

Analysis of Neurovascular Aneurysm Treatment Cost-Drivers using the Value Driven Outcome Database

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

Philipp Taussky MD

Department of Neurosurgery, University of Utah, Salt Lake City, Utah

Click To

Add Logo

Introduction

We utilized the Value-Driven Outcome (VDO) database at our institution to identifies drivers and changes in cost surgical and endovascular (i.e. coiling and pipeline flow diverters) management of both ruptured and unruptured aneurysms.

Methods

A retrospective review was performed for surgical and endovascular treatment of rupture and unruptured intracranial aneurysms from 2011 to 2016. Total cost (as a percentage of each patient's cost to the system), subcategory costs, and potential cost drivers were evaluated.

Results

A total of 404 patients underwent an aneurysm treatment (n=277 surgically clipped, n=46 coiling, and n=81 pipeline flow diverters). Middle cerebral artery aneurysms accounted for the majority (29.2%) of cases in the clipping group; anterior communicating artery (47.8%) in the coiling group; and internal carotid artery aneurysms (63.0%) in the pipeline stenting group. Intracranial aneurysm surgical clipping had a mean total cost of 0.245±0.20%, coiling had a mean total cost of 0.28±0.24%, and pipeline stenting had a mean total cost of 0.23±0.21% (p=0.51 One-way ANOVA). Intracranial clipping showed facility costs as being the most significant (59.9%) contributor, followed by supplies (18.5%); coiling also showed facility as the greatest cost-driver (48.4%), followed by supplies (31.3%); while 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 cost on average 2.3X as much as elective patients (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.

Table 1: Patient demographics				
	Craniotomy N=273	Coiling N=102	Flow diversion N=139	P-value
Age	52.3±13.3	57.6±13.3	56.0±14.7	0.006
Aneurysm location				0.0001
ICA	55 (20.1%)	12 (11.8%)	88 (63.3%)	
ACA	17 (6.2%)	17 (16.7%)	5 (3.6%)	
Acomm	65 (23.8%)	31 (30.4%)	2 (1.4%)	
Pcomm	20 (7.3%)	8 (7.8%)	5 (3.6%)	
MCA	81 (29.7%)	1 (1.0%)	5 (3.6%)	
Basilar	6 (2.2%)	20 (19.6%)	8 (5.8%)	
Vert/SCA/PCA/PICA/AICA	13 (4.8%)	8 (7.8%)	24 (17.3%)	
Multiple	16 (5.9%)	5 (4.9%)	2 (1.4%)	
Aneurysm status	, , ,	, í	`	0.0001
Unruptured	129 (47.3%)	41 (40.2%)	134 (96.4%)	
Ruptured	144 (52.7%)	61 (59.8%)	5 (3.6%)	
Sex (male)	104 (38.1%)	38 (37.3%)	32 (23.0%)	0.007
ASA				0.0001
Unknown	17 (6.2%)	55 (53.9%)	59 (42.5%)	
1	4 (1.5%)	2 (2.0%)	1 (0.7%)	
2	57 (20.9%)	6 (5.9%)	31 (22.3%)	
3	117 (42.9%)	17 (16.7%)	32 (23.0%)	
4	65 (23.8%)	19 (18.6%)	13 (9.4%)	
5	8 (2.9%)	3 (2.9%)	3 (2.2%)	
6	5 (1.8%)	0 (0.0%)	0 (0.0%)	
Length of stay (days)	11.7±9.7	10.5±10.2	4.4±7.1	0.0001
Discharge disposition				0.0001
Home/self-care	147 (53.8%)	62 (60.8%)	117 (84.2%)	
Home health services	14 (5.1%)	2 (2.0%)	6 (4.3%)	
Acute rehabilitation	74 (27.1%)	16 (15.7%)	7 (5.0%)	
LTAC	7 (2.6%)	4 (3.9%)	2 (1.4%)	
SNF	13 (4.8%)	7 (6.9%)	3 (2.2%)	
Deceased	18 (6.6%)	11 (10.8%)	4 (2.9%)	
Mean (±SD) total cost (%)	0.17±0.14	0.25±0.20	0.20±0.16	0.0001





Table 2: Univariate and multivariable analysis of

factors affecting cost Univariate Multivariable Standardized **B P-value** Standardized f **P-value** Aneurysm location -0.040.4 -0.03 0.5 -0.5 0.0001 0.0001 Aneurysm status -0.4 Procedure type 0.08 0.06 0.3 0.0001 0.04 0.05 0.2 0.4 Sex ASA 0.4 0.0001 0.2 0.0001 Discharge disposition 0.5 0.000 0.3 0.0001 0.2 0.2 Year 0.0001 0.0001

References

Twitchell S, Abou-Al-Shaar H, Reese J, Karsy M, Eli IM, Guan J, Taussky P, Couldwell WT. Analysis of cerebrovascular aneurysm treatment cost: retrospective cohort comparison of clipping, coiling, and flow diversion. Neurosurg Focus. 2018 May;44(5):E3.