

Study Links Use of Intraoperative Neuromonitoring during Spine Surgery to Improved Outcomes, Lower Opioid Use

INSIGHT

Spine surgery is a commonly performed procedure today, but even routine cases carry potential risk for injury and painful recoveries. As a result, these surgeries contribute to patient readmissions and often require opioids to manage pain during recovery.

Opioid overuse, abuse, and addiction has reached epidemic proportions. Since 1999, more than [300,000 people in the U.S. have died from an opioid overdose](#). Beyond the adverse health effects and emotional distress for individuals and families, opioid misuse and addiction adds tremendous financial pressure on our healthcare system. With the Centers for Disease Control (CDC) identifying opioid misuse as one of the United States' top public health challenges, it is clear that changes to medical practice that reduce demand for prescription opiates can have important social, economic, and health benefits.

In the following study of more than 8,400 patients, cervical spine patients whose surgeries included intraoperative neuromonitoring (IONM) were significantly less likely to receive prescription opiates in the year following surgery compared to patients whose surgery did not include IONM.

Additionally, the same study determined that patient readmissions were significantly reduced when IONM was used to increase the safety of the patient. This is no surprise given another recent study presented at the 2016 annual meeting of the North American Spine Society (NASS) that directly [linked the lower incidence of post-operative injury](#) in patients to the use of neuromonitoring during surgery.

Patients, hospitals, and our overall U.S. healthcare system can all benefit substantially by using intraoperative neuromonitoring to contribute to the reduction in opioid use, patient complications, and readmissions.

RESEARCH OVERVIEW**Intraoperative Neurophysiological Monitoring
in Cervical Spine Surgeries: Longitudinal Costs and Outcomes**

Original Research Presented at the
Cervical Spine Research Society Annual Meeting

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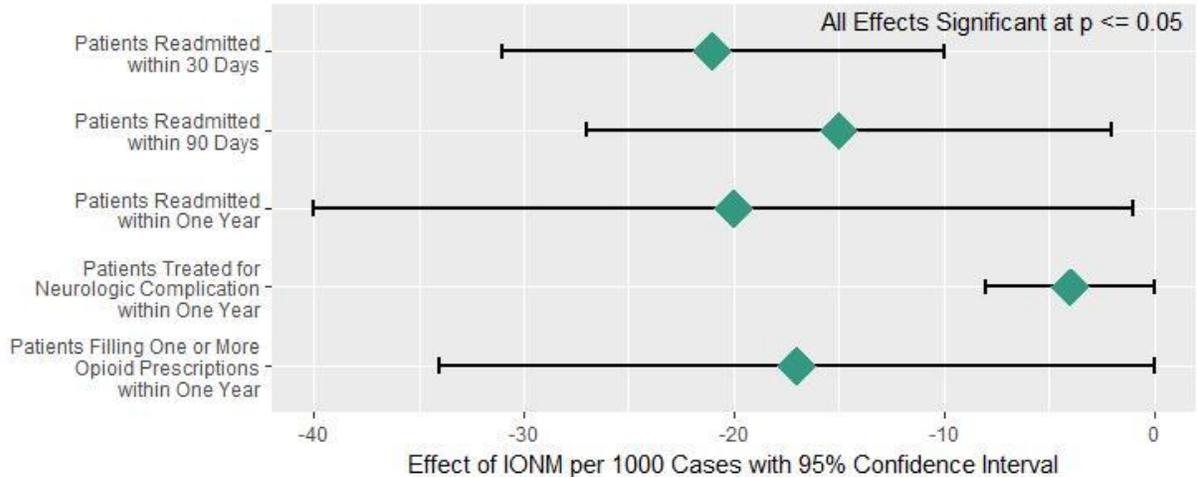
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Executive Summary

- Recent clinical research on intraoperative neuromonitoring (IONM) during cervical spine surgery has focused on unresolved questions of IONM value in single-level procedures.
- Our study, one of the most comprehensive examinations of IONM to date, made use of a large administrative health claims database to assess the possible role of IONM in reducing post-operative readmissions, neurologic complications, and pain. We controlled for numerous patient characteristics, type of surgical procedure, and geographic variations in clinical practice. Our sample included 8,413 patients, 26.7% of whom (2,246) received IONM during surgery.
- Patients receiving IONM had a significant reduction in readmission at 30 days, 90 days, and one year post-surgery. After controlling for patient characteristics, we found that for every 1,000 cases, the IONM group had 21 fewer readmissions at 30 days, 15 fewer readmissions at 90 days, and 20 fewer readmissions at 360 days (all $p < 0.05$).
- Patients receiving IONM had a significant reduction in outpatient opioid use in the year following surgery. After controlling for patient characteristics, we found

that for every 1,000 cases, the IONM group had 17 fewer patients that filled an opioid prescription than the non-IONM group ($p \leq 0.05$).

- Patients receiving IONM had a significant reduction in nervous system complications at one year post-surgery. After controlling for patient characteristics, we found that for every 1,000 cases, the IONM group had four (4) fewer patients with neurologic complications than the non-IONM group ($p \leq 0.05$).
- Despite the comprehensive nature of our study, research based on administrative claims data has a number of known limitations. Our findings are correlational in nature and will require future research to establish potential causal relations between IONM use during surgery and improved long-term outcomes.



Background

To date, the impact of intraoperative neurophysiological monitoring (IONM) on postoperative complications and pain is an unresolved empirical issue. There have been no randomized controlled trials of IONM, and prior analyses of administrative claims data have not examined outcomes beyond 30 days post-discharge. In addition, no studies have controlled for differences in patients' medical history or for differences in ancillary services (i.e., those other than IONM) received in the initial hospitalization.

These limitations are important. Complications from surgery may take time to manifest. To the extent that patients who receive IONM have a history of higher utilization, controlling for detailed characteristics of patients and their index surgeries is essential to obtaining valid estimates of IONM's effects.

Our study addresses these limitations by comparing complication rates and use of outpatient opioids following cervical spine surgery in patients who did and did not receive concurrent IONM. Our follow-up is based on all outpatient and prescription as well as hospital claims to detect differences that may not be captured otherwise. We constructed comprehensive measures of patients' prior medical treatments based on their claims history in the 180 days before surgery, and of ancillary services received during the index hospitalization that may be correlated with, but not caused by, IONM. For these reasons, our approach provides a more accurate assessment of the consequences of IONM.

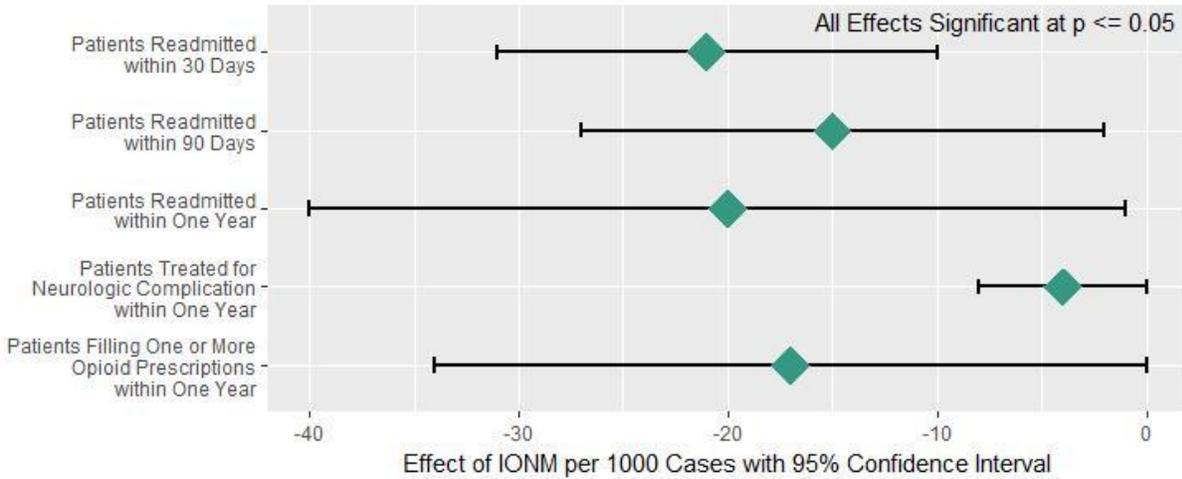
Methods

We used IMS's PharMetrics Plus™ Health Plan Claims data from 2008-2012 to identify the effects of IONM in a population of non-elderly, commercially-insured patients (age 18-63) with uncomplicated cervical spine surgery. We constructed two variables designed to measure postoperative complications and pain in the year after the admission for surgery: the presence of nervous system complications (any claim with ICD-9 diagnosis codes 997.00, 997.01, 997.02, or 997.09), and the presence of an outpatient prescription for opioids (to proxy for pain).

We estimated regression models to predict the presence of postoperative complications and pain as a function of whether the patient received IONM; patient characteristics including age, gender, comorbid illnesses, and prior medical history; the characteristics of the surgical procedure including surgical approach (anterior, posterior, or both), use of corpectomy, use of spinal instrumentation, and presence of myelopathy; and indicator variables for the patient's three-digit residential ZIP Code to capture any additional differences in patient health or physician practice patterns across geographic areas.

Results

A total of 8,413 persons undergoing uncomplicated cervical surgeries in the years 2008-2012 were included in the final sample. Of these, 2,246 had IONM concurrent with their surgery. Our analysis showed that IONM was associated with statistically significant ($p \leq 0.05$) reductions in postoperative complications and pain. In the year after admission for surgery, holding constant patient, surgical procedure, and geographic area characteristics, IONM use was associated with declines in the rate of neurological complications (of 0.4% on a base rate of complications in the no-IONM group of 0.5%), outpatient opiate usage (of 1.7% on a base rate of 12.4%), and readmissions at 30 days (2.1%), 90 days (1.5%), and 360 days (2.0%).



Limitations

Our study has limitations. First, our analysis is based on administrative claims; we did not validate our measures with clinical or chart data. Second, although we controlled for a broad set of factors and restricted our sample to a single type of surgery, our results may be due to unmeasured differences between patients receiving and not receiving IONM; we cannot prove causation. Future research should use individual-level data to more definitively identify the role of IONM in health disparities.

Study Support

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