Clinical Policy Title: Somatosensory evoked potentials (SEPs or SSEPs) test

Clinical Policy Number: 09.01.10

Effective Date: January 1, 2016
Initial Review Date: June 16, 2013
Most Recent Review Date: September 21, 2016
Next Review Date: September 2017

Policy contains:
- Somatosensory evoked potentials (SEPs or SSEPs) test.

Related policies:
None.

ABOUT THIS POLICY: AmeriHealth Caritas Pennsylvania has developed clinical policies to assist with making coverage determinations. AmeriHealth Caritas Pennsylvania’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 Pennsylvania 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 Pennsylvania’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 Pennsylvania’s clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, AmeriHealth Caritas Pennsylvania will update its clinical policies as necessary. AmeriHealth Caritas Pennsylvania’s clinical policies are not guarantees of payment.

Coverage policy

AmeriHealth Caritas Pennsylvania considers the use of short-latency somatosensory evoked potential (SEPs or SSEPs) testing to be clinically proven and therefore, medically necessary when the following criteria are met:

- To assess any neurologic decline which may warrant emergent surgery in unconscious spinal cord injury members who show specific structural damage to the somatosensory system, and who are candidates for emergency spinal cord surgery.
- For diagnosis and management of specific neurologic diseases which involve the somatosensory system, conditions such as multiple sclerosis (MS), spinal cord trauma, myoclonus and pelizaeus-merzbacher disease.
- Intraoperative monitoring during surgeries that place parts of the somatosensory pathways at risk.
- To evaluate members with sensory symptoms that might be psychogenic.
- To localize the cause of a central nervous system deficit seen on exam, but not explained by
lesions seen on computerized tomography (CT) or magnetic resonance imaging (MRI).

- To manage members with spinocerebellar degeneration (e.g., Friedreichs ataxia, olivopontocerebellar [OPC] degeneration).
- Unexplained myelopathy.
- To evaluate members with suspected brain death.
- All medical necessity criteria must be clearly documented in the member's medical record and made available upon request.

Limitations:
AmeriHealth Caritas Pennsylvania considers all other uses of somatosensory evoked potentials testing not medically necessary.

Note: SSEP studies are appropriate only when a detailed clinical history, neurologic examination and appropriate diagnostic tests, such as imaging studies, electromyogram, and nerve conduction studies make a lesion (or lesions) of the central somatosensory pathways a likely and reasonable differential diagnostic possibility.

Note: The following CPT/HCPCS code is not listed in the Pennsylvania Medicaid fee schedule:

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 in addition to primary procedure

Alternative covered services:

Conventional nerve conduction studies or needle electromyography (EMG), as ordered, under care of a primary care physician or neurologist.

Background

SSEP studies the relay of body sensations to the brain and how the brain receives those sensations. A stimulating electrode is placed on the arm or leg, and it generates an electrical signal. Recording electrodes are placed on the head and/or spine. The information received from these electrodes can help to diagnose a problem.

The test evaluates the health of peripheral nerves and the spinal cord. It also tests how the spinal cord and/or brain transmit information about body sensations through peripheral nerves. It can localize a "signal blockage" either in the relay system, (peripheral nerves act like telephone wires) or in the interpretive center (the brain and spinal cord act like a telephone receiver).

Evoked potentials studies involve three major tests that measure response to visual, auditory and electrical stimuli.

- Visual evoked response (VER) test. This test can diagnose problems with the optic nerves
that affect sight. Electrodes are placed along the scalp. The patient is asked to watch a checkerboard pattern flash for several minutes on a screen and the electrical responses in the brain are recorded.

- Brainstem auditory evoked response (BAER) test. This test can diagnose hearing ability and can indicate the presence of brain stem tumors and multiple sclerosis. Electrodes are placed on the scalp and earlobes. Auditory stimuli, such as clicking noises and tones, are delivered to one ear.

- Somatosensory evoked response (SSER) test. This test can detect problems with the spinal cord as well as numbness and weakness of the extremities. For this test, electrodes are attached to the wrist, the back of the knee, or other locations. A mild electrical stimulus is applied through the electrodes. Electrodes on the scalp then determine the amount of time it takes for the current to travel along the nerve to the brain.

A related procedure that may be performed is an electroencephalogram (EEG). An EEG measures spontaneous electrical activity of the brain. Please see this procedure for additional information.

Evoked potential studies may be used to assess hearing or sight, especially in infants and children, to diagnose disorders of the optic nerve, and to detect tumors or other problems affecting the brain and spinal cord. The tests may also be performed to assess brain function during a coma.

A disadvantage of these tests is that they detect abnormalities in sensory function, but usually do not produce a specific diagnosis about what is causing the abnormality. However, the evoked potentials test can sometimes confirm a diagnosis of multiple sclerosis.

**Searches**

AmeriHealth Caritas Pennsylvania searched PubMed and the databases of:

- UK National Health Services Centre for Reviews and Dissemination.
- Agency for Healthcare Research and Quality’s National Guideline Clearinghouse and other evidence-based practice centers.
- The Centers for Medicare & Medicaid Services (CMS).

We conducted searches on August 22, 2016. Search terms were: “evoked potentials (MeSH),” “intraoperative (MeSH),” “spinal cord (MeSH),” “Neuropathy (MeSH)” and “plexopathy (MeSH).”

We included:

- **Systematic reviews**, which pool results from multiple studies to achieve larger sample sizes and greater precision of effect estimation than in smaller primary studies. Systematic reviews use predetermined transparent methods to minimize bias, effectively treating the review as a scientific endeavor, and are thus rated highest in evidence-grading hierarchies.
• Guidelines based on systematic reviews.
• Economic analyses, such as cost-effectiveness, and benefit or utility studies (but not simple cost studies), reporting both costs and outcomes — sometimes referred to as efficiency studies — which also rank near the top of evidence hierarchies.

Findings

SSEPs are used for clinical diagnosis in patients with neurologic diseases, to evaluate patients with sensory symptoms that might be psychogenic, for prognostication in comatose patients, and for intraoperative monitoring during surgeries, that place parts of the somatosensory pathways at risk. Abnormal SEPs can result from dysfunction at the level of the peripheral nerve, plexus, spinal root, spinal cord, brain stem, thalamocortical projections, or primary somatosensory cortex. Since individuals have multiple parallel afferent somatosensory pathways, (e.g., the anterior spinothalamic tract and the dorsal column tracts within the spinal cord), SEPs can be normal in patients with significant sensory deficits. However, an abnormal SEP result demonstrates that there is dysfunction within the somatosensory pathways. Subjects cannot volitionally make their SEPs; abnormal SEPs are useful in identifying clinically in apparent abnormalities and lesions causing only vague or equivocal signs or symptoms, and offer a noninvasive, often quantifiable, method of assessing known lesions. SEPs may also be useful for certain conditions in which the diagnosis is uncertain, by indicating involvement of central somatosensory pathways, as well as suggesting the type of involvement (e.g., demyelination).

Intraoperative SEP monitoring was reliable in ruling out spinal injury in descending thoracic and thoracoabdominal aortic repair, but had a low sensitivity. It did not predict delayed neurologic deficit. Spinal SSEP change was an independent predictor of mortality and correlated with low preoperative glomerular filtration rate. Effects of various anesthetics used during surgical monitoring need to be kept in mind. Sloan et al. have shown drug synergy when isoflurane is mixed with nitrous oxide. If these agents are used for anesthesia, the combination of these agents may produce more amplitude and latency changes than expected from individual agents.

For patients with cervical root disease, electromyography and nerve conduction studies remain the gold standard diagnostic test, though their prognostic value is limited. For patients with suspected cervical myelopathy, somatosensory evoked potentials (SEP) tests are more accurate in differentiating anterior horn cell diseases from myelopathy. For patients with diabetes peripheral neuropathy, adding motor evoked potentials (MEP) testing is useful. SEP and MEP tests appear to have prognostic value in predicting the progression of clinically silent diseases, in predicting responses to surgery, and in monitoring the course of disease and treatment, but data from randomized controlled trials are limited (Chistyakov AV. 2004) and (Dvorak J. 2003).

According to the American Association of Electrodiagnostic Medicine (AAEM), intraoperative SSEP monitoring may not be indicated for routine lumbar or cervical root compression.

Policy updates:
Summary of clinical evidence:

<table>
<thead>
<tr>
<th>Citation</th>
<th>Content, Methods, Recommendations</th>
</tr>
</thead>
</table>
| Lew HL, et al., (2004)          | **Key points:**
| Brainstem auditory-evoked potentials as an objective tool for evaluating hearing dysfunction in traumatic brain injury | • Because of the violent nature of traumatic brain injury, traumatic brain injury patients are susceptible to various types of trauma involving the auditory system.  
• We report a case of a 55-year-old man who presented with communication problems after traumatic brain injury. Initial results from behavioral audiometry and Weber/Rinne tests were not reliable because of poor cooperation  
• Brainstem auditory-evoked potential was then performed to evaluate his hearing function. The results showed bilateral absence of auditory-evoked responses, which strongly suggested bilateral deafness.  
• If hearing loss is suspected in a patient who is unable to participate in traditional behavioral audiometric testing, brainstem auditory-evoked potential may be an option for evaluating hearing dysfunction. |

| Chistyakov AV, et al. (2004)    | **Key points:**
| To assess the efficacy of MEPs and SEPs in the evaluation of cervical myelopathy in the presence of peripheral neuropathy | • Patterns and rates of motor-evoked potential (MEP) and somatosensory-evoked potential (SEP) abnormalities were evaluated in 9 patients with combined cervical cord compression and diabetic neuropathy and 15 patients with asymptomatic cervical cord compression  
• Central somatosensory conduction was assessed by median and tibial SEPs using peak-to-peak and onset-to-onset methods. Central motor conduction was measured by MEPs and F-waves elicited from upper and lower limb muscles in response to transcranial magnetic stimulation, magnetic stimulation of cervical motor roots, and electrical stimulation of peripheral nerves.  
• MEPs were more sensitive than SEPs in detecting central conduction impairments in patients with either pure or preclinical or combined forms of cervical myelopathy.  
• Combined MEP and SEP analysis improved the test sensitivity in detecting clinically 'silent' cervical cord dysfunctions. MEPs associated with SEPs are a valuable tool for assessing the presence and severity of cervical cord involvement in combined cervical cord compression and peripheral neuropathy lesions. |

Glossary

**Electroencephalography (EEG)** — Typically a non-invasive method to record electrical activity of the brain, along the scalp. (However, invasive electrodes are often used in specific applications.) EEG measures voltage fluctuations resulting from ionic current within the neurons of the brain. In clinical contexts, EEG refers to the recording of the brain's spontaneous electrical activity over a period of time, as recorded from multiple electrodes placed on the scalp.

**Medically Necessary** - A service or benefit is Medically Necessary if it is compensable under the MA
Program and if it meets any one of the following standards:

- The service or benefit will, or is reasonably expected to, prevent the onset of an illness, condition or disability.
- The service or benefit will, or is reasonably expected to, reduce or ameliorate the physical, mental or developmental effects of an illness, condition, injury or disability.
- The service or benefit will assist the Member to achieve or maintain maximum functional capacity in performing daily activities, taking into account both the functional capacity of the Member and those functional capacities that are appropriate for Members of the same age.

Motor evoke potentials (MEP) — Testing is used to assess the descending motor pathways of the central nervous system. MEP is elicited by electrical or magnetic stimulation of the motor cortex or the spinal cord.

Neuromonitoring — The use of electrophysiological methods such as electroencephalography (EEG), electromyography (EMG), and evoked potentials to monitor the functional integrity of certain neural structures (e.g., nerves, spinal cord and parts of the brain) during surgery. The purpose of intraoperative neurophysiological monitoring (IONM) is to reduce the risk to the patient of iatrogenic damage to the nervous system, and/or to provide functional guidance to the surgeon and anesthesiologist.

Pelizaeus-merzbacher disease (PMD) — A rare central nervous system disorder in which coordination, motor abilities, and intellectual function are delayed to variable extents.

Somatosensory evoked potentials (SEP) or (SSEP) — a series of waves reflecting sequential activation of neural structures along the somatosensory pathways.

References

Professional society guidelines/ other:


Peer-reviewed references:


Clinical trials:

Searched clinicaltrials.gov on July 2, 2015 using terms Somatosensory Evoked Potential | Open Studies. 30 studies found, one relevant.

Neurosurgical Clinic Duesseldorf, Germany, The Effect of Burst-suppression-pattern in EEG on Generating Somatosensory Evoked Potentials. Published and updated March 2015.
CMS National Coverage Determinations (NCDs):


Local Coverage Determinations (LCDs):

No LCDs identified as of the writing of this policy.

Commonly submitted codes

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

<table>
<thead>
<tr>
<th>CPT Code</th>
<th>Description</th>
<th>Comment</th>
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<tbody>
<tr>
<td>95925</td>
<td>Short-latency somatosensory evoked potential study, stimulation of any/all peripheral nerves or skin sites, recording from the central nervous system; in upper limbs</td>
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<tr>
<td>95926</td>
<td>Short-latency somatosensory evoked potential study, stimulation of any/all peripheral nerves or skin sites, recording from the central nervous system; in lower limbs</td>
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<tr>
<td>95927</td>
<td>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</td>
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<tr>
<td>95938</td>
<td>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</td>
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<table>
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<tr>
<th>ICD 10 Code</th>
<th>Description</th>
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<tr>
<td>G11.0 – G11.9</td>
<td>Hereditary ataxia</td>
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<tr>
<td>G23.0 – G23.9</td>
<td>Other degenerative diseases of the basal ganglia</td>
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<td>G25.3</td>
<td>Myoclonus</td>
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<td>G32.0</td>
<td>Subacute combined degeneration of spinal cord in diseases classified elsewhere</td>
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<tr>
<td>G32.81</td>
<td>Cerebellar ataxia in diseases classified elsewhere</td>
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<td>G35</td>
<td>Multiple sclerosis</td>
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<td>Other demyelinating diseases of central nervous system</td>
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<td>E75.23</td>
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<td>E75.25</td>
<td>Metachromatic leukodystrophy</td>
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<td>G82.20</td>
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<td>G82.21</td>
<td>Paraplegia, complete</td>
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<td>G82.22</td>
<td>Paraplegia, incomplete</td>
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<td>G90.3</td>
<td>Multi-system degeneration of the autonomic nervous system</td>
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<td>G93.0</td>
<td>Cerebral cysts</td>
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<td>G93.5</td>
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<td>G93.6</td>
<td>Cerebral edema</td>
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<td>G93.82</td>
<td>Brain death</td>
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<td>G93.89</td>
<td>Other specified disorders of brain</td>
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<td>G93.9</td>
<td>Disorder of brain, unspecified</td>
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<td>G95.0</td>
<td>Syringomyelia and syringobulbia</td>
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<td>G95.29</td>
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<td>G95.9</td>
<td>Disease of spinal cord, unspecified</td>
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<tr>
<td>I67.83</td>
<td>Posterior reversible encephalopathy syndrome</td>
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<td>P11.5</td>
<td>Birth injury to spine and spinal cord</td>
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<td>S06.1x0A – S06.1x9S</td>
<td>Traumatic cerebral edema</td>
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<td>G0453</td>
<td>Continuous intraoperative neurophysiology monitoring, from outside the operating room (remote or nearby), per patient, (attention directed exclusively to one patient) each 15 minutes (list in addition to primary procedure)</td>
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