

Analysis of Cost Variation in Unruptured Cerebral Aneurysm Treatment

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Introduction

Over the past couple decades, endovascular coiling has become an increasingly popular treatment option for cerebral aneurysms as an alternative to open microsurgical clipping. While studies have compared these interventions based on clinical outcomes and complications, few have analyzed the costs for treating unruptured aneurysms and factors that underlie the variation in costs.

Learning Objectives

- 1) Understand trends in utilization and costs of unruptured aneurysm treatment
- 2) Discuss patient demographic, clinical, and hospital factors that underlie cost variation
- 3) Identify areas of improvement to contain rising costs of unruptured aneurysm treatment

Methods

Data source and population:

Using the National Inpatient Sample from 2002 to 2013, we identified 20,753 unruptured aneurysm patients who were treated via clipping or coiling. Patients were identified using ICD-9/10 diagnosis and procedure codes.

Statistical Analysis:

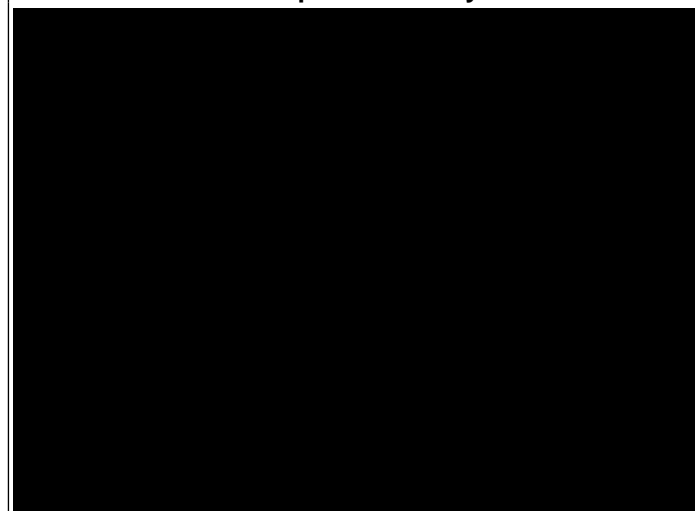
We performed univariate and multivariate analyses (survey-weighted ordinary least squares regression models) to calculate national estimates on rates and costs of aneurysm treatments and to identify patient demographic, clinical, and hospital factors associated with total hospital costs.

Results

National rates for unruptured clipping increased slightly from 1.21 to 1.29 per 100,000 people while unruptured coiling increased drastically from 0.52 to 1.9 per 100,000 people.

Results

Utilization of Unruptured Aneurysm Treatment



Trends in Costs for Unruptured Aneurysm Treatment

Year	Unruptured Clipped	Unruptured Coiled
NIS Database	n=45,150	n=57,455
2002	\$26,811 (\$1,002)	\$21,184 (\$836)
2003	\$28,024 (\$949)	\$23,730 (\$890)
2004	\$29,004 (\$956)	\$24,749 (\$657)
2005	\$26,961 (\$960)	\$24,890 (\$706)
2006	\$29,967 (\$788)	\$26,805 (\$510)
2007	\$32,320 (\$775)	\$30,425 (\$762)
2008	\$29,326 (\$840)	\$28,095 (\$486)
2009	\$33,664 (\$1,045)	\$27,239 (\$454)
2010	\$32,432 (\$854)	\$33,122 (\$886)
2011	\$32,879 (\$711)	\$30,051 (\$862)
2012	\$32,340 (\$934)	\$32,650 (\$650)
2013	\$33,549 (\$916)	\$32,592 (\$730)

Inflation-adjusted costs for clipping increased 25% while costs for coiling increased 54%

Results

Multivariate Analysis of Predictors of Total Cost for Unruptured Aneurysm Clipping and Coiling

	Unruptured Clipping			Unruptured Coiling		
	Estimates	P-value	Sig	Estimates	P-value	Sig
Age, in 10 year increments	1.00	0.627		1.02	0.002	***
Sex (Female vs. Male)	0.97	0.008	***	0.96	0.008	***
Race (vs. White)						
Black	1.07	<0.001	***	0.97	0.168	
Hispanic	1.01	0.546		0.95	0.004	***
Other	1.03	0.17		1.06	0.033	***
Insurance Status (vs. Private)						
Medicare	1.01	0.602		1.00	0.754	
Medicaid	1.01	0.435		1.00	0.852	
Other	1.02	0.251		1.08	<0.001	***
Risk of Mortality (vs. Minor)						
Moderate	1.13	<0.001	***	1.03	0.195	
Major/Extreme	1.22	<0.001	***	1.10	0.003	***
Severity of Illness (vs. Minor)						
Moderate	1.37	0.053		1.04	0.003	***
Major/Extreme	1.52	0.006	***	1.16	<0.001	***
LOS, in days	1.04	<0.001	***	1.05	<0.001	***
Elective (vs. Non-elective)	1.06	<0.001	***	1.03	0.023	***
Bedsize (vs. Small)						
Medium	0.93	0.012	***	1.06	0.162	
Large	0.87	<0.001	***	1.05	0.217	
Wage Index	1.59	<0.001	***	1.24	<0.001	***
Location (urban vs. rural)	0.86	<0.001	***	0.79	<0.001	***
Teaching status (non-teaching vs. teaching)	1.11	<0.001	***	0.94	0.017	***
Region (vs. Northeast)						
Midwest	1.17	<0.001	***	1.01	0.664	
South	1.05	0.001	***	1.07	<0.001	***
West	1.24	<0.001	***	1.13	<0.001	***

Female sex, LOS, ROM, SOI, patient's residence (metropolitan), wage index, and hospitals in the western United States were associated with higher hospital costs for both clipping and coiling (P<0.05).

Conclusions

There is a significant increase and large variation in costs for treatment of unruptured aneurysms. The utilization rate and costs for endovascular coiling increased more quickly than those of microsurgical clipping. Even after controlling for patient and hospital factors, hospitals in the West had significantly higher costs than other regions in the country.