaucoma, age-related macular degeneration, psychiatric disorders, Parkinson's disease, amyotrophic lateral sclerosis, or Fabry disease.

Alternative covered services

Guideline-directed diagnostic work-up

Electro-oculography

Visual evoked potential

Background

Signs and symptoms associated with optic neuropathies, maculopathies, and retinopathies are often similar and can be challenging to diagnose. Diagnostic tests that detect structural changes associated with ocular pathology do not always correlate with clinical findings, as electrophysiological changes often precede structural findings on retinal imaging. Electrodiagnostic tests provide noninvasive, objective methods of localizing and characterizing retinocortical pathway dysfunction. Standardized electrodiagnostic testing performed according to International Society for Clinical Electrophysiology of Vision requirements is fundamental to diagnosis; functional phenotyping; and monitoring disease progression, treatment efficacy, and treatment safety (Calcagni, 2024).

The electroretinogram measures light-induced electrical activity in the retina (rods and cones) by placing a contact lens electrode on the eye or conjunctiva or skin electrodes attached to the lower eyelids to record responses to a series of lights (Robson, 2018). Standard full field electroretinograms, along with pattern and multifocal electroretinograms, have been developed:

- The full-field electroretinogram measures the electrical activity of the retina at the corneal surface and records the global or total retinal electrical response to a full-field (Ganzfeld) light stimulus. The recording enables the distinction between generalized outer and inner retinal dysfunction and between predominantly rod or cone system dysfunction, which can differentiate among various retinal diseases (Asanad, 2023a).
- The pattern electroretinogram measures central retinal function by assessing the retinal response to a pattern-reversing black-and-white checkerboard or striped stimulus, derived largely from the macular retinal ganglion cells. It can help differentiate between diseases of macular versus optic nerve dysfunction (Asanad, 2023b).
- The multifocal electroretinogram is a specialized type of pattern electroretinogram, which can simultaneously detect and localize distinct areas of outer retinal damage in the macula and paramacular and discrete peripheral areas, primarily the foveal cones or bipolar cell layers. It provides a topographical map of the distribution of retinal activity reflecting the integrity of central retinal (macula) function and helps correlate electrophysiologic findings with visual field testing (Asanad, 2022).

Findings

In the assessment of patients with visual impairment, ophthalmic examination and structural imaging may be normal in the presence of retinocortical pathway dysfunction or may reveal abnormalities that do not correlate

with the nature or severity of dysfunction. The unique information of function and dysfunction from the electroretinogram complements routine ophthalmic examination, subjective tests of visual function, and retinal imaging methods in determining the location of dysfunction within the visual pathway. The choice of electroretinogram and order of testing is individualized according to the clinical context.

Guidelines

The International Society for Clinical Electrophysiology of Vision has developed standards for use of electroretinography since 1989. The most recent guidelines provide recommendations for electrodes, stimuli, recording equipment, patient preparation, analysis/reporting, and reference values (Hoffmann, 2021; Robson, 2022; Thompson, 2024).

In another guideline, the International Society for Clinical Electrophysiology of Vision outlines general principles and common uses for electroretinograms. The full-field electroretinogram can distinguish between generalized outer and inner retinal dysfunction and predominant rod or cone system dysfunction of the entire retina. Since the retinal periphery primarily generates electrophysiological activity with minimal contribution from the macula, assessment of macular function requires the use of other techniques, such as pattern or multifocal electroretinograms. Together, pattern and full-field electroretinograms help differentiate maculopathy from generalized retinopathy. The multifocal electroretinogram offers superior spatial resolution, has no contribution from retinal ganglion cells, and is less affected by optical factors than the pattern electroretinogram. It is a useful adjunct for distinguishing the cause of visual evoked potential abnormality or central visual loss. The International Society for Clinical Electrophysiology of Vision offers a suggested test strategy for cases of suspected visual pathway dysfunction, starting with multifocal electroretinograms and proceeding to other complementary testing to localize dysfunction within the visual system (Robson, 2018).

The American Academy of Ophthalmology has issued several guidelines that incorporate the electroretinogram into the care management of patients with suspected or known retinopathy:

- In patients with inherited retinal degeneration, the full-field electroretinogram is important for diagnosis and staging of diffuse photoreceptor disease and evaluating the retina-wide function of rods and cones. Multifocal or pattern electroretinogram testing can be useful for detecting and monitoring disease progression for diseases that primarily affect the macula; however, their accuracy can be limited in those patients with notable loss of central vision who are unable to maintain steady fixation (American Academy of Ophthalmology, 2022).
- In patients with diabetic retinopathy, the electroretinogram may be considered to evaluate neural dysfunction of the retina (American Academy of Ophthalmology, 2024b).
- In patients with autoimmune retinopathy, electrophysiologic testing provides an objective means of identifying retinal dysfunction. Reduction of both rod and cone responses on a full-field electroretinogram is a key characteristic of non-paraneoplastic autoimmune retinopathy (Modjtahedi, 2025).
- When screening patients for chloroquine and hydroxychloroquine toxicity, the multifocal electroretinogram can corroborate findings on the primary tests of automated visual fields plus spectral-domain optical coherence tomography; it is not routinely recommended as a primary test (Marmor, 2025).
- In patients with congenital or acquired childhood nystagmus, a full-field electroretinogram can assist in narrowing the diagnosis when specific patterns are identified. This test can be performed awake on most infants and young children (Dumitrescu, 2020).
- For patients with age-related macular degeneration, there is no mention of the electroretinogram in the diagnostic work-up (American Academy of Ophthalmology, 2024a).

The American Optometric Association (2017) states an electroretinogram may assist in diagnosing children with unexplained vision loss.

The role of the electroretinogram in glaucoma is controversial. The International Society for Clinical Electrophysiology of Vision states that pattern electroretinogram is sensitive to macular ganglion cell dysfunction and nerve fiber layer loss in glaucoma. It may be of value in the evaluation of early or suspected glaucoma prior to the measurable loss of visual field. Full-field and multifocal electroretinograms are generally insensitive to ganglion cell injury (Robson, 2018). Neither the American Academy of Ophthalmology (2026a, 2026b) nor the American Optometric Association (2024) mentions the electroretinogram in the diagnostic workup or management of patients with suspected glaucoma.

Evidence review

The following systematic reviews and meta-analyses include indications for electroretinography not addressed or recommended in professional guidelines. These emerging indications are glaucoma, age-related macular degeneration, refractive errors, psychiatric disorders, Parkinson's disease, amyotrophic lateral sclerosis, and Fabry disease.

In the diagnosis of early manifest glaucoma, pattern electroretinogram has been proposed as a potentially reliable proxy for the viability of retinal ganglion cells. A review of 30 studies showed electrophysiological testing (including electroretinography) reasonably matched structural and functional analyses for glaucoma, but no definitive indications for routine use of the test exist for early detection or follow-up of the disease. Therefore, the evidence is insufficient to determine the clinical benefit of pattern electroretinogram-based testing in the work up of patients with suspected glaucoma (Senger, 2020).

The intrinsic variability of the testing methodology and high interobserver variability contribute to the lack of standard international reference ranges and, consequently, the use of the pattern electroretinogram in glaucoma diagnosis. The American Academy of Ophthalmology undertook a systematic review and meta-analysis of 23 case-control and cross-sectional studies (1,754 total eyes) to develop normative values and compare them to values in patients with ocular hypertension, suspected glaucoma, and early manifest glaucoma. The results require validation from additional prospective studies to establish the role of the pattern electroretinogram in the management of at-risk and early manifest glaucoma (Gallo Afflitto, 2023).

For age-related macular degeneration, a systematic review of six cross-sectional studies compared the extent of retinal dysfunction on full-field electroretinogram between patients with the disease (n = 301) and healthy individuals (n = 180). A meta-analysis was performed in four studies that used the International Society for Clinical Electrophysiology of Vision standard protocol, allowing for data comparison across laboratories. Outcome measures were a-wave function (representing photoreceptor function) and b-wave function (representing inner retinal function). The meta-analysis showed evidence of rod dysfunction in patients with late-stage disease, but not in patients with early-stage disease, when compared with healthy age-matched individuals. Rod dysfunction may not be observable on full-field electroretinogram until the disease has entered its late stage, when it has progressed beyond the macula. Further studies are warranted to explore the effects of the heterogeneity of age-related macular degeneration on the utility of the full-field electroretinogram (Forshaw, 2022).

In patients with refractive errors, electroretinography has been proposed to help distinguish retinal degeneration or dystrophy from severe functional vision issues caused by refractive error. Current systematic review evidence suggests multi-focal, pattern, and full-field electroretinograms can detect alterations in a- and b- waveforms in the myopic eye, but further study is needed to understand the functional changes of the retina behind high refractive errors and the role of electroretinography in this population (Ribeiro, 2025; Zahra, 2023).

Electroretinography is being used to investigate the electrophysiological underpinnings of mental health illnesses and major clinical phenomena. In a review by Youssef (2019), electroretinography showed promising results in correlating functional and structural abnormalities in the retina but with a lack of specificity in diagnosing various psychiatric disorders. The lack of consistency among protocols, small sample sizes, and lack of replicable findings limit the ability to quantify the results meaningfully through meta-analysis and, consequently, to interpret electroretinogram data reliably in psychiatry. Other analyses confirm these findings (Kaggwa, 2023; Kazakos, 2020; Komatsu, 2024; Peredo, 2022).

For other indications, electroretinography shows promise for diagnosis, early detection, or monitoring disease progression in patients with Parkinson's disease (Li, 2026), amyotrophic lateral sclerosis (Khanna, 2024), and Fabry disease (Biffi, 2022). Further longitudinal studies are needed to clarify the pathological mechanisms of retinal abnormalities and establish the retina as a marker of current disease state or predisposition to disease.

References

On 2/17/2026, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were: diabetic retinopathy, electroretinography, eye screen, macular degeneration. We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

American Academy of Ophthalmology. Age-related macular degeneration Preferred Practice Pattern. https://www.aao.org/Assets/0a6e1e7b-1698-4e42-8756-e82f45ec6a64/639021079025730000/age-related-macular-degeneration-ppp. Published 2024.(a)

American Academy of Ophthalmology. Clinical statement. Guidelines on clinical assessment of patients with inherited retinal degenerations. https://www.aao.org/Assets/fb574a6a-a13a-4353-bcbd-34d767a7147d/638006550690630000/inherited-retinal-degenerations-clin. Published 2022.

American Academy of Ophthalmology. Primary open-angle glaucoma Preferred Practice Pattern 2025. https://www.aao.org/education/preferred-practice-pattern/primary-open-angle-glaucoma-ppp. Published February 2026.(a)

American Academy of Ophthalmology. Primary Open-Angle Glaucoma Suspect Preferred Practice Pattern 2025. https://www.aao.org/education/preferred-practice-pattern/primary-open-angle-glaucoma-suspect-ppp. Published February 2026.(b)

American Academy of Ophthalmology. Summary Benchmarks for Preferred Practice Pattern — Retina. https://www.aao.org/Assets/d7e2280e-85c0-476c-9a33-09ef9bcbc4b7/638749651812530000/ppp-summary-benchmarks-24-retina-pdf. Published 2024.(b)

American Optometric Association. Care of the patient with primary open-angle glaucoma. https://www.aoa.org/documents/EBO/GLAUCOMA/FINAL_EBO_Glaucoma_Guildline_digital_10_28_24.pdf. Approved October 5, 2024.

American Optometric Association. Comprehensive pediatric eye and vision examination. https://www.aoa.org/AOA/Documents/Practice%20Management/Clinical%20Guidelines/EBO%20Guidelines/Comprehensive%20Pediatric%20Eye%20and%20Vision%20Exam.pdf. Approved February 12, 2017.

Asanad S, Karanjia R. Full-Field Electroretinogram. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. https://www.ncbi.nlm.nih.gov/books/NBK557483/. Updated August 28, 2023.(a)

Asanad S, Karanjia R. Multifocal Electroretinogram. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. https://www.ncbi.nlm.nih.gov/books/NBK564322/. Updated October 9, 2022.

Asanad S, Karanjia R. Pattern Electroretinogram. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. https://www.ncbi.nlm.nih.gov/books/NBK560641/. Updated July 25, 2023.(b)

Biffi E, Turple Z, Chung J, Biffi A. Retinal biomarkers of cerebral small vessel disease: A systematic review. *PLoS One*. 2022;17(4):e0266974. Doi: 10.1371/journal.pone.0266974.

Calcagni A, Neveu MM, Jurkute N, Robson AG. Electrodiagnostic tests of the visual pathway and applications in neuro-ophthalmology. *Eye (Lond)*. 2024;38(12):2392-2405. Doi: 10.1038/s41433-024-03154-6.

Dumitrescu AV, Ashton Scruggs B, Drack AV. Clinical Guidelines: Childhood Nystagmus Workup. American Academy of Ophthalmology website. https://www.aao.org/education/disease-review/clinical-guidelines-childhood-nystagmus-workup. Published February 12, 2020.

Forshaw TRJ, Subhi Y, Andreasson S, Sorenson TL. Full-field electroretinography changes associated with age-related macular degeneration: A systematic review with meta-analyses. *Ophthalmologica*. 2022;245(3):195-203. Doi: 10.1159/000521834.

Gallo Afflitto G, Chou TH, Swaminathan SS, et al. Pattern electroretinogram in ocular hypertension, glaucoma suspect and early manifest glaucoma eyes: A systematic review and meta-analysis. *Ophthalmol Sci*. 2023;3(4):100322. Doi: 10.1016/j.xops.2023.100322.

Hoffmann MB, Bach M, Kondo M, et al. ISCEV standard for clinical multifocal electroretinography (mfERG) (2021 update). *Doc Ophthalmol*. 2021;142(1):5-16. Doi: 10.1007/s10633-020-09812-w.

Kaggwa MM, Prat S, Davids A, et al. Electroretinography and suicidal behaviors: A systematic review. *BMC Psychiatry*. 2023;23(1):948. Doi: 10.1186/s12888-023-05453-w.

Kazakos CT, Karageorgiou V. Retinal changes in schizophrenia: A systematic review and meta-analysis based on individual participant data. *Schizophr Bull*. 2020;46(1):27-42. Doi: 10.1093/schbul/sbz106.

Khanna RK, Catanese S, Mortemousque G, et al. Exploring amyotrophic lateral sclerosis through the visual system: A systematic review. *Eur J Neurol*. 2024;31(12):e16475. Doi: 10.1111/ene.16475.

Komatsu H, Onoguchi G, Silverstein SM, et al. Retina as a potential biomarker in schizophrenia spectrum disorders: A systematic review and meta-analysis of optical coherence tomography and electroretinography. *Mol Psychiatry*. 2024;29(2):464-482. Doi: 10.1038/s41380-023-02340-4.

Li SWR, Gardner A, Votruba M. The retina as a biomarker for Parkinson's disease: A systematic review. *Neuroophthalmology*. 2026;50(1):1-12. Doi: 10.1080/01658107.2025.2547216.

Marmor MF, Ahn SJ, Ehlers JP, et al. Special AAO report: Recommendations on screening for hydroxychloroquine retinopathy (2025 revision). *Ophthalmology*. 2025; Doi: 10.1016/j.ophtha.2025.11.001.

Modjtahedi BS, Palestine AG, Jampol LM, et al. Guidelines for the diagnosis, management, and study of autoimmune retinopathy from the American Academy of Ophthalmology's task force. *Ophthalmol Retina*. 2025;9(10):1005-1016. Doi: 10.1016/j.oret.2025.03.024.

Peredo R, Hébert M, Mérette C. Developing a clinical decision tool based on electroretinogram to monitor the risk of severe mental illness. *BMC Psychiatry*. 2022;22(1):718. Doi: 10.1186/s12888-022-04375-3.

Ribeiro B, Fernandes A, Brardo FM, Vaz Pato M, Pinto N. Electrophysiological insights into neurovisual dysfunctions in myopia: A systematic review. *Semin Ophthalmol*. 2025:1-10. Doi: 10.1080/08820538.2025.2546535.

Robson AG, Frishman LJ, Grigg J, et al. ISCEV Standard for full-field clinical electroretinography (2022 update). *Doc Ophthalmol*. 2022;144:165-177. https://doi.org/10.1007/s10633-022-09872-0. Published May 5, 2022.

Robson AG, Nilsson J, Li S, et al. ISCEV guide to visual electrodiagnostic procedures. *Doc Ophthalmol*. 2018;136(1):1-26. Doi: 10.1007/s10633-017-9621-y.

Senger C, Moreto R, Watanabe SES, Matos AG, Paula JS. Electrophysiology in glaucoma. *J Glaucoma*. 2020;29(2):147-153. Doi: 10.1097/IJG.0000000000001422.

Thompson DA, Bach M, McAnany JJ, Šuštar Habjan M, Viswanathan S, Robson AG. ISCEV standard for clinical pattern electroretinography (2024 update). *Doc Ophthalmol*. 2024;148(2):75-85. Doi: 10.1007/s10633-024-09970-1.

Youssef P, Nath S, Chaimowitz GA, Prat SS. Electroretinography in psychiatry: A systematic literature review. *Eur Psychiatry*. 2019;62:97-106. Doi: 10.1016/j.eurpsy.2019.09.006.

Zahra S, Murphy MJ, Crewther SG, Riddell N. Flash electroretinography as a measure of retinal function in myopia and hyperopia: A systematic review. *Vision (Basel)*. 2023;7(1):15. Doi: 10.3390/vision7010015.

Policy updates

Initial review date: 6/2026 and clinical policy effective date: 7/2026

Related codes

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy CCP.1523. This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

Code	Code description
92273	Electroretinography (ERG), with interpretation and report; full field (i.e., ffERG, flash ERG, Ganzfeld ERG)
92274	Electroretinography (ERG), with interpretation and report; multifocal (mfERG)
0509T	Electroretinography (ERG) with interpretation and report, pattern (PERG)