Longitudinal Databases Enable Improved Capture of Adverse Events in Spine Surgery

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Introduction

The significant medical and economic toll of spine disorders, the increasing volume of spine surgeries, and the necessity of improved postoperative metrics due to health care reform make an overall understanding of post-operative complications imperative. This study begins to resolve the variable understanding of adverse events following spine surgery by describing the utility of a longitudinal database to provide overall and procedure-specific complication rates during both the index hospitalization and post-operative follow up.

Methods

We conducted a retrospective study of a longitudinal patient claims data in a sample of 188,965 patients from the MarketScan database of private insurance payers. We calculated overall and procedure-specific complication rates at time points ranging from the immediate peri-operative admission (index admission) to 30-days postoperatively. We captured complications identified in the immediate peri-operative period and compared them to complication incidence at other time points with total follow-up truncated at 30 days post-op.

Complication	*at 10 days*	*at 20 days*	*at 30 days*
Wound dehiscence	76.36%	213.48%	308.25%
Wound infection	56.26%	139.90%	194.42%
Wound hematoma	31.12%	61.69%	80.47%
Other wound complication	77.67%	190.31%	272.44%
New chronic pain	13.23%	27.38%	39.21%
Delirium	23.04%	45.95%	64.22%
Overall	**13.64%**	**26.67%**	**35.78%**

Table 1. Percentage increase in rates of postoperativespinal surgery complications at 10,20 and 30-days after discharge

Results

The frequency of individual complications increased consistently with longer follow-up. Wound dehiscence, infection and other wound complications demonstrated large relative increases in frequency with follow-up between 10 and 20 days, while rates for new chronic pain, delirium, and dysrhythmia increased in a graded manner up to the 30 day end-point. Index admission complication rate was 19.90%; with data capture up to 30 days post-op, the rate increased to 27.02%. 30 day follow-up increased the capture of wound infections by 194.4%, wound hematomas (80.5%), DVT (89.0%), PE (50.9%), dysphagia (72.5%) and neurological complication (30.2%). We did not observe large relative changes in complication rates for specific procedures.

Procedure	*Index Rate*	*At 30 days*
Lumbar fusion, single level, posterior	9.12%	13.96%
Lumbar fusion, single level, posterior and anterior	11.75%	17.32%
Lumbar fusion, single level, posterior with decompression	9.25%	14.12%
Lumbar fusion, single level, posterior and anterior, with decompression	10.97%	16.55%
Lumbar fusion, multiple levels	16.69%	23.32%
Lumbar fusion, multiple levels, posterior and anterior	20.50%	27.34%
Lumbar fusion, multiple levels, posterior, with decompression	13.65%	20.15%
Lumbar fusion, multiple levels, posterior and anterior, with decompression	15.65%	23.80%

Table 2. Post-operative complications rates byprocedure during index admission and 30-dayperiod after discharge.

Conclusions

Our analysis demonstrates that longitudinal databases enable use of large sample sizes and robust patient data to develop an understanding of overall and procedure-specific complication rates following spine surgery. Database studies using non-longitudinal or index admission only data capture likely underestimate complication occurrence.

Learning Objectives

By the conclusion of this session, participants should be able to:
1) Describe the importance of collecting and analyzing large patient samples in understanding complication rates in spine surgery
2) In small groups, discuss the implications of variable complication rates in the literature
3) Identify methods in which adverse event analysis could become standardized

References

Martin, B. I., Deyo, R. A., Mirza, S. K., Turner, J. A., Comstock, B. A., Hollingworth, W., & Sullivan, S. D. (2008). Expenditures and health status among adults with back and neck problems. JAMA?: The Journal of the American Medical Association, 299(6), 656–64. doi:10.1001/jama.299.6.656

Nasser, R., Yadla, S., Maltenfort, M. G., Harrop, J. S., Anderson, D. G., Vaccaro, A. R., … Ratliff, J. K. (2010). Complications in spine surgery. Journal of Neurosurgery. Spine, 13(2), 144–57. doi:10.3171/2010.3.SPINE09369

Bazaz, R., Lee, M. J., & Yoo, J. U. (2002). Incidence of dysphagia after anterior cervical spine surgery: a prospective study. Spine, 27(22), 2453–8. doi:10.1097/01.BRS.0000031407.52778.4B

McCullough, B. J., Comstock, B. A., Deyo, R. A., Kreuter, W., & Jarvik, J. G. (2013). Major medical outcomes with spinal augmentation vs conservative therapy. JAMA Internal Medicine, 173(16), 1514–21. doi:10.1001/jamainternmed.2013.8725

Patil, C. G., Sarmiento, J. M., Ugiliweneza, B., Mukherjee, D., Nuño, M., Liu, J. C., … Boakye, M. (2013). Interspinous device versus laminectomy for lumbar spinal stenosis: a comparative effectiveness study. The Spine Journal?: Official Journal of the North American Spine Society. doi:10.1016/j.spinee.2013.08.053