

# Intraoperative Monitoring Is Associated with Fewer Neurologic Complications in ‘Low Risk’ Spinal Surgeries

BY SUSAN FITZGERALD

## ARTICLE IN BRIEF

A new analysis of a large national inpatient dataset found that intraoperative monitoring significantly reduced the rate of neurologic complications in patients who underwent spinal decompressions or simple fusions compared with patients who were not monitored.

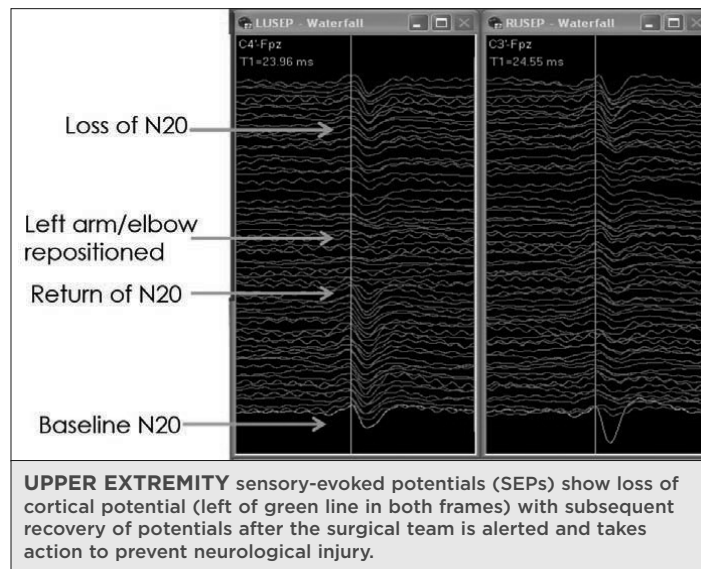
The question of whether intraoperative neurophysiological monitoring provides any benefit for so-called “low risk” spinal surgeries such as decompression and simple fusion has been the focus of some debate. Skeptics say monitoring is not necessary for straightforward spinal procedures and that it is overused, increasing the cost of surgery.

A new analysis of a large national inpatient dataset found, however, that intraoperative monitoring (IOM) significantly reduced the rate of neurologic complications in patients who underwent spinal decompressions or simple fusions compared with patients who were not monitored. The difference in the neurologic complication rate was 0.8 percent for the IOM group compared with 1.4 percent for the non-IOM group.

The analysis also showed that the use of IOM was associated with 39 percent higher total hospital charges on discharge compared with non-IOM cases; the difference was narrowed to 9 percent, however, when the researchers statistically adjusted the numbers for confounding factors, including patient demographics, type of surgery, and comorbidities.

“Spinal decompressions and fusions are among the most widely performed and costly surgeries in the United States, carrying a small but real chance of neural injury, with profound consequences for patient quality of life and health care costs,” the study authors wrote in the paper, published online first October 7 in *Neurology*.

Sparing patients the complications of surgery would likely translate into significant savings on health care costs



in the long term, lead study author John Ney, MD, MPH, an affiliated assistant professor at the Comparative Effectiveness, Cost and Outcomes Research Center at the University of Washington, told *Neurology Today*. “You could be preventing a lifetime of disability,” he said.

The intent of IOM is to provide on-the-spot feedback on neural pathways



**DR. JOHN NEY** said sparing patients the complications of surgery would likely translate into significant savings on health care costs in the long term. “You could be preventing a lifetime of disability,” he added.

so that if there is a loss of neural signal the surgeon can reverse course or make adjustments before damage is done, he explained.

## STUDY METHODOLOGY

For their analysis, the researchers examined data in the National (Nationwide) Inpatient Sample, the largest all-payer dataset of inpatient hospitalizations in the US, for the years 2007 to 2012. They looked at a sample of 10,867 cases involving IOM and 223,200 cases that did not involve monitoring, representing an estimated 1.1 million discharges.

The study authors reviewed ICD-9 diagnostic coding for neurologic complications from procedures such as spinal decompression or spinal fusion. They excluded surgeries with instrumentation and prosthetic discs, anterior and dorso-lateral approach lumbar fusions, atlanto-axial fusions, posterior cervical fusions, fusions involving more than three vertebrae, and fusions involving combined anterior and posterior approaches. Discharges involving trauma or neoplasms were also excluded from the analysis.

The use of IOM seemed especially beneficial in laminectomies. The complications rate was 2.7 percent with no

monitoring, compared with 1.7 percent with monitoring; there were no significant differences in complication rates associated with anterior cervical fusions among the groups.

Patients who underwent monitoring were more likely to be privately insured and have three or more comorbidities. Dr. Ney noted that in 2013, Medicare tightened its reimbursement rules for IOM, but the study was done before that change. IOM was more commonly used with spinal fusions than with decompressions, and was used more often in hospitals in the western part of the US than elsewhere in the country. It was also more commonly used in non-teaching hospitals than in academic centers.

## IS IT WORTH THE COST?

“Although we focused on comparatively low risk surgeries, the clinical impact of IOM suggested by our analysis is substantial,” the researchers concluded. “Here, the main clinical outcome of IOM use, a reduction in neurological complications by nearly half, is important even when the risk is less than 2 percent.”

They also noted that “although the hospital charges appear to be greater in monitored surgeries, the actual cost of IOM should be set against a lifetime of lost wages and health care costs from neurological complications (including spinal cord injury).”

The dataset used for the study did not allow the researchers to pinpoint the neurologic complications the patients experienced or whether they involved paralysis or temporary setbacks such as postoperative weakness. Also, there was no way to determine from the coding the type of monitoring that was done or who performed it (a neurologist, physiatrist, or surgeon). Generally, the surgeon decides whether to use IOM during a spinal procedure, Dr. Ney said.

Dr. Ney, who is currently a neurologist at the Edith Nourse Rogers Memorial Veterans Hospital in Bedford, MA, said a randomized controlled trial would be impractical because a very large number of patients would be needed to arrive at statistically meaningful results.

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## Thrombolysis, Severe Ischemic Stroke

Continued from page 1

### ARTICLE IN BRIEF

Researchers reported that there was no excess risk of cerebral hemorrhage in patients with NIH Stroke Scale (NIHSS) scores greater than 25, indicating a very severe stroke, compared with severe stroke (NIHSS scores between 15 and 25). The investigators suggest that the European contraindication to IV tissue plasminogen activator for those with very severe stroke may be unwarranted.

ischemic stroke who had NIH Stroke Scale (NIHSS) scores of more than 25 points compared with patients with less severe stroke whose NIHSS scores were between 15 and 25.

The findings, which were based on data on more than 20,000 patients treated at 793 hospitals across Europe, were published in the November 6 online edition of *Neurology*.

Michael V. Mazya, MD, PhD, a specialist in neurology at Karolinska University Hospital in Stockholm and the lead author of the study, said he believes that those who have a very severe stroke should be considered for thrombolysis. He added that he and his colleagues hope the findings prompt European regulators to reconsider the off-label status for IV tissue plasminogen activator (tPA) for the most severe stroke patients.

"There is a close similarity between regulations on tPA for very severe stroke

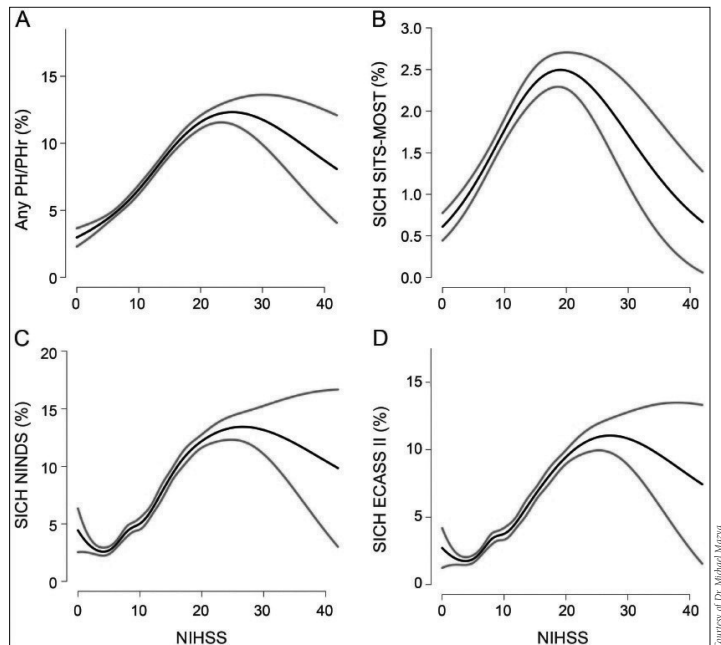
and those previously applied to patients over 80 years," he said. "Outcomes are inevitably poorer in those with very severe stroke, just as in the elderly. This has been conflated with a presumption that it is better not to treat them. Thousands of elderly patients were denied effective treatment while evidence disproving that presumption gradually accumulated. Our results indicate that the same situation likely exists for very severe stroke."

### STUDY METHODOLOGY

For the study, the researchers analyzed data from the Safe Implementation of Treatments in Stroke International Stroke Thrombolysis Registry (SITS-ISTR), an ongoing prospective multinational registry. Of the 57,000 patients treated with IV tPA between December 2002 and April 2013 who had a baseline NIHSS score, 868 had very severe stroke (with an NIHSS score greater than 25) and 19,995 had severe stroke (with an NIHSS score of 15 to 25).

Door-to-needle time for those with NIHSS scores was, on average, 73 minutes for those with very severe strokes versus 65 minutes for those with severe strokes. The arterial territory of the stroke was available for about 24 percent of the subjects, as the data were entered in the registry only beginning in 2010. Data on endovascular treatment were only entered beginning in 2010 as well, so only 3.3 percent of the very severe stroke group and 1.5 percent of the severe stroke group were recorded as having been treated with endovascular thrombectomy after receiving IV tPA.

Patients who had very severe strokes had higher rates of death after seven



**RELATIONSHIP BETWEEN BASELINE NIHSS score and risk of ICH/SICH following stroke thrombolysis. The black line indicates risk of the respective hemorrhagic outcome; red lines indicate 95% confidence intervals. The risk of parenchymal hemorrhage and SICH in tPA-treated patients peaks around the NIHSS level of 20-25. This limits the justification for contraindicating treatment in patients with NIHSS >25, the researchers said.**

Courtesy of Dr. Michael Mazya

## Intraoperative Monitoring, Low Risk Spinal Surgery

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### EXPERTS COMMENT

In an editorial accompanying the study, Aatif Husain, MD, a professor of neurology at Duke University Medical Center, wrote: "This study provides important evidence for the value of IOM in even so-called low risk surgeries. It is important to appreciate that only 4.9 percent of such surgeries utilized IOM. As such, there are potentially many more neurologic complications that can be avoided."

He also noted that while the study pointed to the value of IOM, it did not indicate which type of monitoring should be performed.

Eva Ritzl, MD, an assistant professor of neurology and director of the Intraoperative Monitoring Service at Johns Hopkins Hospital, said the new study

made a good case for the clinical benefits of IOM by examining a large database and using robust statistical methods. In studies with smaller case numbers, she noted, the financial benefits haven't always been immediately apparent.

"From a quality of life perspective, the addition of IOM during spine surgery could have immeasurable value," she said.

She noted that at her center, younger surgeons seem to prefer IOM for non-complex cases more than older surgeons. Nowadays, surgeons get comfortable with IOM during their training and readily embrace the technique and the additional information it offers, she said.

Many patients may be unaware of the potential benefit of doing IOM even if their spine procedure is a common, low risk one, Dr. Ritzl added. "People who know about IOM tend to want the IOM team."

days and at three months and worse scores on the modified Rankin Scale than those with severe strokes, but the outcomes weren't attributable to hemorrhage, the researchers found. In fact, death within seven days and within three months was more likely to be attributed to hemorrhage in the group who scored between 15 and 25 on the NIHSS.

Stanley Skinner, MD, a neurologist at Abbott Northwestern Hospital in Minneapolis, offered a few caveats about the findings. "These huge datasets are attractive to investigators because they give them access to a huge pile of insurance claims and administrative data. The problem with this kind of retrospective analysis is that the data points available to investigators are rather general, and a lot of approximations have to be made about what the patients were really like. Case matching and prospective scoring (which was not used by the authors) could have helped here," he said. "What this study does is offer some balance to some other equally confounded studies."

More research is needed to identify the best modalities for IOM during particular surgeries, Dr. Skinner added. A registry of IOM spine cases that includes case details would also be useful to better define the best use of monitoring, he said.

At three months, 14 percent of those who had an NIHSS score greater than 25 had modified Rankin Scale scores of 5 — meaning they were severely disabled, bedridden, incontinent, and requiring constant nursing care and attention — versus 12 percent of those who scored between 20 and 25 and 9 percent of those with scores between 15 and 19.

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And more patient and doctor education is needed around the topic of IOM, he said. Dr. Skinner favors an approach similar to what is used in anesthesiology, where the doctor meets the patient ahead of surgery.

"Every patient should know their monitoring team," said Dr. Skinner, who follows his own advice. "In our model, doctors introduce themselves, do a brief physical, and explain what they are going to do." •

### LINK UP FOR MORE INFORMATION:

- Ney JP, Van der Goes DN, Nuwer MR. Does intraoperative neurophysiologic monitoring matter in noncomplex spine surgeries? *Neurology* 2015; Epub 2015 Oct. 7.
- Husain AM. Neurophysiologic intraoperative monitoring in "low risk" spine surgeries. *Neurology* 2015; Epub 2015 Oct. 7.