

Subject: Visual, Somatosensory and Motor Evoked Potentials
Guideline #: CG-MED-50
Status: Reviewed

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Description

This document addresses non-operative uses of the following evoked potential (EP) studies:

- visual evoked potentials (VEPs);
- somatosensory evoked potentials (SSEPs or SEPs);
- motor evoked potentials (MEPs).

Evoked potentials (EPs) or evoked responses are electrical waves created in the central nervous system by peripheral stimulation of a sensory organ. EPs are used to identify abnormal central nervous system function that may not be detected clinically.

Note: This document does not address intra-operative uses for VEPs, SSEPs, or MEPs. Please see the following related documents for additional information:

- [CG-MED-94 Vestibular Function Testing](#);
- [CG-SURG-104 Intraoperative Neurophysiological Monitoring](#).

Clinical Indications

I. Visual Evoked Potentials:

Medically Necessary:

Visual evoked potentials are considered **medically necessary** for the diagnosis, evaluation, or monitoring of any of the following conditions:

- A. Multiple sclerosis or neuromyelitis optica, or other demyelinating disorders of the optic nerve;**or**
- B. Suspected disorder of the optic nerve, optic chiasm or optic radiations not explained by magnetic resonance imaging, computerized tomography, infectious diseases or metabolic disorders.

Not Medically Necessary:

Visual evoked potentials are considered **not medically necessary** for all other uses, including but not limited to glaucoma testing and routine screening of infants.

II. Somatosensory Evoked Potentials:

Medically Necessary:

Somatosensory evoked potentials are considered **medically necessary** when the results will be used to guide clinical management for the following conditions:

- A. Acute (within 72 hours of onset) anoxic encephalopathy;**or**
- B. Coma following traumatic, hypoxic-ischemic and other diffuse brain injuries;**or**
- C. Central nervous system deficit identified on clinical exam when not explained by appropriate imaging studies;**or**
- D. Demyelinating disease (such as multiple sclerosis) when diagnosis is uncertain and clinical suspicion exists based on neurologic symptoms or cerebrospinal fluid evaluation; **or**
- E. Myelopathy, unexplained; **or**
- F. Spinocerebral degeneration (such as Friedreich's ataxia);**or**
- G. Spinal cord lesions secondary to trauma when the need for surgical intervention is uncertain;**or**
- H. Suspected brain death.

Not Medically Necessary:

Somatosensory evoked potentials are considered **not medically necessary** for all other uses.

III. Motor Evoked Potentials:

Medically Necessary:

Motor evoked potentials are considered **medically necessary** for evaluation of suspected hysterical or factitious paralysis.

Not Medically Necessary:

Motor evoked potentials are considered **not medically necessary** in the non-operative setting when the above criteria are not met.

Coding

The following codes for treatments and procedures applicable to this guideline 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 policy. 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.

Visual evoked potentials, non-operative

When services may be Medically Necessary when criteria are met:

CPT	
95930	Visual evoked potential (VEP) checkerboard or flash testing, central nervous system except glaucoma, with interpretation and report
0333T	Visual evoked potential, screening of visual acuity, automated, with report

ICD-10 Diagnosis

G35	Multiple sclerosis
H46.00-H46.9	Optic neuritis
H47.011-H47.49	Disorders of optic nerve, not elsewhere classified
H54.0X33-H54.8	Blindness and low vision

When services are Not Medically Necessary:

For the procedure codes listed above when criteria are not met, for all other diagnoses not listed, or for situations designated in the Clinical Indications section as not medically necessary.

When services are also Not Medically Necessary:

For the following procedure codes; or when the code describes a procedure designated in the Clinical Indications section as not medically necessary.

CPT	
0464T	Visual evoked potential, testing for glaucoma, with interpretation and report

ICD-10 Diagnosis

All diagnoses

Somatosensory evoked potentials, non-operative

When services may be Medically Necessary when criteria are met:

CPT	
	For the following codes when specified as 'non-operative':
95925	Short-latency somatosensory evoked potential study, stimulation of any/all peripheral nerves or skin sites, recording from the central nervous system; in upper limbs
95926	Short-latency somatosensory evoked potential study, stimulation of any/all peripheral nerves or skin sites, recording from the central nervous system; in lower limbs
95927	Short-latency somatosensory evoked potential study, stimulation of any/all peripheral nerves or skin sites, recording from the central nervous system; in the trunk or head
95938	Short-latency somatosensory evoked potential study, stimulation of any/all peripheral nerves or skin sites, recording from the central nervous system; in upper and lower limbs

ICD-10 Diagnosis

All diagnoses

When services are Not Medically Necessary:

For the procedure codes listed above when criteria are not met.

Motor evoked potentials, non-operative

When services may be Medically Necessary when criteria are met:

CPT	
	For the following codes when specified as 'non-operative':
95928	Central motor evoked potential study (transcranial motor stimulation); upper limbs
95929	Central motor evoked potential study (transcranial motor stimulation); lower limbs
95939	Central motor evoked potential study (transcranial motor stimulation); in upper and lower limbs

ICD-10 Diagnosis

All diagnoses

When services are Not Medically Necessary:

For the procedure codes listed above when criteria are not met.

Discussion/General Information

Evoked Potentials are recordings of the nervous system's electrical response to the stimulation of specific sensory pathways. These recordings have the ability to provide information relative to the functional integrity of pathways within the nervous system. Only a few evoked potentials are used on a routine basis and those most frequently encountered include VEPs and SSEPs.

Visual Evoked Potentials (VEPs)

VEPs track signals from the retina to the visual cortex and determine how a visual system reacts to light. A common indication for VEPs is to help confirm the diagnosis of MS, or to evaluate and monitor MS. In general, myelin plaques that occur in MS slow the speed of VEP wave peaks. Over time, VEPs in individuals with MS become progressively slower, eventually attenuating in amplitude as demyelination increases (Creel, 2012). The American Academy of Neurology (AAN) (Gronseth, 2000) recommends VEPs as probably useful to identify those at increased risk for clinically definite MS.

VEPs have also been used for other conditions including neuromyelitis optica (NMO) or other demyelinating disorders of the optic nerves, or for a suspected disorder of the optic nerve, optic chiasm, or optic radiations not explained by magnetic resonance imaging (MRI), computerized tomography (CT), infectious diseases, or metabolic disorders.

The U.S. Preventive Services Task Force (USPSTF) (2017) has not recommended vision screening for infants and young children. The USPSTF concludes that the evidence is insufficient to assess the balance of benefits and harms of vision screening for children less than 3 years of age.

van Laerhoven and colleagues (2013) published a systematic literature review to investigate the prognostic value of clinical tests used for evaluation of long-term neurodevelopmental outcomes of neonates with perinatal asphyxia and hypoxic-ischemic encephalopathy (HIE). A total of 29 studies were included in the review describing 13 prognostic tests performed 1631 times in 1306 term neonates. Considerable heterogeneity was noted in test performance, cut-off values, and outcome measures. The VEP was found to have

relatively high diagnostic accuracy (sensitivity 0.90 [0.74-0.97]; specificity 0.92 [0.68-0.98]). This review reported on diagnostic accuracy of VEP; well-designed prospective studies examining clinical utility are needed before standardized clinical use is advocated.

Several small studies (Horn, 2012; Pillai, 2013) have investigated the use of VEP technology to differentiate between normal healthy eyes and eyes with early to advanced visual field loss resulting from glaucoma. The authors indicated that VEP signals may discriminate between normal eyes and glaucomatous eyes. However, larger studies are needed to confirm these findings. Additionally, VEP has not been shown to be as good as or superior to standard visual field testing in managing clinical outcomes for persons with glaucoma.

Somatosensory Evoked Potentials (SSEPs)

SSEPs are electrical waves that are generated by the response of sensory neurons to stimulation. An abnormal SSEP finding demonstrates that there is dysfunction within the somatosensory pathways.

SSEP studies may be useful for helping to assess the extent of injury and predict outcomes in persons with traumatic, hypoxic-ischemic and other diffuse brain injuries, including those who are comatose. A 2020 systematic review by Sandroni and colleagues identified 94 studies evaluating factors associated with a poor neurological outcome in comatose individuals following cardiac arrest. Among other factors identified in the review, the bilateral absence of N20 waves of short latency SSEP within 7 days of the return of spontaneous circulation, examined in 18 studies, was associated with a poor neurological outcome in most of the 18 studies.

Wijdicks and colleagues (2006) for the Quality Standards Subcommittee of the American Academy of Neurology issued a practice parameter on "Prediction of outcome in comatose survivors after cardiopulmonary resuscitation (an evidence-based review)." The authors recommended that the assessment of poor prognosis can be guided by the bilateral absence of cortical SSEPs (N20 response) within 1 to 3 days (recommendation level B).

The American Academy of Neurology (AAN) (Gronseth, 2000) recommends SSEPs as possibly useful to identify those at increased risk of for developing clinically definite MS.

Additional indications for SSEPs include: acute anoxic encephalopathy; deficit of the central nervous system identified on exam, but not explained by appropriate imaging studies; demyelinating diseases under certain conditions; unexplained myelopathy; spinocerebral degeneration (such as Friedreich's ataxia); spinal cord lesions secondary to trauma when the need for surgical intervention is uncertain; or suspected brain death.

Motor Evoked Potentials (MEPs)

MEPs evaluate motor pathways located in the anterolateral spinal tracts perfused by the anterior spinal artery. Single- or repetitive-pulse stimulation of the brain causes the spinal cord and peripheral muscles to produce neuroelectrical signals known as MEPs. In a case series, Cantello and colleagues (2001) examined the use of MEPs for diagnosing psychogenic or hysterical paralysis. The series found that MEP studies assisted in the diagnosis of psychogenic paralysis and the authors noted that if nerve trunks and muscles were found to be intact, a psychogenic cause for paralysis may be implied.

A systematic review by Siow and colleagues in 2019 examined published literature on the MEPs as a potential biomarker for hereditary spastic paraplegia (HSP). The authors identified 32 studies on MEPs and HSP published between 1987 and 2016. Studies were primarily case series/case reports or case-control studies. No pooled analyses of study data were performed due to differences in study methodologies and heterogeneity among study results. The most common finding of the included studies, according to the review's authors, was absent or prolonged lower limb center motor conduction time (CMCT) in individuals with HSP (this was true for 78% of study participants). However, studies varied widely in their findings on the correlation between CMCT and clinical outcomes, such as disease severity and gait abnormalities. Prospective studies with long-term follow-up are needed to clarify the utility of MEPs as a prognostic biomarker for HSP.

Definitions

Friedreich's ataxia: A rare genetic disease that affects the muscles and heart.

Hysterical paralysis: An uncommon psychogenic, nonorganic loss of motor function.

Visually evoked potential (VEP), (visually evoked response [VER] and visually evoked cortical potential [VECP] are equivalent): These terms refer to electrical potentials, initiated by brief visual stimuli, which are recorded from the scalp overlying the visual cortex. VEP waveforms are extracted from the electro-encephalogram (EEG) by signal averaging. VEPs are used primarily to measure the functional integrity of the visual pathways from the retina via the optic nerves to the visual cortex of the brain. Evoked potentials, whether auditory, visual or somatosensory, are extracted from the EEG by a simple computer program that saves a defined time period of EEG activity following a visual stimulus and isolates the VEP. Transient pattern VEPs have components that can be followed during maturation, pathological conditions and changes of visual acuity.

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Government Agency, Medical Society, and Other Authoritative Publications:

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Websites for Additional Information

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The use of specific product names is illustrative only. It is not intended to be a recommendation of one product over another, and is not intended to represent a complete listing of all products available.

History

Status	Date	Action
Reviewed	02/15/2024	Medical Policy & Technology Assessment Committee (MPTAC) review. Updated the note in the Description section to include a cross reference to CG-MED-94 Vestibular Function Testing (for vestibular evoked potential testing). Also updated the Discussion/General Information, References and Websites for Additional Information sections.
Reviewed	02/16/2023	MPTAC review. References were updated.
Reviewed	02/17/2022	MPTAC review. The Definitions and References sections were updated. Updated Coding section.
Reviewed	02/11/2021	MPTAC review. Discussion/General Information and References sections updated. Reformatted Coding section.
	10/01/2020	Updated Coding section with 10/01/2020 ICD-10-CM changes; added G11.10 replacing G11.1 deleted 09/30/2020.
Reviewed	02/20/2020	MPTAC review. Discussion/General Information, References and Websites sections updated.
Reviewed	03/21/2019	MPTAC review. References and Websites sections updated.
Reviewed	05/03/2018	MPTAC review. References and Websites sections updated.
	12/27/2017	The document header wording updated from "Current Effective Date" to "Publish Date." Updated Coding section with 01/01/2018 CPT descriptor change for code 95930.
Revised	05/04/2017	MPTAC review. Added glaucoma testing to not medically necessary statement for visual evoked potentials. Replaced "deficiency" with "deficit" in medically necessary statement for somatosensory evoked potentials. Formatting updated and abbreviations removed in Clinical Indications section. Discussion and References sections updated.
	01/01/2017	Updated Coding section with 01/01/2017 CPT changes.
	10/01/2016	Updated Coding section with 10/01/2016 ICD-10-CM diagnosis code changes.
Revised	05/05/2016	MPTAC review. Spelled out abbreviations in Clinical Indications section. Discussion and References sections updated. Removed ICD-9 codes from Coding section.

Reviewed	05/07/2015	MPTAC review. Description, Discussion, Coding and References sections updated.
Reviewed	05/15/2014	MPTAC review. Discussion and References sections updated.
New	05/09/2013	MPTAC review. Initial document development.

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