

Analysis of Cost Drivers of Neurovascular Aneurysm Treatment

Hussam Abou-Al-Shaar MD; Spencer Twitchell BS; Jared Reese BS; Michael Karsy; Jian Guan MD; Philipp Tausky MD;
William T. Couldwell MD, PhD

Introduction

With the continuous attention on healthcare costs, hospitals and healthcare providers must find ways to reduce costs while maintaining high-quality care. Comparison of surgical and endovascular (i.e., coiling and flow diverters) treatment of intracranial aneurysms has been an area of interest in the effort to reduce costs in neurosurgery. The Value-Driven Outcome (VDO) database at the University of Utah identifies cost drivers and tracks changes over time. We evaluated specific cost drivers for surgical and endovascular management of both ruptured and unruptured intracranial aneurysms using the VDO system.

Methods

The authors performed a retrospective review of surgical and endovascular treatment of ruptured and unruptured intracranial aneurysms from July 2011 to May 2016. Total cost (as a percentage of each patient's cost to the system), subcategory costs, and potential cost drivers were analyzed.

Results

A total of 404 patients underwent aneurysm treatment: 277 aneurysms were surgically clipped, 46 were repaired with coiling, and 81 were addressed with Pipeline stent placements. Aneurysms of the middle cerebral artery accounted for most (29.2%) of cases in the clipping group; those of the anterior communicating artery were predominant (47.8%) in the coiling group; and those of the internal carotid artery (63.0%) were most common in the Pipeline stenting group. Intracranial aneurysm surgical clipping had a mean total cost of $0.245 \pm 0.20\%$, coiling had a mean total cost of $0.28 \pm 0.24\%$, and Pipeline stenting had a mean total cost of $0.23 \pm 0.21\%$ ($P = 0.51$, one-way ANOVA). Facility costs were the most significant (59.9%) contributor to intracranial clipping costs, followed by supplies (18.5%); coiling also showed facility as the greatest cost driver (48.4%), followed by supplies (31.3%). Pipeline stent placement was unique in that supplies were the greatest influence on total cost (65.9%), followed by facility (21.8%). Patients presenting with ruptured aneurysms had an average 2.3 times greater cost than patients treated electively (unruptured aneurysms) ($P = 0.0001$, t-test).

Conclusions

Facility utilization and supplies constitute the major factors for total costs in aneurysm treatment strategies. Developing and implementing approaches and protocols to mitigate the total costs and improve resource utilization are important in reducing costs while maintaining high-quality patient care.

Learning Objectives

1. To evaluate specific cost drivers for surgical and endovascular management of both ruptured and unruptured intracranial aneurysms using the Value-Driven Outcome (VDO) system.
2. To propose approaches and protocols to mitigate the total costs and improve resource utilization are important in reducing costs while maintaining high-quality patient care.

[Default Poster]

References

- 1.IOM (Institute of Medicine): Best care at lower cost: the path to continuously learning health care in America. Washington, DC: The National Academies Press; 2012 2012.
- 2.Kawamoto K, Martin CJ, Williams K, Tu MC, Park CG, Hunter C, et al. Value Driven Outcomes (VDO): a pragmatic, modular, and extensible software framework for understanding and improving health care costs and outcomes. *J Am Med Inform Assoc.* 2015;22(1):223-235.
- 3.Lee VS, Kawamoto K, Hess R, Park C, Young J, Hunter C, et al. Implementation of a Value-Driven Outcomes Program to Identify High Variability in Clinical Costs and Outcomes and Association With Reduced Cost and Improved Quality. *JAMA.* 2016;316(10):1061-1072.
- 4.Bekelis K, McGirt MJ, Parker SL, Holland CM, Davies J, Devin CJ, et al. The present and future of quality measures and public reporting in neurosurgery. *Neurosurg Focus.* 2015;39(6):E3.
- 5.Missios S, Bekelis K. Hospitalization cost after spine surgery in the United States of America. *J Clin Neurosci.* 2015;22(10):1632-1637.
- 6.Karsy M, Brock AA, Guan J, Bisson EF, Couldwell WT. Assessment of Cost Drivers in Transsphenoidal Approaches for Resection of Pituitary Tumors Using the Value-Driven Outcome Database. *World Neurosurg.* 2017;105:818-823.
- 7.Molyneux A, Kerr R, Stratton I, Sandercock P, Clarke M, Shrimpton J, Holman R, et al. International Subarachnoid Aneurysm Trial (ISAT) of neurosurgical clipping versus endovascular coiling in 2143 patients with ruptured intracranial aneurysms: a randomised trial. *Lancet.* 2002;360(9342):1267-1274.
- 8.Bairstow P, Dodgson A, Linto J, Khangure M. Comparison of cost and outcome of endovascular and neurosurgical procedures in the treatment of ruptured intracranial aneurysms. *Australas Radiol.* 2002;46(3):249-251.
- 9.Familiari P, Maldaner N, Kursumovic A, Rath SA, Vajkoczy P, Raco A, et al. Cost Comparison of Surgical and Endovascular Treatment of Unruptured Giant Intracranial Aneurysms. *Neurosurgery.* 2015;77(5):733-741; discussion 741-743.
- 10.Halkes PH, Wermer MJ, Rinkel GJ, Buskens E. Direct costs of surgical clipping and endovascular