Clinical Review Criteria
Intraoperative Neurophysiological Monitoring (IONM)

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Criteria
For Medicare Members

<table>
<thead>
<tr>
<th>Source</th>
<th>Policy</th>
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<tbody>
<tr>
<td>CMS Coverage Manuals</td>
<td>None</td>
</tr>
<tr>
<td>National Coverage Determinations (NCD)</td>
<td>None</td>
</tr>
</tbody>
</table>

Local Coverage Determinations (LCD)

Noridian retired LCD Sensory Evoked Potentials & Intraoperative Neurophysiology Monitoring (L34072). These services still need to meet medical necessity as outlined in the LCD and will require review. LCDs are retired due to lack of evidence of current problems, or in some cases because the material is addressed by a National Coverage Decision (NCD), a coverage provision in a CMS interpretative manual or an LCD. Most LCDs are not retired because they are incorrect. The criteria should be still referenced when making an initial decision. However, if the decision is appealed, the retired LCD cannot be specifically referenced. Maximus instead looks for “medical judgment” which could be based on our commercial criteria or literature search.

Local Coverage Article

None

For Non-Medicare Members

GENERAL CRITERIA

- 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

- 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

- Monitoring is conducted and interpreted real-time (either on-site or at a remote location) and continuously communicated to the surgical team; AND

- The physician performing, or supervising monitoring must be monitoring no more than three cases simultaneously; AND

- Charges related to intraoperative monitoring will only be reimbursed when billed on a HCFA 1500 claim form for professional charges; AND

- Any charges related to intraoperative monitoring billed on a UB form are not reimbursable.
INDICATIONS

Intraoperative neuromonitoring may be indicated for a variety of spinal, intracranial, and vascular procedures. The specific type of monitoring indicated for each procedure varies, as outlined in the below criteria and summarized in the following tables. Pre-procedural baseline testing may be separately reported, but only once per operative session.

Somatosensory-evoked potentials with or without motor-evoked potentials

Intraoperative neuromonitoring using somatosensory-evoked potentials (SSEP), with or without motor-evoked potentials (using electrical stimulation), may be medically necessary during the following procedures:

- **Spinal procedures**
  - Dorsal rhizotomy
  - Correction of scoliosis
  - Correction of deformity involving traction on the spinal cord
  - Spinal cord tumor removal
  - Surgery due to traumatic injury to spinal cord
  - Surgery for arteriovenous (AV) malformation of spinal cord

- **Intracranial procedures**
  - Microvascular decompression of cranial nerves
  - Removal of acoustic neuroma, congenital auricular lesions, or cranial base lesions
  - Cholesteatoma, including mastoidotomy or mastoidectomy
  - Vestibular neurectomy for Meniere’s
  - Removal of cranial nerve neuromas affecting any of the following nerves:
    - Abducens
    - Facial
    - Glossopharyngeal
    - Hypoglossal
    - Oculomotor
    - Recurrent laryngeal
    - Spinal accessory
    - Superior laryngeal
    - Trochlear
  - Deep brain stimulation
  - Endolymphatic shuntin for Meniere’s disease
  - Oval or round window graft
  - Removal of cavernous sinus tumors
  - Resection of brain tissue near primary motor cortex and requiring brain mapping
  - Resection of epileptogenic brain tissue or tumor
  - Other intracranial procedures (e.g., aneurysm repair, intracranial AVM)

- **Non-cranial vascular procedures**
  - Carotid artery surgery
  - Arteriography with test occlusion of carotid artery
  - Deep hypothermic circulatory arrest
  - Distal aortic procedures
  - Surgery of the aortic arch, its branch vessels, or thoracic aorta

Electroencephalographic monitoring

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

- **Intracranial procedures**
  - Microvascular decompression of cranial nerves
  - Removal of acoustic neuroma, congenital auricular lesions, or cranial base lesions
- Cholesteatoma, including mastoidotomy or mastoidectomy
- Vestibular neurectomy for Meniere’s
- Removal of cranial nerve neuromas affecting any of the following nerves:
  - Abducens
  - Facial
  - Glossopharyngeal
  - Hypoglossal
  - Oculomotor
  - Recurrent laryngeal
  - Spinal accessory
  - Superior laryngeal
  - Trochlear
- Deep brain stimulation
- Endolymphatic shunting for Meniere’s disease
- Oval or round window graft
- Removal of cavernous sinus tumors
- Resection of brain tissue near primary motor cortex and requiring brain mapping
- Resection of epileptogenic brain tissue or tumor
- Other intracranial procedures (e.g., aneurysm repair, intracranial AVM)

• Non-cranial vascular procedures
  - Carotid artery surgery
  - Arteriography with test occlusion of carotid artery

**Electromyographic monitoring**

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

- Dorsal rhizotomy
- Microvascular decompression of cranial nerves
- Removal of acoustic neuroma, congenital auricular lesions, or cranial base lesions
- Cholesteatoma, including mastoidotomy or mastoidectomy
- Vestibular neurectomy for Meniere’s
- Removal of cranial nerve neuromas affecting any of the following nerves:
  - Abducens
  - Facial
  - Glossopharyngeal
  - Hypoglossal
  - Oculomotor
  - Recurrent laryngeal
  - Spinal accessory
  - Superior laryngeal
  - Trochlear

<table>
<thead>
<tr>
<th>SPINAL PROCEDURES</th>
<th>SSEP (with or without MEP)</th>
<th>EEG</th>
<th>EMG</th>
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<tbody>
<tr>
<td></td>
<td>95925, 95926, 95927, 95938</td>
<td>95822, 95955</td>
<td>95860, 95861, 95867, 95868, 95870</td>
</tr>
<tr>
<td><strong>Dorsal rhizotomy</strong></td>
<td>✓</td>
<td></td>
<td>✓</td>
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<tr>
<td><strong>Correction of scoliosis</strong></td>
<td>✓</td>
<td></td>
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</tr>
<tr>
<td>Criteria</td>
<td>Codes</td>
<td>Revision History</td>
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<tr>
<td>Correction of deformity involving traction on the spinal cord</td>
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<tr>
<td>Spinal cord tumor removal</td>
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<td></td>
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<tr>
<td>Surgery due to traumatic injury to spinal cord</td>
<td>☑</td>
<td></td>
<td></td>
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<tr>
<td>Surgery for AV malformation of spinal cord</td>
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### NON-CRANIAL VASCULAR PROCEDURES

<table>
<thead>
<tr>
<th>Procedure</th>
<th>SSEP (with or without MEP)</th>
<th>EEG</th>
<th>EMG</th>
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<tbody>
<tr>
<td>Carotid artery surgery</td>
<td>☑</td>
<td>☑</td>
<td></td>
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<tr>
<td>Arteriography w/ test occlusion of carotid artery</td>
<td>☑</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>Deep hypothermic circulatory arrest</td>
<td>☑</td>
<td></td>
<td></td>
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<tr>
<td>Distal aortic procedures (due to risk of ischemia to spinal cord)</td>
<td>☑</td>
<td></td>
<td></td>
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<tr>
<td>Surgery of aortic arch, its branch vessels, or thoracic aorta</td>
<td>☑</td>
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<tr>
<td>INTRACRANIAL PROCEDURES*</td>
<td>SSEP (with or without MEP) 95925, 95926, 95927, 95938 With MEP – 95928, 95929, 95939</td>
<td>EEG 95822 95955</td>
<td>EMG 95860 95861 95867 95868 95870</td>
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<tr>
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<tr>
<td>Microvascular decompression of cranial nerves</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Removal of acoustic neuroma, congenital auricular lesions, cranial base lesions</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Cholesteatoma, including mastoidotomy or mastoidectomy</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Vestibular neurectomy for Meniere’s</td>
<td>✓</td>
<td>✓</td>
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<td>Removal of cranial nerve neuromas affecting any of following nerves: Abducens Facial Glossopharyngeal Hypoglossal Oculomotor Recurrent laryngeal Spinal accessory Superior laryngeal Trochlear</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Deep brain stimulation</td>
<td>✓</td>
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<td>Endolymphatic shunt for Meniere’s disease</td>
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<tr>
<td>Removal of cavernous sinus tumors</td>
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<td>Resection of brain tissue near primary motor cortex and requiring brain mapping</td>
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<tr>
<td>Resection of epileptogenic brain tissue or tumor</td>
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<tr>
<td>Other intracranial vascular procedures (e.g. aneurysm repair, intracranial AV malformation)</td>
<td>✓</td>
<td>✓</td>
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</table>

*Intraoperative brainstem auditory evoked response monitoring may also be appropriate for intracranial procedures in which auditory function is at risk, such as acoustic neuroma resection or brainstem tumor resection.

**EXPERIMENTAL AND INVESTIGATIONAL**

IONM is considered experimental/investigational for all 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:
• Routine lumbar or cervical laminectomies and fusions
• Spinal cord stimulator implantation
• Thyroid or parathyroid surgery
• Cochlear implantation
• Vagal nerve stimulator implantation
• Spinal injections
• Hip replacement
• Parotid gland surgery

Intraoperative monitoring of visual evoked potentials is experimental and investigational for all indications.

Intraoperative monitoring of motor evoked potentials using transcranial magnetic stimulation is experimental and investigational for all indications.

Nerve conduction studies for intraoperative monitoring purposes are considered experimental and investigational for all indications.

**If requesting these services, please send the following documentation to support medical necessity:**

- Last 6 months of clinical notes from requesting provider &/or specialist
- Last 6 months of radiology if applicable

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**Background**

**EVIDENCE BASIS**

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.

A systematic review (Fehlings 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.

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.

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. 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

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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 or 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.

In a systematic review on IONM for cervical degenerative myelopathy and radiculopathy, authors concluded that altering 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.

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.

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).

Medical Technology Assessment Committee (MTAC)

Intraoperative Neurophysiologic Monitoring (IONM)

08/17/2015: MTAC REVIEW

Evidence Conclusion: The selected studies offer a small sample of the extensive literature currently available relating to IONM. For the most part, the available evidence is descriptive and details the experience of IONM in various surgical settings. In the selected studies, IONM is using to support surgeries in various specialties including neurosurgery (brain and spine), cardiac, and vascular. Population sizes range from 62 to 119 and assessed pre- and post-surgical outcomes such as neurophysiologic alerts during surgery and post-operative neurological deficits. Conclusions from the selected studies conflict with some asserting the utility of IONM technology and others finding minimal utility due to the inability to predict post-operative complications (Schramm, Koht et al. 1990; Linstedt, Maier et al. 1998; Ghariani, Liard et al. 1999; Bose, Sestokas et al. 2004). Surgical procedures and interventions are not always based on scientific evidence and instead, tend to evolve over time. Today, IONM is considered to be a standard of care limiting the ability to carry out methodologically sound comparative studies due to equipoise. Beyond that, the existing literature base is extremely heterogeneous addressing various surgical procedures in different populations with varying and conflicting conclusions. As a result, the evidence is insufficient to be able to determine if IONM is truly effective at detecting and preventing neurologic complications.

Conclusions: There is insufficient evidence to establish that IONM, either on-site or remote, reduces the risk of neurologic injuries during surgical procedures. There is insufficient evidence to support the safety of IONM.

Articles: The literature search revealed a large number of publications relating to IONM. There were no randomized controlled trials (RCTs) comparing the outcomes of surgeries that employed the use of IONM (either remote or on-site) with those not utilizing the monitoring technique nor where there any studies making a comparison between remote and onsite monitoring. The search yielded a wide variety of observational studies the majority of which had no comparison group. Due to the extensive amount of literature identified, the following studies are a small sample of the available evidence: Bose B, Sestokas AK, Schwartz DM. Neurophysiological monitoring of spinal cord function during instrumented anterior cervical fusion. The Spine Journal. 2004;4(2):202-207. See Evidence Table 1. Schramm J, Koht A, Schmidt G, et al. Surgical and electrophysiological observations during clipping of 134 aneurysms with evoked potential monitoring. Neurosurgery. 1990;26(1):61-70. See Evidence Table 1. Ghariani S, Liard L, Spaey J, et al. Retrospective study of somatosensory evoked potential monitoring in deep hypothermic circulatory arrest. The Society of Thoracic Surgeons. 1999; 67:1915-1918. See Evidence Table 1. Linstedt

The use of Intraoperative Neurophysiologic Monitoring (IONM) does not meet Kaiser Permanente Medical Technology Assessment Criteria.

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<tr>
<th>Date Created</th>
<th>Date Reviewed</th>
<th>Date Last Revised</th>
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<td>08/27/2015</td>
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MDCRPC Medical Director Clinical Review and Policy Committee
MPC Medical Policy Committee

<table>
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<tr>
<th>Revision History</th>
<th>Description</th>
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<tr>
<td>05/07/2019</td>
<td>MPC approved to adopt KP National criteria for IONM.</td>
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**Codes**

CPT:
- General neuromonitoring: 95940, 95941, G0453
- Somatosensory-evoked potentials (SSEP): 95925, 95926, 95927, 95938
- Motor evoked potentials (MEP): 95928, 95929, 95939
- Brainstem auditory evoked potentials (BAEP): 92585, 92586
- Electroencephalography: 95822, 95955
- Electromyography: 95860, 95861, 95867, 95868, 95870
- Experimental and Investigational for Intraoperative Monitoing Use: 95907-95913, 95930, 95937

**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.