

# Effect of Surgical Approach on Neuromonitoring Alert Rates and Neurologic Outcome in Lumbar Spine Surgery

Anthony Sestokas<sup>1</sup>, Eric Tesdahl<sup>1</sup>, Kornelis Poelstra<sup>2</sup>, John Devine<sup>3</sup>, Cheryl Wiggins<sup>1</sup>, Jason Soriano<sup>1</sup>, Jeffrey Cohen<sup>1</sup>, Samuel Weinstein<sup>1</sup>

## PURPOSE

Intraoperative neuromonitoring is used to help reduce the incidence of adverse neurologic outcomes in lumbar spine surgery. Little has been reported about rates of neuromonitoring alerts and postoperative neurologic sequelae as a function of surgical approach and number of spine levels addressed during these procedures.

## METHODS

A multi-institutional database (SpecialtyCare Operative Procedural Registry, SCOPE<sup>™</sup>) of 25,020 extradural lumbar spine procedures monitored between May, 2013 and August, 2015 was reviewed retrospectively.

Procedures were categorized by surgical approach and number of spine levels operated on. Differences within these categories in rates of alerts and new onset neurologic deficits at the time of postoperative wakeup were analyzed using binary logistic regression and post-hoc Tukey HSD tests.

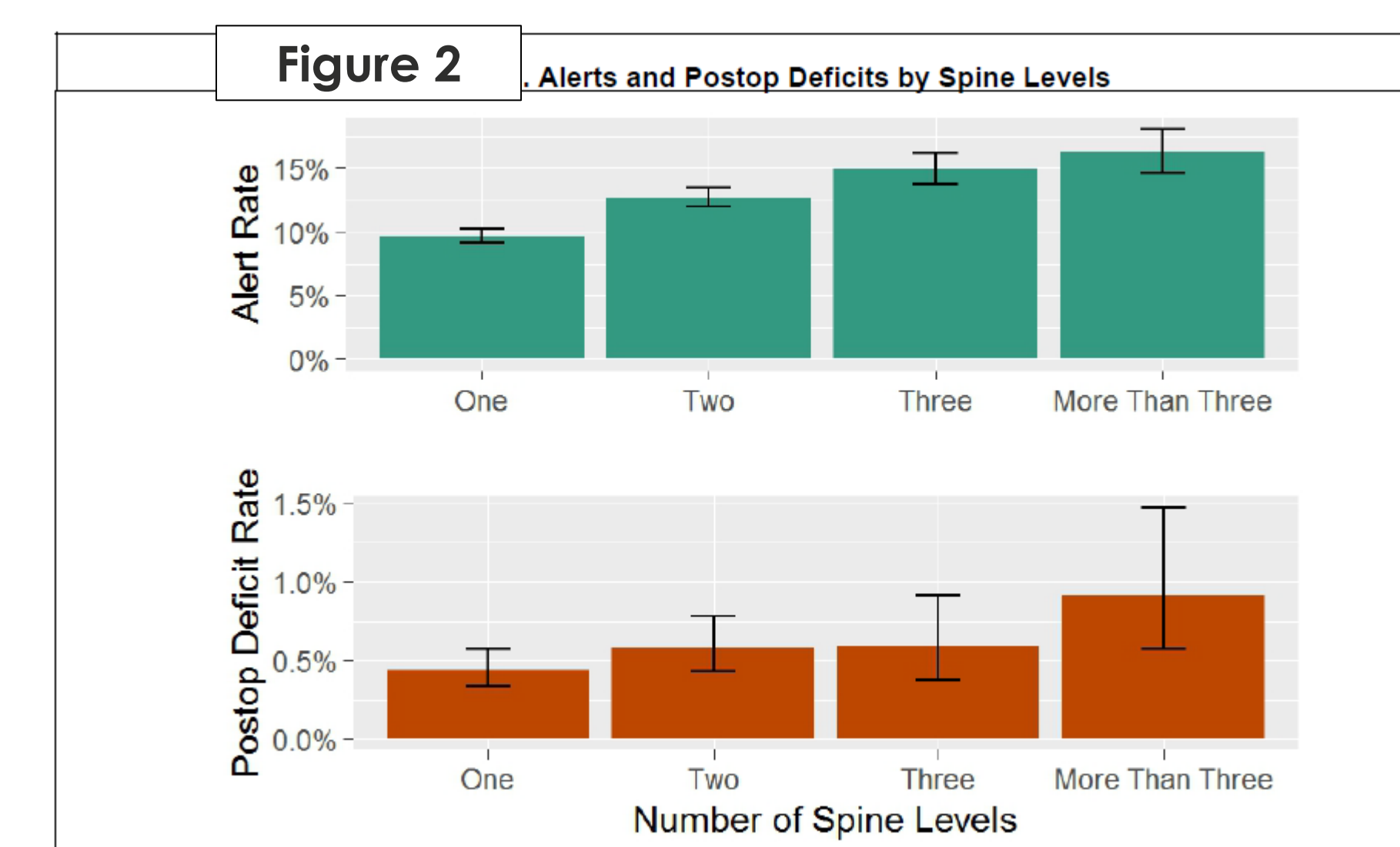
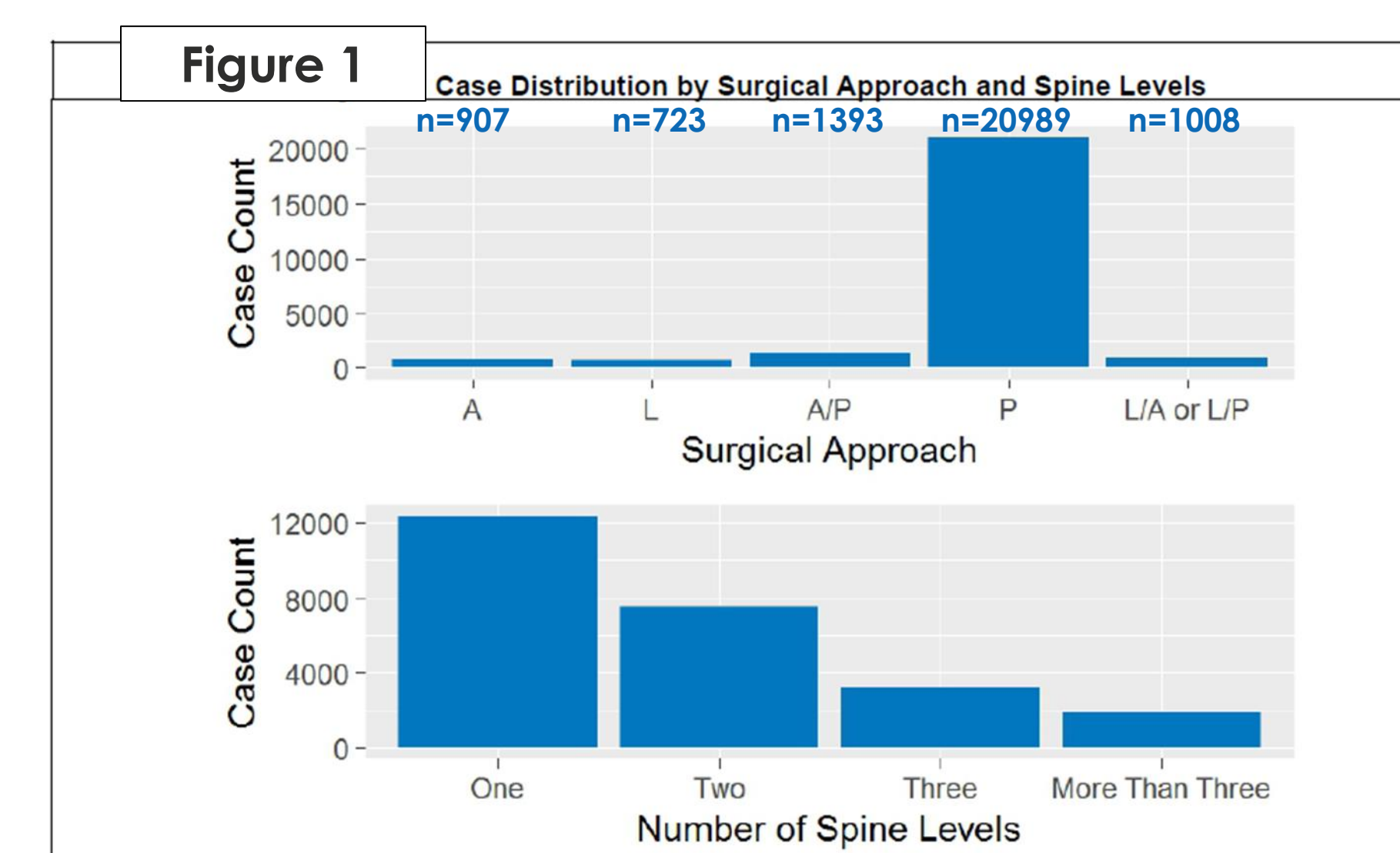
## RESULTS

Case count distributions are presented by surgical approach and number of spine levels in Figure 1.

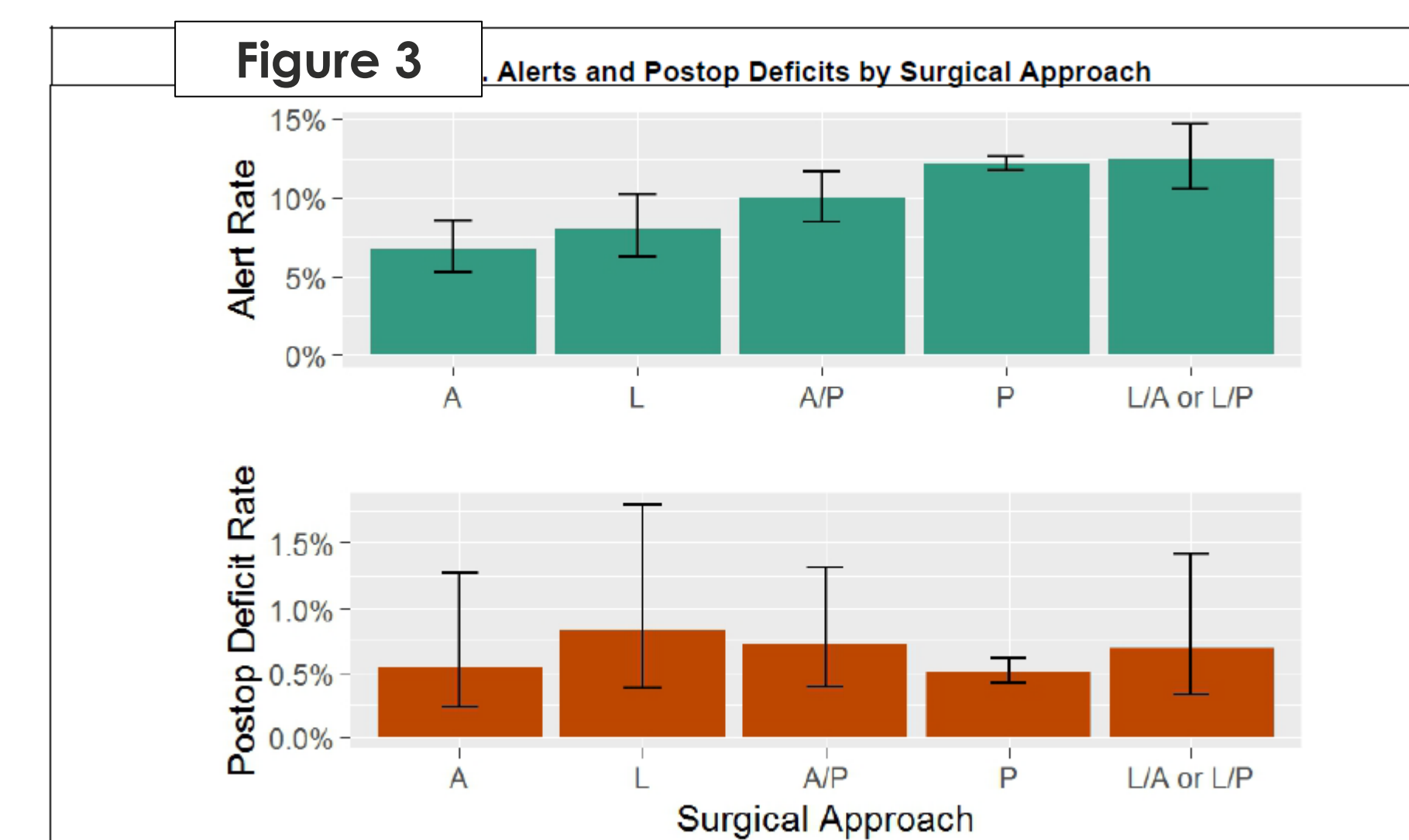
Overall rates of neuromonitoring alerts and postoperative neurologic deficits across all procedures were 11.8% and 0.5%, respectively.

The rate of neuromonitoring alerts increased with number of levels operated on (1 = 9.6%, 2 = 12.7%, 3 = 15.0%, >3 = 16.3%), as shown in Figure 2. Differences between the lowest and highest alert rates were statistically significant ( $p < 0.001$ ). Deficit rates ranged from 0.4% in single level procedures to 0.9% in procedures with >3 levels ( $p = 0.036$ ).

The lowest rate of alerts occurred in anterior procedures (6.7%), increasing for lateral (8.0%), combined anterior/posterior (10.0%), posterior (12.2%) and combined lateral surgical approaches (12.5%), as shown in Figure 3. While differences between the lowest and highest alert rates were statistically significant ( $p < 0.001$ ), there were no significant differences in postoperative neurologic deficit rates across surgical approaches when controlling for number of spine levels operated on.



Differences in neuromonitoring alert rates were statistically significant for the following comparisons: 1 vs 2 levels ( $p < 0.001$ ), 1 vs 3 levels ( $p < 0.001$ ), 1 vs >3 levels ( $p < 0.001$ ), 2 vs 3 levels ( $p = 0.008$ ), 2 vs >3 levels ( $p < 0.001$ ). Postoperative neurologic deficit rates were significantly different for 1 level vs >3 level procedures ( $p = 0.036$ ).



Differences in neuromonitoring alert rates were statistically significant for the following comparisons of surgical approaches: anterior (A) vs posterior (P) ( $p < 0.001$ ), anterior (A) vs combined lateral (L/A or P) ( $p < 0.001$ ), lateral (L) vs posterior (P) ( $p = 0.0065$ ), lateral (L) vs combined lateral (L/A or P) ( $p = 0.0230$ ) and anterior (A) vs combined anterior/posterior (A/P) ( $p = 0.0497$ ). Rates of neurologic sequelae did not differ significantly for any pairwise comparisons of surgical approaches.

## CONCLUSION

Neuromonitoring alert rates and neurologic sequelae both increase with number of lumbar spine levels operated on. While alert rates also vary with surgical approach, they are not tightly coupled to postoperative neurologic deficit rates.

The use of IONM in lumbar spine surgery may help to mitigate neurologic injury despite an increase in neuromonitoring alerts during some surgical approaches to the spine.

## DISCLOSURES/AFFILIATIONS

1. SpecialtyCare Intraoperative Neuromonitoring, Nashville, TN, United States.
2. The Spine Institute on the Emerald Coast, Destin, FL, United States.
3. Medical College of Georgia, Augusta, GA, United States.