# Intraoperative Neurophysiological Monitoring (IONM) Alerts in 2,599 Lumbar Surgeries

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## Abstract

Intraoperative neuromonitoring (IONM) has been used in surgical procedures where the functional integrity of the nervous system is at risk. More recent studies have shown the benefits of IONM in lumbar surgeries. Our data shows the incidence of different alerts in various types of lumbar surgeries utilizing IONM. Intraoperative neurophysiological monitoring (IONM) or intraoperative neuromonitoring is 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 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. Neuromonitoring employs various electrophysiologic modalities, such as extracellular single unit and local field recordings, SSEP, transcranial electrical motor evoked potentials (TCeMEP), EEG, EMG, and auditory brainstem response (ABR). EMG is used for cranial nerve monitoring in skull base cases and for nerve root monitoring and testing in spinal surgery Patients benefit from neuromonitoring during certain surgical procedures, namely any surgery where there is risk to the nervous system. Most neuromonitoring is utilized by spine surgeons, but neurosurgeons, vascular, orthopedic, otolaryngologists, and urology surgeons have all utilized neuromonitoring as well. The most common applications are in spinal surgery; selected brain surgeries; carotid endarterectomy; ENT procedures such as acoustic neuroma (vestibular schwannoma) resection, parotidectomy; and nerve surgery. Motor evoked potentials have also been used in surgery for thoracic aortic aneurysm.

We performed a retrospective analysis of IONM data of 2,599 extradural lumbar surgeries performed between January 2019 to March 2021 (males 50.2%, females 49.8%; 6-89 years, median 52 years). We identified surgical events categorized by changes in neurophysiological signals that required intraoperative intervention, surgical pause, or other efforts to prevent any neurological injury. The aims of the study were to determine the most common alert type, type of surgical approach with the highest incidence of alerts, and modality with the highest incidence of alerts.

A total of 1072 events occured with highest incidence in lateral lumbar surgeries (21.3%) and lowest incidence in anterior lumbar surgeries (11%). A single surgery may have more than one event: anesthesia: 227, positioning: 203, surgical: 642. EMG activity occurred in approximately 75% of the cases with surgical events. 651 of the events were resolved by closing. 145 were not resolved by closing, and 74 were alerts (such as T-EMG navigation) where the modality resolution was not applicable.

According to our data, surgical events were the most common type of alerts and EMG as the common modality. IONM assists the surgical team in preventing post-operative neurological deficits. Many potential post-operative deficits were resolved intraoperatively with IONM

**Keywords:** Intraoperative neuromonitoring; electroencephalography; electromyography; nerve; lumbar surgeries; neurological deficits;

## Biography

Dr. Faisal R. Jahangiri is the immediate past-president of the American Society of Neurophysiological Monitoring (ASNM) and working as a Vice President of Clinical Affairs at Axis Neuromonitoring LLC in Richardson, Texas. Dr. Jahangiri specializes in the field of Intra Operative Neurophysiological Monitoring (IONM). He has been teaching IONM courses at The University of Texas at Dallas (Texas) and Labouré College (Massachusetts). He is one of the few board-certified diplomates by the American Board of Neurophysiological Monitoring (ABNM).He has published more than 36 papers, plus books chapters and three books on IONM. He is Fellow of ASNM and Neurodiagnostic Society