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## Intraoperative Neuromonitoring

### Audience

Providers, Members, Brokers, MHC

### Purpose

Medical policies provide general support for applying Mountain Health Co-Op member policy document coverage decisions and must reference the member-specific benefit plan document. The terms of the member-specific Policy document may differ from the standard benefit plan on which this medical policy is based. If there is a conflict between a member-specific policy document and the Mountain Health Co-Op medical policy, the member-specific policy document supersedes this medical policy. Any person(s) applying this medical policy must identify member eligibility, the member-specific policy document, and related policies or guidelines before applying this medical policy, including the existence of any state or federal guidance. Mountain Health Co-Op medical policies are designed for informational purposes only and are not an authorization, explanation of benefits, or contract. Receipt of benefits is subject to satisfaction of all terms and conditions of the member-specific policy document coverage. Mountain Health Co-Op reserves the sole discretionary right to modify all policies and guidelines at any time.

### Definition

Intraoperative neuromonitoring (IONM) employs the use of electrodiagnostic modalities to record electrical signals produced by the nervous system in response to a stimuli; the intraoperative neuromonitoring reflects the time spent during ongoing, concurrent, real time electrodiagnostic testing performed throughout the surgery. The goal of intraoperative monitoring is to detect response changes due to surgery, to diminish the risk of neurologic injury, improve patient safety and subsequent surgical outcomes. Intraoperative neuromonitoring modalities may include, but are not limited to the following:

- Neurophysiological techniques, alone or in combination such as sensory evoked potentials (i.e., somatosensory [SSEP])
- Auditory brainstem evoked responses [ABR]
- Visual evoked potentials [VEP]
- Motor evoked potentials (MEP)
- Electromyography (EMG)
- Free-running or stimulus-triggered, and electroencephalogram (EEG)

Multiple modalities are typically used for IONM to overcome the limitations of individual monitoring. Selection of the approach used is dependent upon the type of surgery and the degree of risk.

Intraoperative neuromonitoring allows for immediate intervention thus preventing or minimizing postoperative neurological deficits although there is no clear consensus as to which patients should undergo IONM, other than for individuals at greater risk of nerve injury. According to the American Academy of Neurology (2012), there is no need for IONM in situations where historical data and current practices reveal no potential for neural damage.

## Policy/Procedure

### Commercial Plans/CHIP

**Mountain Health Co-Op covers intraoperative neuromonitoring (IONM) in limited clinical circumstances as current evidence supports improved outcomes in these settings when specific criteria are met.**

#### 1. Coverage Requirements:

- 1.1** Intraoperative neurophysiologic monitoring must be performed by either a licensed physician trained in clinical neurophysiology or a trained technologist who is practicing within the scope of his/her license/certification as defined by state law or appropriate authorities and is working under direct supervision of a physician trained in neurophysiology; AND
- 1.2** Intraoperative neurophysiologic monitoring must be interpreted by a licensed physician trained in clinical neurophysiology, other than the operating surgeon, who is either in attendance in the operating suite or present by means of a real-time remote mechanism for neurophysiologic monitoring situations and is immediately available; AND
- 1.3** Monitoring is conducted and interpreted real-time (either on-site or at a remote location) and continuously communicated to the surgical team; AND
- 1.4** The physician performing or supervising monitoring must be monitoring no more than three cases simultaneously.

### **Surgical Circumstances in which IONM is covered:**

#### **Somatosensory-evoked potentials with or without motor-evoked potentials**

- 2.** Intraoperative neuromonitoring using somatosensory-evoked potentials (SSEP), with or without motor-evoked potentials (using electrical stimulation), may be medically necessary during the following procedures:
  - 2.1** Spinal procedures
    - a)** Dorsal rhizotomy

- b)** Correction of scoliosis and kyphosis
  - c)** Anterior cervical spine surgery associated with increased risk from preexisting recurrent laryngeal nerve pathology, when there is residual function of the recurrent laryngeal nerve.
  - d)** Correction of deformity involving traction on the spinal cord
  - e)** Spinal cord tumor removal
  - f)** Surgery due to traumatic injury to spinal cord
  - g)** Surgery for arteriovenous (AV) malformation of spinal cord
- 2.2** Intracranial procedures
- a)** Microvascular decompression of cranial nerves
  - b)** Removal of acoustic neuroma, congenital auricular lesions, or cranial base lesions
  - c)** Cholesteatoma, including mastoidotomy or mastoidectomy
  - d)** Vestibular neurectomy for Meniere's
  - e)** Removal of cranial nerve neuromas affecting any of the following nerves:
    - i.** Abducens
    - ii.** Facial
    - iii.** Glossopharyngeal
    - iv.** Hypoglossal
    - v.** Oculomotor
    - vi.** Recurrent laryngeal
    - vii.** Spinal accessory
    - viii.** Superior laryngeal
    - ix.** Trochlea
  - f)** Deep brain stimulation
  - g)** Endolymphatic shunting for Meniere's disease
  - h)** Oval or round window graft
  - i)** Removal of cavernous sinus tumors
  - j)** Resection of brain tissue near primary motor cortex and requiring brain mapping
  - k)** Resection of epileptogenic brain tissue or tumor
  - l)** Other intracranial procedures (e.g., aneurysm repair, intracranial AVM)
- 2.3** Non-cranial vascular procedures
- a)** Carotid artery surgery
  - b)** Arteriography with test occlusion of carotid artery
  - c)** Deep hypothermic circulatory arrest
  - d)** Distal aortic procedures
  - e)** Surgery of the aortic arch, its branch vessels, or thoracic aorta
- 2.4** High-risk thyroid or parathyroid surgery, including:
- a)** Total thyroidectomy
  - b)** Repeat thyroid or parathyroid surgery
  - c)** Surgery for cancer
  - d)** Thyrotoxicosis
  - e)** Retrosternal or giant goiter
  - f)** Thyroiditis

### **Electroencephalographic monitoring**

**3.** Intraoperative electroencephalographic (EEG) monitoring may be considered medically necessary for any of the following procedures:

#### **3.1** Intracranial procedures

- a)** Microvascular decompression of cranial nerves;
- b)** Removal of acoustic neuroma, congenital auricular lesions, or cranial base lesions;
- c)** Cholesteatoma, including mastoidotomy or mastoidectomy;
- d)** Vestibular neurectomy for Meniere's;
- e)** Removal of cranial nerve neuromas affecting any of the following nerves:
  - i.** Abducens;
  - ii.** Facial;
  - iii.** Glossopharyngeal;
  - iv.** Hypoglossal;
  - v.** Oculomotor;
  - vi.** Recurrent laryngeal;
  - vii.** Spinal accessory;
  - viii.** Superior laryngeal;
  - ix.** Trochlear.
- f)** Deep brain stimulation;
- g)** Endolymphatic shunting for Meniere's disease;
- h)** Oval or round window graft;
- i)** Removal of cavernous sinus tumors;
- j)** Resection of brain tissue near primary motor cortex and requiring brain mapping;
- k)** Resection of epileptogenic brain tissue or tumor;
- l)** Other intracranial procedures (e.g., aneurysm repair, intracranial AVM).

### **Electromyographic monitoring**

**4.** Intraoperative electromyographic (EMG) monitoring may be considered medically necessary when monitoring is during any of the following procedures:

#### **4.1** Dorsal rhizotomy;

#### **4.2** Microvascular decompression of cranial nerves

#### **4.3** Removal of acoustic neuroma, congenital auricular lesions, or cranial base lesions;

#### **4.4** Cholesteatoma, including mastoidotomy or mastoidectomy;

#### **4.5** Vestibular neurectomy for Meniere's;

#### **4.6** Removal of cranial nerve neuromas affecting any of the following nerves:

- a)** Abducens;
- b)** Facial;
- c)** Glossopharyngeal;
- d)** Hypoglossal;
- e)** Oculomotor;
- f)** Recurrent laryngeal;
- g)** Spinal accessory;
- h)** Superior laryngeal;
- i)** Trochlear.

**5. Mountain Health Co-Op considers IONM experimental/investigational for all other indications not meeting the above criteria.** Examples of procedures for which there is insufficient evidence to establish net benefit of IONM include, but are not limited to, the following:

- 5.1** Routine lumbar, cervical or thoracic laminectomies and fusions;
- 5.2** Spinal cord stimulator implantation;
- 5.3** Cochlear implantation;
- 5.4** Vagal nerve stimulator implantation;
- 5.5** Spinal injections;
- 5.6** Hip replacement;
- 5.7** Parotid gland surgery.

**Mountain Health Co-Op considers intraoperative monitoring of motor evoked potentials using transcranial magnetic stimulation as experimental and investigational for all indications.**

**Mountain Health Co-Op considers nerve conduction studies for intraoperative monitoring purposes experimental and investigational for all indications.**

**Mountain Health Co-Op considers intraoperative monitoring of visual-evoked potentials investigational.**

**Mountain Health Co-Op does NOT cover intraoperative electromyography and nerve conduction velocity monitoring during surgery on the peripheral nerves as it is considered not medically necessary.**

## **6. Clinical Rationale**

- 6.1** There is moderate strength of evidence that IONM may identify patients at greater risk of adverse outcomes due to neurological injury among individuals undergoing certain spinal procedures. For surgeries that risk damaging the spinal cord (e.g., scoliosis correction, spinal cord tumor removal), the effectiveness of IONM has been assumed. As such, the evidence base for comparative studies is minimal. However, multiple retrospective and prospective cohort studies indicate that IONM may accurately identify those with postoperative neurological deficits. Less clear is whether knowledge of injury, intraoperatively, can lead to intervention which prevents or reverses said neurological deficits.
- 6.2** A systematic review (Fehlings et. al, 2010) concluded that IONM is sensitive and specific for detecting neurological complications during spinal surgery. That review included 14 prospective cohort studies addressing a variety of spinal indications. Across all included studies, IONM was not associated with any serious harms. Authors concluded that IONM can be a valuable tool during spinal surgery when the spinal cord or nerve roots are at risk.
- 6.3** IONM has also been proposed as potentially valuable during thyroid surgery as a means to prevent injury to the recurrent laryngeal nerve. A systematic review (Malik 2016) evaluated 17 studies comparing thyroid surgery with and without IONM. Using pooled data from those studies, authors found no statistically significant difference in recurrent laryngeal nerve palsy (RLNP) between those who had undergone thyroid surgery with or without IONM. Another systematic review (Yang 2017) reported a

slightly lower incidence of RLNP among those who had thyroid surgery with IONM, but this difference was not statistically significant.

- 6.4** The American Association of Neurological Surgeons (AANS) and the Congress of Neurological Surgeons (CNS) released a position statement on IONM in April 2014. The AANS/CNS concluded that there is insufficient evidence to show that the use of IONM mitigates the severity of neurological injury or reduces its incidence. However, the position statement did note that use of IONM may help to diagnose neurological injury during surgery. Later that year, an analysis of all spine surgeries performed from 2007-2011 that were included in the Nationwide Inpatient Sample database was published by James WS, et al. This study included 443,194 spine procedures in which 31,680 cases utilized IONM. Iatrogenic neurological injury was rare, occurring in less than 1% with no difference in cases where IONM was used.
- 6.5** In 2015, Hawksworth et al, from the University of Texas Health Sciences Center, published an analysis of their department's spine surgeries completed from 2011-2013, before and after adopting a departmental policy limiting IONM use to intradural procedures and those for spinal deformity correction. While utilization of IONM dropped from 38% of spinal cases to 7%, there was no change in incidence of neurological injury. In fact, the only observed cases of injury occurred in cases utilizing IONM where the monitoring did not alert the surgeon to the injury.
- 6.6** In 2017, Hadley, et al published, "Guidelines for the Use of Electrophysiological Monitoring for Surgery of the Human Spinal Column and Spinal Cord" which was approved by both the American Association for Neurological Surgeons and the Congress of Neurological Surgeons. This Guideline was based on review of relevant published literature from 1966-2017. Similar to the aforementioned 2014 position statement, this new Guideline found that IONM "has not been shown to be successful in reducing the rate of perioperative neurological deterioration or to improve neurological outcome during spinal surgery procedures." The authors later conclude that because use of IONM during spinal surgery has not been correlated with improvements in neurological outcome that its expense does not appear justified.
- 6.7** A 2017 retrospective cohort study (Ibrahim et. al.) evaluated the use of neuromonitoring during spinal surgery to assess the function of the spinal cord in an effort to prevent intraoperative injury. The study identified 121 patients who underwent spinal cord procedures with the use of intraoperative neuromonitoring, to determine its ability to detect neurological changes and the specificity and sensitivity in this setting. The patients were classified into one of four groups according to the findings of intraoperative monitoring and the clinical outcomes on postoperative neurological exam. Intraoperative monitoring was evaluated for its specificity, sensitivity, and predictive value. The study determined that out of the 121 patients, the use of intraoperative neuromonitoring had a low sensitivity, which may produce an excessive number of false negatives. The authors concluded that although its use is widespread, no clear benefit has been demonstrated in using neuromonitoring during spinal surgery.
- 6.8** Furthermore, based on these findings, neuromonitoring seems to have a poor positive predictive value and is thus an inappropriate test to prevent harm to patients.

**6.9** In a 2017 retrospective review, Ajiboye et al evaluated the trends in the use of intraoperative neuromonitoring (ION) for anterior cervical discectomy and fusion (ACDF) surgery in the United States and assessed the incidence of neurological injuries after ACDFs with and without ION. Somatosensory evoked potentials (SSEPs) and motor-evoked potentials (MEPs) are the commonly used ION modalities for ACDFs. Controversy exists on the routine use of ION for ACDFs and there is limited literature on national practice patterns of its use. The type of ION modality used and the rates of neurological injury after surgery were assessed. The study consisted of 15,395 patients whom underwent an ACDF. Overall, ION was used in 2627 (17.1%) of these cases. There was a decrease in the use of ION for ACDFs from 22.8% in 2007 to 4.3% use in 2014 ( $P < 0.0001$ ). The ION modalities used for these ACDFs were quite variable: SSEPs only (48.7%), MMEPs only (5.3%), and combined SSEPs and MMEPs (46.1%). Neurological injuries occurred in 0.23% and 0.27% of patients with and without ION, respectively ( $P = 0.84$ ). Younger age was associated with a higher utility of ION (75: 13.6%,  $P < 0.0001$ ). Significant regional variability was observed in the utility of ION for ACDFs across the country (West; 21.9%, Midwest; 12.9% ( $P < 0.0001$ )). In conclusion, the authors found that ION did not further prevent the rate of postoperative neurological complications for ACDFs as compared to cases without use of ION. Thus, the utility of routine ION for ACDFs is questionable.

**6.10** In a systematic review (Resnick et al.) on IONM for cervical degenerative myelopathy and radiculopathy, the authors concluded that altering of the surgical plan or intraoperative steroid administration based upon IONM monitoring was not shown to decrease the incidence of neurological injury. However, the review concluded that IONM may be sensitive for assessing neurological injury for diagnostic information.

**6.11** Hayes, Inc. completed a systematic review of intraoperative neuromonitoring (IONM) for lumbar spinal fusion and decompression. The review encompassed 5 studies that evaluated IONM for detection of new neurological deficits and 11 studies that evaluated IONM for intraoperative guidance designed to prevent new neurological deficits. The review observed the reviewed studies of IONM for lumbar spinal discectomy or discectomy and fusion provide inconclusive evidence as to whether IONM accurately detects new neurological deficits and whether IONM can help prevent nerve damage during surgery. It was noted that all of the reviewed studies have limitations that may have caused underestimation of the diagnostic accuracy or intraoperative efficacy of IONM. Across clinical validity studies, sensitivity rates were very low or low (0% to 62%), reflecting a high false-negative rate. The clinical utility studies reported limited evidence of benefit of IONM. A small number of studies reported that use of IONM significantly decreased transient complications and reduced hospital stay relative to no IONM. No studies reported between-group differences in rate of new neurological deficits for IONM versus standard care (i.e., without IONM). It is unclear whether the lack of consistent benefit is due to poor efficacy of IONM or limitations of the evidence base. IONM poses minimal safety concerns. Additional RCTs of IONM are needed to evaluate its capacity to prevent nerve damage during lumbar partial discectomy or fusion. In conclusion, the review found a very low quality of insufficient evidence in regards to

the safety and efficacy of IONM for detection and prevention of new neurological deficits in patients undergoing lumbar discectomy or fusion. Further studies are needed for clinical validity and utility, however, the evaluation process will be complicated by differences in disease severity, diversity of surgical approaches that can be used, and availability of EMG, MEP, and SSEP IONM techniques that can be used alone or in combinations.

**6.12** The American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM) released a position statement in 2014 supporting the use of intraoperative SSEP for certain spinal surgeries, particularly those with increased risk for nerve root or spinal cord injury (including complex, extensive, or lengthy procedures). Authors also stated that intraoperative SSEP was not indicated for routine lumbar or cervical root decompression.

**6.13** In 2012, the American Academy of Neurology (AAN) and the American Clinical Neurophysiology Society (ACNS) identified 11 studies as part of their evidence-based guidelines process, from which they concluded the IONM is safe and effective for identifying increased risk of adverse outcomes, including paraparesis, paraplegia, and quadriplegia during spinal surgery (Nuwer 2012).

## **Applicable Coding**

### **CPT Codes**

#### **General Neuromonitoring**

**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)

**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)

#### **Somatosensory-Evoked Potentials (SSEP)**

**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** ; in lower limbs

**95927** ; in the trunk or head

**95938** ; in upper and lower limbs

#### **Motor evoked potentials (MEP)**

**95928** Central motor evoked potential study (transcranial motor stimulation); upper limbs

**95929** ; lower limbs

**95939** ; in upper and lower limbs

#### **Brainstem auditory evoked potentials (BAEP)**

**92585** Auditory evoked potentials for evoked response audiometry and/or testing of the central nervous system; comprehensive

**92586** Auditory evoked potentials for evoked response audiometry and/or testing of the central nervous system; limited

#### **Electroencephalography**

**95822** Electroencephalogram (EEG); recording in coma or sleep only

**95955** Electroencephalogram (EEG) during non-intracranial surgery (e.g., carotid surgery)

**Electromyography**

**95860** Needle electromyography; 1 extremity with or without related paraspinal areas

**95861** Needle electromyography; 2 extremities with or without related paraspinal areas

**95867** Needle electromyography; cranial nerve supplied muscle(s), unilateral

**95868** Needle electromyography; cranial nerve supplied muscles, bilateral

**95870** Needle electromyography; limited study of muscles in 1 extremity or non-limb (axial) muscles (unilateral or bilateral), other than thoracic paraspinal, cranial nerve supplied muscles, or sphincters

***Not covered when used in combination with intraoperative monitoring:***

**95907-95913** Nerve conduction studies

**95930** Visual evoked potential (VEP) checkerboard or flash testing, central nervous system except glaucoma, with interpretation and report

**95937** Neuromuscular junction testing (repetitive stimulation, paired stimuli), each nerve, any 1 method

*NOTE: CPTs 95925 and 95926 should not be billed during the same procedure if both upper and lower limbs are monitored; instead, CPT 95938 should be used. CPT 95938 should not be coded in conjunction with either 95925 or 95926. Similarly, 95928 and 95929 should not be billed together; instead 95939 should be used if both upper and lower limbs are monitored.*

**HCPCS Codes**

No applicable HCPCS codes

**Vendors**

- **Personify**
- **HPS**

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<b>Review/Revision/Approval History</b>	
Date	Description
<b>07/10/2024</b>	<b>New Policy</b>
<b>04/27/2027</b>	<b>Reviewed and approved by Mountain Health CO-OP Policy Committee</b>

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