COVERAGE:

The following types of intra-operative monitoring are considered medically necessary during spinal, intracranial, or vascular procedures when such procedures have a risk of significant complications(s) that can be detected and prevented through use of neurophysiological monitoring:

- somatosensory-evoked potentials,
- brainstem auditory-evoked potentials,
- EMG of cranial or spinal nerves,
- EEG, and
- electrocorticography (ECOG),

Intra-operative EMG and nerve conduction velocity monitoring on the peripheral nerves during surgery is considered not medically necessary.

Intra-operative monitoring is considered experimental or investigational for intra-operative visual-evoked potentials and motor-evoked potentials.

DESCRIPTION:

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 or hematomas, or mechanical stretching. The various different methodologies of monitoring are described below.

SENSORY-EVOKED POTENTIALS

Sensory-evoked potentials describe the response 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 involves 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 stimulation used.

- Somatosensory-Evoked Potentials (SSEPs) are electrical waves that are generated by the response of sensory neurons to stimulation. Intra-operative monitoring of SSEPs is most commonly used during orthopedic or neurologic surgery in order to prompt intervention to reduce surgically induced morbidity and/or to monitor the level of anesthesia. One of the most common indications for SSEP 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.

- 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.

- Visual-Evoked Potentials (VEPs) are used to track visual signals from the retina to the occipital cortex using 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 (ELECTROMYOGRAM) MONITORING AND NERVE CONDUCTION VELOCITY MEASUREMENTS

This type of monitoring 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. Additionally, 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 the monitoring is done in the direction opposite to that of sensory-evoked
potentials, but the purpose is similar (to verify that the neural pathway is intact).

**MOTOR - EVOKED POTENTIAL MONITORING**

This type of monitoring involves stimulation to the motor cortex using a magnetic coil placed over the head. The electromagnetic energy induces an electrical current within the brain which in turn can stimulate the motor neurons. While there is ongoing research interest in the use of motor-evoked potentials to assess the integrity of the corticospinal tracts (which are not assessed using sensory-evoked potentials), this technique has not yet received FDA approval.

**EEG (ELECTROENCEPHALOGRAM) 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 in order 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 under local anesthesia so that monitoring of cortical function can be directly assessed;

Electrocorticography (ECOG) is the recording of the EEG directly from a surgically exposed cerebral cortex. ECOG 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.

**RATIONALE:**

At the present time, intra-operative monitoring of neurologic function is a widely used practice, particularly during cervical and thoracic spinal surgery.

An additional search of literature was completed through the MEDLINE database for the period of 11/2000 - 6/2003.

**PRICING:**
Intra-operative monitoring is considered a support service to the operating surgeon.

Intra-operative monitoring is reimbursable as a separate service when provided to the operating surgeon by a licensed physician separate from the surgical team (operating surgeon, assistant surgeons, and/or anesthesiologists).

This interpreting physician must either be physically in attendance in the operating suite or present by means of a real-time remote mechanism for all electro neurodiagnostic (END) monitoring situations, available to interpret the recording and advise the surgeon.

REFERENCES:


DISCLAIMER:

State and federal law, as well as contract language, including definitions and specific inclusions/exclusions, takes precedence over Medical Policy and must be considered first in determining coverage. The member’s contract benefits in effect on the date that services are rendered must be used. Any benefits are subject to the payment of premiums for the date on which services are rendered. Medical technology is constantly evolving, and we reserve the right to review and update Medical Policy periodically.

HMO Blue Texas physicians who are contracted/affiliated with a capitated IPA/medical group must contact the IPA/medical group for information regarding HMO claims/reimbursement information and other general polices and procedures.