Intra-operative Neurophysiologic Monitoring (Sensory-evoked Potentials, Motor-evoked Potentials, EEG Monitoring)

Archived Medical Policy

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Policy # 00078
Original Effective Date: 04/13/1994
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Applies to all products administered or underwritten by Blue Cross and Blue Shield of Louisiana and its subsidiary, HMO Louisiana, Inc. (collectively referred to as the “Company”), unless otherwise provided in the applicable contract. Medical technology is constantly evolving, and we reserve the right to review and update Medical Policy periodically.

When Services May Be Eligible for Coverage
Coverage for eligible medical treatments or procedures, drugs, devices or biological products may be provided only if:

- Benefits are available in the member’s contract/certificate, and
- Medical necessity criteria and guidelines are met.

Based on review of available data, the Company may consider intra-operative monitoring, which includes somatosensory-evoked potentials (SSEPs), motor evoked potentials (MEPs), brainstem auditory-evoked potentials (BAEPs), electromyograms (EMGs), electroencephalogram (EEG) and visual-evoked potentials (VEP) during spinal, intracranial or vascular procedures to be eligible for coverage if the medical appropriateness criteria are met.

Medical Appropriateness Criteria
Coverage eligibility for the use of intraoperative neurophysiologic monitoring will be considered when the following criteria are met:

- The physician who performed the service, usually a neurologist, was not directly involved with the performance of the operative procedure and provided real-time professional interpretation and/or technical support of the testing and results. (Intraoperative neurophysiology monitoring from a remote location is eligible for reimbursement when real-time review and response to the operating physician is done at the time of the procedure); and
- SSEPs and MEPs, when used for selected surgical procedures involving the spinal levels C1-L2, are considered medically appropriate for the following procedures:
  - Anterior cervical disectomy with fusion (ACDF)
  - Posterior cervical fusion
  - Surgery to relieve neural cord compression due to fractures, abscess, spondylosis, etc.
  - Spinal cord tumors
  - Scoliosis surgery
- EMGs when used for selected surgical procedures involving the spinal levels C1-S1, are considered medically appropriate for the following procedures:
  - Posterior cervical fusion
  - Scoliosis surgery
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1. Posterior lumbar interbody fusion (PLIF) for pedicle screw placement
   (Pedicle screw testing usually involves evaluating free-run and triggered EMG. The triggered EMG is when the screw is stimulated. Pedicle screw testing should be coded either (95870) for a limited EMG, or (95861) for a full EMG of two extremities.)
2. Cranial nerve supplied muscle EMGs are considered appropriate monitoring for excision of cranial nerve neuromas (i.e. acoustic neuroma), facial nerve monitoring during parotid surgery and recurrent laryngeal monitoring during thyroid surgery.
   - SSEPs; or EEG monitoring for cerebral vascular surgical procedures used to restore normal anatomy and blood flow to cerebral artery complex including carotids, vertebral arteries and cerebral arteries (e.g., carotid endarterectomies, cerebral aneurysms)
   - BAEPs for any surgical procedure on or near the acoustic nerve, inner ear or brainstem
   - VEPs for any procedure on or near the optic nerve, cortex or chiasm

When Services Are Considered Not Medically Necessary

Based on review of available data, the Company considers nerve conduction velocity monitoring during surgery on the peripheral nerves to be not medically necessary.**

When Services Are Considered Investigational

Coverage is not available for investigational medical treatments or procedures, drugs, devices or biological products.

Based on review of available data, the Company considers intra-operative monitoring, which includes SSEPs, MEPs, BAEPs, EMG, EEG and VEP, during spinal, intracranial or vascular procedures as investigational* when medical appropriateness criteria are not met.

In addition, the following examples of monitoring are considered to be investigational:
- EMG for ACDF procedures, including cranial nerve monitoring of the recurrent laryngeal nerve
- EMG for cervical or thoracic decompressive procedures or spinal cord tumor surgery
- Any monitoring for lumbar decompressive procedures without fusion
- Any monitoring on an anterior lumbar interbody fusion (ALIF) procedure
- Upper extremity SSEPs to prevent brachial plexus injury from malpositioning during a lumbar procedure
- EEG for monitoring of any spinal procedures
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- Anal sphincter EMG monitoring on a PLIF procedure
- SSEPs and MEPs for spinal procedures below L2
- Neuromuscular junction testing and H-reflex studies

Background/Overview

Intra-operative neurophysiologic monitoring describes a variety of procedures that have been used to monitor the integrity of neural pathways during high-risk neurosurgical, orthopedic and vascular surgeries. The principal goal of intra-operative monitoring is the identification of nervous system impairment in the hope that prompt intervention will prevent permanent deficits. Correctable factors at surgery include circulatory disturbance, excess compression from retraction, bony structures, hematomas or mechanical stretching. The various different methodologies of monitoring are described below:

Sensory-evoked Potentials

Sensory-evoked potential describes the responses of the sensory pathways to sensory or electrical stimuli. Intra-operative monitoring of sensory-evoked potentials is used to assess the functional integrity of central nervous system (CNS) pathways during operations that put the spinal cord or brain at risk for significant ischemia or traumatic injury. The basic principles of sensory-evoked potential monitoring involve identification of a neurological region at risk, selection and stimulation of a nerve that carries a signal through the at-risk region and recording and interpretation of the signal at certain standardized points along the pathway. Monitoring of sensory-evoked potentials is commonly used during the following procedures: carotid endarterectomy, brain surgery involving vasculature, surgery with distraction compression or ischemia of the spinal cord and brainstem and acoustic neuroma surgery. Sensory-evoked potentials can be further broken down into the following categories according to the type of simulation used:

- SSEPs are electrical waves that are generated by the response of sensory neurons to stimulation. Peripheral nerves, such as the median, ulnar, or tibial nerve 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. Intra-operative monitoring of SSEPs is most commonly used during orthopedic or neurologic surgery to prompt intervention to reduce surgically induced morbidity and/or to monitor the level of anesthesia. One of the most common indications for SSEP monitoring is in patients undergoing corrective surgery for scoliosis. In this setting, SSEP monitors the status of the posterior column pathways, and thus does not reflect ischemia in the anterior (motor) pathways. Several different techniques are commonly used, including stimulation of a relevant peripheral nerve with monitoring from the scalp, from interspinous ligament needle electrodes or from catheter electrodes in the epidural space.
- 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
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- Neuroma, places the auditory nerves at risk, and BAEPs have been extensively used to monitor auditory function during these procedures.
- VEPs are used to track visual signals from the retina to the occipital cortex light flashes. VEP monitoring has been used for surgery on lesions near the optic chiasm. However, VEPs are very difficult to interpret due to their sensitivity to anesthesia, temperature and blood pressure.

EMG Monitoring and Nerve Conduction Velocity Measurements
Electromyogram monitoring and nerve conduction velocity measurements can be performed in the operating room and may be used to assess the status of the peripheral nerves, e.g., to identify the extent of nerve damage prior to nerve grafting or during resection of tumors. In addition, these techniques may be used during procedures around the nerve roots and around peripheral nerves to assess the presence of excessive traction or other impairment. Surgery in the region of cranial nerves can be monitored by electrically stimulating the proximal (brain) end of the nerve and recording via EMG in the facial or neck muscles. Thus monitoring is done in the direction opposite that of sensory-evoked potentials, but the purpose is similar — to verify that the neural pathway is intact.

Motor-Evoked Potential Monitoring
Motor-evoked potential monitoring involves transcranial stimulation of the motor cortex, either magnetic or electrical. Magnetic stimulation is generally regarded as unsuitable for intraoperative monitoring because it is more sensitive to anesthesia. Electrical stimulation is too painful for clinical use in awake patients. MEPs usually are recorded with surface electrodes in target muscles, thereby allowing monitoring of the integrity of the ventral cord, specifically the lateral corticospinal tract.

EEG Monitoring
Spontaneous EEG monitoring can also be recorded during surgery and can be subdivided as follows:
- EEG monitoring has been widely used to monitor cerebral ischemia secondary to carotid cross clamping during a carotid endarterectomy. EEG monitoring may identify those patients who would benefit from the use of a vascular shunt during the procedure to restore adequate cerebral perfusion. Conversely, shunts, which have an associated risk of iatrogenic complications, may be avoided in those patients in whom the EEG is normal. Carotid endarterectomy may be done with the patient under local anesthesia so that monitoring of cortical function can be directly assessed.
- Electrocorticography (Cog) is the recording of the EEG directly from a surgically exposed cerebral cortex. Cog is typically used to define the sensory cortex and to map the critical limits of a surgical resection. ECoG recordings have been most frequently used to identify epileptogenic regions for resection. In these applications, electrocorticography does not constitute monitoring per se.
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FDA or Other Governmental Regulatory Approval

U.S. Food and Drug Administration (FDA)
Numerous evoked response photic stimulators have been approved by the FDA (Class II, product codes GWE and HLX).

These devices may also have recording/measuring capabilities, or the visual signals produced by these devices may be recorded and measured by standard EEG recording devices (product code GWQ)

Centers for Medicare & Medicaid Services (CMS)
CMS has not issued a National Coverage Determination (NCD) specifically for SEP testing. However, the following NCD has been made. Evoked response tests, including brainstem evoked response and visual evoked response tests, are generally accepted as safe and effective diagnostic tools. Program payment may be made for these procedures

Rationale/Source
This medical policy was developed through consideration of peer-reviewed medical literature generally recognized by the relevant medical community, U.S. Food and Drug Administration approval status, nationally accepted standards of medical practice and accepted standards of medical practice in this community, Blue Cross and Blue Shield Association technology assessment program (TEC) and other non-affiliated technology evaluation centers, reference to federal regulations, other plan medical policies, and accredited national guidelines.

References

Coding
The five character codes included in the Blue Cross Blue Shield of Louisiana Medical Policy Coverage Guidelines (BCBSLAMPCG) are obtained from Current Procedural Terminology (CPT®), copyright 2010 by the American Medical Association (AMA). CPT is
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Developed by the AMA as a listing of descriptive terms and five character identifying codes and modifiers for reporting medical services and procedures performed by physician.

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CPT is a registered trademark of the American Medical Association.

Codes used to identify services associated with this policy may include (but may not be limited to) the following:

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Policy History

Original Effective Date: 04/13/1994
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08/20/2001 Managed Care Advisory Council approval
07/22/2003 Medical Policy Committee review
08/31/2004 Medical Director review
09/21/2004 Medical Policy Committee review. Format revision. The following parameters were approved for addition to the policy guidelines: provided real-time professional interpretation and/or technical support of the testing and results (Intraoperative neurophysiology monitoring from a remote location is eligible for reimbursement when real-time review and response to the operating physician at the time of the procedure); The operative procedure being performed was of a complex and or high-risk neurologic nature, i.e., removal of spinal tumor, brain tumor or cerebral aneurysm (the appropriateness of the intraoperative testing is supported by the complexity of the neurosurgical procedure).
09/27/2004 Managed Care Advisory Council approval
08/03/2005 Medical Director review

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08/16/2005    Medical Policy Committee review. Coverage eligibility unchanged.  
08/24/2005    Managed Care Advisory Council approval  
07/07/2006    Format revision, including addition of FDA and or other governmental regulatory approval and rationale/source. Coverage eligibility unchanged.  
01/10/2007    Medical Director review  
03/14/2007    Medical Director review  
03/21/2007    Medical Policy committee approval. Rationale updated. References added.  
09/05/2007    Medical Director review  
11/07/2007    Medical Director review  
11/15/2007    Medical Policy Committee approval. Policy revised to reflect changes in coverage for selected services including SSEP, MEP, EMG and VEPs.  
03/04/2009    Medical Director review  
03/18/2009    Medical Policy Committee approval. No change to coverage eligibility.  
06/03/2010    Medical Policy Committee review  
06/16/2010    Medical Policy Implementation Committee approval. No change.  
06/02/2011    Medical Policy Committee review  
11/03/2011    Medical Policy Committee review  
01/01/2012    Archived Date  

Next Scheduled Review: Archived Medical Policy

Investigational – A medical treatment, procedure, drug, device, or biological product is Investigational if the effectiveness has not been clearly tested and it has not been incorporated into standard medical practice. Any determination we make that a medical treatment, procedure, drug, device, or biological product is Investigational will be based on a consideration of the following:

A. whether the medical treatment, procedure, drug, device, or biological product can be lawfully marketed without approval of the U.S. Food and Drug Administration (FDA) and whether such approval has been granted at the time the medical treatment, procedure, drug, device, or biological product is sought to be furnished; or

B. whether the medical treatment, procedure, drug, device, or biological product requires further studies or clinical trials to determine its maximum tolerated dose, toxicity, safety, effectiveness, or effectiveness as compared with the standard means of treatment or diagnosis, must improve health outcomes, according to the consensus of opinion among experts as shown by reliable evidence, including:

1. Consultation with the Blue Cross and Blue Shield Association technology assessment program (TEC) or other nonaffiliated technology evaluation center(s);  
2. credible scientific evidence published in peer-reviewed medical literature generally recognized by the relevant medical community; or  
3. reference to federal regulations.

**Medically Necessary (or “Medical Necessity”) - Health care services, treatment, procedures, equipment, drugs, devices, items or supplies that a Provider, exercising prudent clinical judgment, would provide to a patient for the purpose of preventing, evaluating, diagnosing or treating an illness, injury, disease or its symptoms, and that are:

A. in accordance with nationally accepted standards of medical practice;
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B. clinically appropriate, in terms of type, frequency, extent, level of care, site and duration, and considered effective for the patient's illness, injury or disease; and

C. not primarily for the personal comfort or convenience of the patient, physician or other health care provider, and not more costly than an alternative service or sequence of services at least as likely to produce equivalent therapeutic or diagnostic results as to the diagnosis or treatment of that patient's illness, injury or disease.

For these purposes, “nationally accepted standards of medical practice” means standards that are based on credible scientific evidence published in peer-reviewed medical literature generally recognized by the relevant medical community, Physician Specialty Society recommendations and the views of Physicians practicing in relevant clinical areas and any other relevant factors.

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