MEDICAL POLICY

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MEDICAL POLICY DETAILS	
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Product Disclaimer	• *If a product excludes coverage for a service, it is not covered, and medical policy criteria do not apply.* • *If a commercial product (including an Essential Plan or Child Health Plus product), medical policy criteria apply to the benefit.* • *If a Medicaid product covers a specific service, and there are no New York State Medicaid guidelines (eMedNY) criteria, medical policy criteria apply to the benefit.* • *If a Medicare product (including Medicare HMO-Dual Special Needs Program (DSNP) product) covers a specific service, and there is no national or local Medicare coverage decision for the service, medical policy criteria apply to the benefit.* • *If a Medicare HMO-Dual Special Needs Program (DSNP) product DOES NOT cover a specific service, please refer to the Medicaid Product coverage line.*

POLICY STATEMENT

Based upon our criteria and assessment of the peer-reviewed literature:

I. Visual-evoked potentials have been medically proven to be effective and, therefore, are considered **medically appropriate** for the following indications:
   A. To diagnose and monitor multiple sclerosis;
   B. To localize the cause of a visual field defect that is not explained by lesions seen on CT or MRI, metabolic disorder, or infectious disease; or
   C. To diagnose or evaluate deficits or damage to the visual system of infants or unresponsive/nonverbal patients.

II. Somatosensory-evoked potentials have been medically proven to be effective and, therefore, are considered **medically appropriate** for the following indications:
   A. To assess any decline that may be considered emergent to surgery in unconscious spinal cord injury patients who show specific structural damage to the somatosensory system and who are candidates for emergency spinal cord surgery;
   B. To diagnose and monitor multiple sclerosis;
   C. To evaluate patients with suspected brain death;
   D. To diagnose unexplained myelopathy; or
   E. To localize the cause of a neurologic deficit seen on exam and not explained by lesions on CT or MRI.

III. Auditory-evoked potentials have been medically proven to be effective and, therefore, are considered **medically appropriate** for the following indications:

A. To evaluate brainstem function in acquired metabolic disorders;
B. To assess recovery of brainstem function after a lesion compressing the brainstem has been surgically removed;
C. To localize the cause of a neurologic deficit seen on exam, not explained by lesions seen on computed tomography (CT) scan or magnetic resonance imaging (MRI);
D. To diagnose and monitor demyelinating and degenerative diseases affecting the brain stem (e.g., multiple sclerosis, central pontine myelinolysis, olivopontocerebellar degeneration, and others);
E. To diagnose lesions in the auditory system;
F. To evaluate the irreversibility of coma or brain death, along with an electroencephalogram (EEG); or
G. For children under age five, to determine the type and degree of hearing problems or to determine the developed status of nerves.

IV. Vestibular evoked myogenic potentials (cVEMPs and oVEMPs) are considered **investigational**.

V. Intra-operative neurophysiologic monitoring has been medically proven to be effective and, therefore, is considered **medically appropriate** during high-risk thyroid or parathyroid surgery, or during spinal, intracranial, or vascular procedures. All other indications for intra-operative neurophysiologic monitoring are considered **not medically necessary.**

VI. Intra-operative monitoring of visual-evoked potentials is considered **investigational**.

VII. Visual-evoked potential testing for the diagnosis and evaluation of glaucoma is considered **investigational.**

VIII. Due to lack of approval from the United States Food and Drug Administration (FDA), the use of transcranial magnetic stimulation to elicit motor-evoked potentials is considered **investigational**.

Refer to Corporate Medical Policy #11.01.03 Experimental and Investigational Services.

Refer to Corporate Medical Policy #2.01.39 Auditory Processing Disorder (APD) Testing.

DESCRIPTION

Evoked potentials (EP) are responses (electrical signals) produced by the nervous system in response to a stimulus. These computerized tests help diagnose nerve disorders, locate the site of nerve damage, and evaluate the patient's condition after treatment or during surgery. There are several types of EP tests. Each uses mild stimulus to cause the nerves to react and send a message to the brain. Electrodes placed on the skin surface record how the brain and spinal cord respond to stimulus. The responses are analyzed by a computer and printed as a waveform pattern. The wave pattern may reveal certain problems and show where any damage is located along the nerve pathway(s) being tested. EPs can be further broken down into the following categories, according to the type of stimulation used:

I. **Somatosensory-Evoked Potentials**

Somatosensory-evoked potentials (SSEPs) are electrical waves that are generated by the response of sensory neurons to stimulation. Peripheral nerves, such as the median, ulnar or tibial nerves, are typically stimulated, but in some situations the spinal cord may be stimulated directly. Recording is done either cortically or at the level of the spinal cord above the surgical procedure.

II. **Auditory-Evoked Potentials**

A. Auditory-evoked potentials, also called auditory brainstem response (ABR), are electrophysiologic measures of auditory function that utilizes responses produced by the auditory nerve and brainstem and helps differentiate sensory from neural hearing loss. The response is the waveform averaged over many auditory clicks.

B. Brainstem auditory-evoked potentials (BAEPs) are generated in response to auditory clicks and can define the functional status of the auditory nerve. Surgical resection of a cerebellopontine angle tumor, such as an acoustic neuroma, places the auditory nerves at risk, and BAEPs have been extensively used to monitor auditory function during these procedures.

III. **Vestibular Evoked Myogenic Potentials**

Vestibular-evoked myogenic potentials (VEMPs) testing is described as an alternative method of assessing otolith organs and their function, with a goal of diagnosing suspected vestibular disorders. VEMPs are performed by repeatedly stimulating the ears using loud sounds such as clicks and tone bursts or bone vibration. These sounds/vibrations create a pressure stimulus. VEMPs are recorded using slightly modified standard evoked potential equipment. The cervical VEMP (cVEMP) pathway begins in the saccule, that travels through the inferior vestibular nerve, vestibular nucleus, medial vestibulospinal tract, the accessory nucleus, the eleventh nerve, and then to a contracted ipsilateral sternocleidomastoid muscle where it is recorded via surface electrode. An abnormality in any part of the pathway is thought to affect the response. Ocular VEMPs (oVEMPs) stimulate the otolithic membrane, traveling to the vestibule to trigger the utricle and the vestibular ocular reflex causing contraction of the extraocular muscle and is measured by surface electrodes placed under the contralateral eye during an upward gaze. VEMPS have been investigated for the diagnosis of vestibular neuritis, benign paroxysmal positional vertigo, vestibular schwannoma, Meniere disease, vestibular migraine, superior semicircular canal dehiscence (SCDS), and other vestibular disorders.

IV. **Visual-Evoked Potentials**

Visual-evoked potentials (VEPs) are used to track visual signals from the retina to the occipital cortex. VEP monitoring has been used for surgery on lesions near optic chiasm. However, intra-operatively recorded VEPs are very difficult to interpret, due to their sensitivity to anesthesia, temperature, and blood pressure.

V. **Motor-Evoked Potentials**

Motor-evoked potentials (MEPs) are elicited by either electrical or magnetic stimulation of the motor cortex or the spinal cord. Transcranial electrical stimulation involves stimulation of the motor cortex via electrodes placed on the scalp, or, if the brain is exposed by a craniotomy, placed directly on the brain surface. Magnetic stimulation delivers a pulsed magnetic field over the scalp in the region of the primary motor cortex. Magnetic stimulation is generally regarded as unsuitable for intra-operative monitoring because it is more sensitive to anesthesia.

VI. **Intra-Operative Neurophysiologic Monitoring**

Intra-operative neurophysiologic monitoring (IONM) describes a variety of procedures used to monitor the integrity of neural pathways during high-risk neurosurgical, orthopedic, and vascular surgeries. It involves the detection of electrical signals produced by the nervous system in response to sensory or electrical stimuli, to provide information about the functional integrity of neuronal structures. Different methodologies include, but may not be limited to, SSEPs, MEPs using transcranial electrical stimulation, BAEPs, electromyography (EMG) of cranial nerves, electroencephalography, and electrocorticography.

RATIONALE

There is sufficient data published in the medical literature to conclude that measurement of EPs and intra-operative monitoring of EPs, in appropriate situations, improves health outcome. Improved health outcomes have been achieved outside the investigational setting.

Studies have demonstrated a statistically significant association between abnormal VEPs and an increased risk of developing clinically definite multiple sclerosis (CDMS). In these studies, patients with suspected multiple sclerosis (MS) were 2.5 to 9 times as likely to develop CDMS as patients with normal VEPs. VEP sensitivities ranged from 25% to 83%. VEPs improved the ability to predict which MS suspects will develop CDMS by as much as 29%. Measurement of visual-evoked responses (VERs) is the primary means of objectively testing vision in infants and young children. VER measurements are useful in infants and young children suspected of having disorders of the visual system, where the child is too young to report differences in color vision or to undergo assessment of visual fields and visual acuity. Lesions affecting the visual pathways can be localized by noting the presence of decreased amplitudes or increased latencies of VERs, and by determining whether VER abnormalities involve one or both eyes.

Several small studies (Pillai et al., 2013; Mousa et al., 2014; Jha et al., 2017 and Waisbourd et al., 2017) 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 superior to standard visual field testing in the diagnosis of glaucoma or management of clinical outcomes.

The clinical utility of BAEP over standard auditory testing is due to BAEP's characteristics: (1) BAEP's resistance to alteration by systemic metabolic abnormalities, medications or pronounced changes in the state of consciousness of the patient; and (2) the close association of BAEP waveform abnormalities to underlying structural pathology. BAEP has been proven effective for differentiating conductive from sensory hearing loss, for detecting tumors and other disease states affecting central auditory pathways (e.g., acoustic neuromas, subclinical lesions in MS), and for non-invasively detecting hearing loss in patients who cannot cooperate with subjective auditory testing (e.g., infants, comatose patients). BAEP is the test of choice to assess hearing in infants and young children. It is most useful for following asphyxia, hyperbilirubinemia, intracranial hemorrhage, or meningoencephalitis or for assessing an infant who has trisomy. BAEP also is useful in the assessment of MS or other demyelinating condition, coma, or hysteria. Audiometric analysis using multiple sound frequencies is usually preferred over BAEP for testing hearing in cooperative patients who are able to report when sounds are heard.

The American Academy of Neurology (AAN) released a practice guideline for cervical and ocular vestibular evoked myogenic potential testing in 2017, after reviewing relevant published studies from January 1980 through December 2016. The guideline states that clinicians may use cVEMP and oVEMP to distinguish SCDS from controls, and notes that the guideline is based on class III studies with several limitations, including low number of participants and potential for bias. No meta-analysis could be conducted on these studies given their heterogeneity. The AAN goes on to state:

> "…evidence is insufficient to determine whether cVEMP and oVEMP can accurately identify vestibular function specifically related to the saccule/utricle, or whether cVEMP or oVEMP is useful in diagnosing vestibular neuritis or Meniere disease. It has not been demonstrated that cVEMP substantively aids in diagnosing benign paroxysmal positional vertigo, or that cVEMP or oVEMP aids in diagnosing/managing vestibular migraine."

Published studies mostly assess how cVEMP and oVEMP change with various disease states as opposed to assessing the diagnostic accuracy or determination of appropriate populations. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

IONM has been utilized in attempts to minimize neurological morbidity from operative manipulations. The goal of such monitoring is to identify changes in brain, spinal cord, and peripheral nerve function prior to irreversible damage. Intraoperative monitoring also has been effective in localizing anatomical structures, including peripheral nerves and sensorimotor cortex, which helps guide the surgeon during dissection. SSEP has been the standard of intraoperative monitoring, with excellent ability to assess dorsal column and lateral sensory tract function; it may also be able to detect changes in function of anterior motor tracts by stimulating mixed sensorimotor peripheral nerves. However, significant motor deficits have been seen in patients undergoing spinal surgery, despite normal SSEPs. MEPs were developed to better monitor the motor neurophysiological pathways.

In patients with pre-operative spinal cord compromise, MEPs may be present when SSEPs are absent or ill-defined. This is because MEPs and SSEPs are conducted in different spinal cord pathways and have different blood supplies. Consequently, being able to perform MEP monitoring makes spinal cord monitoring possible in cases where SSEP signals are unobtainable. In the operating room, transcranial electrical stimulation is preferable to transcranial magnetic stimulation, because the electrical stimulus is more reproducible.

For individuals who receive IONM while undergoing thyroid or parathyroid surgery due to high risk of injury to the recurrent laryngeal nerve (RLN), the evidence includes a large, randomized, controlled trial (RCT) and systematic reviews. Relevant outcomes are morbid events, functional outcomes, and quality of life. The strongest evidence on neurophysiologic monitoring derives from an RCT of 1,000 patients undergoing thyroid surgery. This RCT found a

significant reduction in RLN injury in patients at high risk for injury. "High risk" in this trial was defined as surgery for cancer, thyrotoxicosis, retrosternal or giant goiter, or thyroiditis. The high-risk category may also include patients with prior thyroid or parathyroid surgery or total thyroidectomy. A low volume of surgeries might also contribute to a higher risk for RLN injury. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

CODES

- *Eligibility for reimbursement is based upon the benefits set forth in the member's subscriber contract.*
- *CODES MAY NOT BE COVERED UNDER ALL CIRCUMSTANCES. PLEASE READ THE POLICY AND GUIDELINES STATEMENTS CAREFULLY.*
- *Codes may not be all inclusive as the AMA and CMS code updates may occur more frequently than policy updates.*
- *Code Key: Experimental/Investigational = (E/I), Not medically necessary/appropriate = (NMN)*

CPT Codes

Code	Description
92517 **(E/I)**	Vestibular evoked myogenic potential (VEMP) testing, with interpretation and report, cervical (cVEMP)
92518 **(E/I)**	Vestibular evoked myogenic potential (VEMP) testing, with interpretation and report, ocular (oVEMP)
92519 **(E/I)**	Vestibular evoked myogenic potential (VEMP) testing, with interpretation and report, cervical (cVEMP) and ocular (oVEMP)
92650	Auditory evoked potentials; screening of auditory potential with broadband stimuli, automated analysis
92651	Auditory evoked potentials; for hearing status determination, broadband stimuli, with interpretation and report
92652	Auditory evoked potentials; for threshold estimation at multiple frequencies, with interpretation and report
92653	Auditory evoked potentials; neurodiagnostic, with interpretation and report
95925-95927, 95938	Somatosensory-evoked potentials (code range)
95928-95929, 95939	Central motor evoked potential study (transcranial motor stimulation) (code range)
95930	Visual-evoked potential (VEP) checkerboard or flash testing, central nervous system except glaucoma, with interpretation and report
95940	Continuous intraoperative neurophysiology monitoring in the operating room, one on one monitoring requiring personal attendance, each 15 minutes (List separately in addition to code for primary procedure)
95941	Continuous intraoperative neurophysiology monitoring, from outside the operating room (remote or nearby) or for monitoring of more than one case while in the operating room, per hour (List separately in addition to code for primary procedure)
0333T **(E/I)**	Visual evoked potential, screening of visual acuity, automated, with report
0464T **(E/I)**	Visual evoked potential, testing for glaucoma, with interpretation and report

HCPCS Codes

Code	Description
G0453	Continuous intraoperative neurophysiology monitoring, from outside the operating room (remote or nearby) per patient (attention directed exclusively to one patient) each 15 minutes (List separately in addition to code for primary procedure)

ICD10 Codes

Code	Description
C71.6	Malignant neoplasm of cerebellum
C79.31	Secondary malignant neoplasm of brain
D33.0-D33.2	Benign neoplasm of brain (code range)
D33.3	Benign neoplasm of cranial nerves
D43.0-D43.2	Neoplasm of uncertain behavior of brain (code range)
D43.4	Neoplasm of uncertain behavior of spinal cord
D49.6	Neoplasm of unspecified behavior of brain
H40.001-H40.9 **(E/I)**	Glaucoma (code range)
H53.411-H53.419	Scotoma involving central area (code range)
H53.421-H53.429	Scotoma of blind spot area (code range)
H53.431-H53.439	Sector or arcuate defects (code range)
H53.451-H53.459	Other localized visual field defect (code range)
H53.461-H53.469	Homonymous bilateral field defects (code range)
H53.47	Heteronymous bilateral field defects
H53.481-H53.489	Generalized contraction of visual field (code range)
I63.031-I63.039	Cerebral infarction due to thrombosis of carotid artery (code range)
I63.131-I63.139	Cerebral infarction due to embolism of carotid artery (code range)
I63.231-I63.239	Cerebral infarction due to unspecified occlusion or stenosis of carotid arteries (code range)
I65.21-I65.29	Occlusion and stenosis of carotid artery (code range)
I71.00-I71.03	Dissection of aorta (code range)
M40.00-M40.05	Postural kyphosis (code range)
M40.202-M40.209	Unspecified kyphosis (code range)
M40.292-M40.299	Other kyphosis (code range)
M40.30-M40.37	Flatback syndrome (code range)

Code	Description
M40.40-M40.57	Lordosis (code range)
M41.00-M41.27	Idiopathic scoliosis (code range)
M41.30-M41.35	Thoracogenic scoliosis (code range)
M41.80-M41.87	Other forms of scoliosis (code range)
M41.9	Scoliosis, unspecified
M43.6	Torticollis
M48.00-M48.08	Spinal stenosis (code range)
M50.10-M50.13	Cervical disc disorder with radiculopathy (code range)
M50.20-M50.23	Other cervical displacement (code range)
M53.0	Cervicocranial syndrome
M53.1	Cervicobrachial syndrome
M53.80-M53.88	Other specified dorsopathies (code range)
M54.11	Radiculopathy, occipito-atlanto-axial region
M54.13	Radiculopathy, cervicothoracic region
M54.81	Occipital neuralgia
M96.3	Postlaminectomy kyphosis
M96.4	Postsurgical lordosis
M99.20-M99.29	Subluxation stenosis of neural canal (code range)
M99.30-M99.39	Osseous stenosis of neural canal (code range)
M99.40-M99.49	Connective tissue stenosis of neural canal (code range)
M99.50-M99.59	Intervertebral disc stenosis of neural canal (code range)
M99.60-M99.69	Osseous and subluxation stenosis of intervertebral foramina (code range)
M99.70-M99.79	Connective tissue and disc stenosis of intervertebral foramina (code range)

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*Key Article

KEY WORDS

ABR, BAEPs, Evoked potentials, MEPS, SEEPs, VEPS, VEMP, oVEMP, cVEMP.

CMS COVERAGE FOR MEDICARE PRODUCT MEMBERS

There is currently a National Coverage Determination (NCD) for Evoked Response Tests. Please refer to the following NCD website for Medicare Members: [http://www.cms.gov/medicare-coverage-database/details/ncd-details.aspx?NCDId=200&ncdver=1&CoverageSelection=Both&ArticleType=All&PolicyType=Final&s=New+York+-+Upstate&CptHcpcsCode=36514&bc=gAAAABAAAAAA&]

There is currently a Local Coverage Determination (LCD) for Visual Electrophysiology Testing. Please refer to the following LCD website for Medicare Members: [https://www.cms.gov/medicare-coverage-database/details/lcd-details.aspx?LCDId=36831&ver=34&SearchType=Advanced&CoverageSelection=Both&NCSelection=NCA%7cCAL%7cNCD%7cMEDCAC%7cTA%7cMCD&ArticleType=SAD%7cEd&PolicyType=Both&s=41&KeyWord=evoked+potentials&KeyWordLookUp=Doc&KeyWordSearchType=Exact&kq=true&bc=IAAAACAAgAAA&]