

Medicare payment data for spine reimbursement; important but flawed data for evaluating utilization of resources

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Abstract

Background: Medicare data showing physician-specific reimbursement for 2012 were recently made public in the mainstream media. Given the ongoing interest in containing healthcare costs, we analyze these data in the context of the delivery of spinal surgery.

Methods: Demographics of 206 leading surgeons were extracted including state, geographic area, residency training program, fellowship training, and academic affiliation. Using current procedural terminology (CPT) codes, information was evaluated regarding the number of lumbar laminectomies, lumbar fusions, add-on laminectomy levels, and anterior cervical fusions reimbursed by Medicare in 2012.

Results: In 2012 Medicare reimbursed the average neurosurgeon slightly more than an orthopedic surgeon for all procedures (\$142,075 vs. \$110,920), but this was not found to be statistically significant ($P = 0.218$). Orthopedic surgeons had a statistical trend illustrating increased reimbursement for lumbar fusions specifically, \$1187 versus \$1073 ($P = 0.07$). Fellowship trained spinal surgeons also, on average, received more from Medicare (\$125,407 vs. \$76,551), but again this was not statistically significant ($P = 0.112$). A surgeon in private practice, on average, was reimbursed \$137,495 while their academic counterparts were reimbursed \$103,144 ($P = 0.127$). Surgeons performing cervical fusions in the Centers for Disease Control West Region did receive statistically significantly less reimbursement for that procedure than those surgeons in other parts of the country ($P = 0.015$). Surgeons in the West were reimbursed on average \$849 for CPT code 22,551 while those in the Midwest received \$1475 per procedure.

Conclusion: Medicare reimbursement data are fundamentally flawed in determining healthcare expenditure as it shows a bias toward delivery of care in specific patient demographics. However, neurosurgeons, not just policy makers, must take ownership to analyze, investigate, and interpret these data as it will affect healthcare reimbursement and delivery moving forward.

Key Words: Healthcare economics, Medicare, reimbursement, spinal surgery

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INTRODUCTION

Costs for healthcare delivery total \$2.8 trillion, or about 18% of the US gross domestic product. The Affordable Care Act focuses on value in the medical arena.^[5] Given the climate of healthcare reform spinal surgery is currently under scrutiny for economic and medical validation.^[9,10,20] This article focuses on cost containment in spinal surgery.

The dollar amount billed to Medicare physician was made public in 2012. Neurosurgeons must take ownership of the data regarding their perceived reimbursement. Medicare billing data show the physician-specific payments of 77 billion dollars across 880,000 medical providers.^[7] This allows the general population to research exactly how much was billed and for what procedures by individual physicians. Information extrapolated from these data is often misapplied to represent the totality of United States healthcare; this is the information being researched by the general public, policy makers, and lawyers.^[20] Here, we critically analyzed the data for 200 prominent spinal surgeons across the United States.

METHODS

Surgeons were enrolled into our analysis if they were listed in Becker's 2012 Spine Review "Spine Surgeons and Specialist to Know."^[1] This sample population was selected because it focuses outside of specialized medical publications; listed surgeons are considered to be influential to business, legal, and medical industry leaders.

Spinal surgeons crossing the discipline of neurosurgery and orthopedic surgery were investigated for utilization of resources. Demographics of individual spine surgeons were extracted including state, geographic area, residency training program, fellowship training, and academic affiliation. Geographic area was split based on the Centers for Disease Control Prevention and Health Promotion map, carving the United States among 10 Department of Health and Human Services Regions.^[4]

Residency program training information was retrieved from publically available information regarding surgeon biography. Fellowship training was considered only for the discipline of spinal surgery. No distinction was made between the type of spinal fellowship being orthopedic or neurosurgical. No distinction was made between the specific discipline of the fellowship; minimally invasive, scoliosis, degenerative, and spinal oncology were all considered. No distinction was made between "en-folded" neurosurgery fellowships and typical postresidency fellowships. Physicians were considered to have an academic affiliation if this information was listed in publically available information regarding the physician. There was no distinction made between academic

title (e.g., Professor vs. Clinical Instructor). It was not possible, given the data, to separate between the physical location of surgery (e.g., community hospital, academic hospital, or surgery center).

No human subjects or patient specific information was used from this publically available data set thereby not requiring Internal Review Board approval.

Database

Medicare data were extracted from the Wall Street Journal search page for "Medicare Payments to Providers in 2012."^[14] Physicians were searched by name and state to locate physician-specific data in regards to exact dollar amount the individual received from Medicare reimbursements in 2012. This database provides direct information regarding payment for all Medicare reimbursed procedures if the physician performed the procedure on more than 10 patients in the given year.^[14]

Information was also extracted regarding the number of lumbar laminectomies, the addition of another laminectomy level, lumbar fusions, and anterior cervical fusions performed by each surgeon. The average dollar amount for each surgery was calculated. The 2012 data described procedures per Medicare are based on current procedural terminology (CPT) codes.^[12,13] The descriptor "removal of spinal lamina" is ascribed to CPT code 63047-F. Lumbar fusion was queried from code 22612-F representing posterior-lateral lumbar fusion. Anterior cervical spine fusion was generated from CPT 22551-F, and removal of spinal lamina add-on was quantified from CPT 63048-F. No information is available from the Medicare database regarding supplemental private insurance billing (Medicare advantage). If information was not available in the database regarding a specific procedure for a particular surgeon, this was excluded from individual analysis for that procedure.

Statistical analysis

Appropriate descriptive statistics were obtained. Comparison between total utilization of resources as well as mean reimbursement per procedure type was obtained. Mean total or average payments among the two groups were compared using the independent *t*-test. ANOVA test was performed if such association was made between more than 2 groups. $P < 0.05$ was considered to have statistical significance. Analyses were performed using the SPSS software (v21, IBM Inc., IL, USA).

RESULTS

Descriptive findings

Two hundred and six physicians were reviewed for utilization of resources during the 2012 Medicare reimbursement period. Descriptive data are located in Table 1. The list favored orthopedic surgeons as they comprised 149/206 (72.3%) of the list with 56/206 (27.2%)

Table 1: Descriptive statistics among 206 spinal experts evaluated in the 2012 Medicare database

Variable	Physicians (%)
Total number of spinal surgeons	206 (100)
Surgical specialty	
Orthopedics	149 (72.3)
Neurosurgery	56 (27.2)
Fellowship training	
No	32 (15.5)
Yes	174 (84.5)
Academic affiliation	
No	88 (42.7)
Yes	118 (57.3)
Geographic region	
A (Northeast)	25 (12.1)
B (Mid-Atlantic)	31 (15.0)
C (Southeast)	22 (10.7)
D (South)	5 (2.4)
E (Midwest)	43 (20.9)
F (Central South)	19 (9.2)
G (Central)	5 (2.4)
H (Mountain)	12 (5.8)
I (West)	38 (18.4)
J (Northwest)	6 (2.9)

practicing as neurosurgeons. One physician's initial training was in pediatrics 1/206 (0.5%). 57.3% (118/206) of surgeons own an academic appointment while 42.7% (88/206) of surgeons were strictly in private practice. 84.5% (174/206) of surgeons completed advanced spinal surgery fellowships while 15.5% (32/206) did not.

Geographically, Becker's List favored the major cities. Breakdown of geographic representation can be seen in Figure 1. 12.1% of surgeons were from the Northeast, 15% from the Mid-Atlantic, 10.7% from the Southeast. 2.4% of surgeons were from the South, 20.9% from the Midwest, 9.2% from the Central South, 2.4% from the Central Region, 5.8% from Mountain Region, 18.4% from the West, and 2.9% from the Northwest.

Total reimbursement

The comparisons of the total amount received from Medicare in 2012 per surgeon for all procedures are found in Table 2. There was no statistical difference in the yearly reimbursement based on geographic region $P = 0.478$. This is appreciated in Figure 2. The average neurosurgeon was reimbursed slightly more than an orthopedic surgeon in 2012 (\$142,075 vs. \$110,920), but this was not statistically significant ($P = 0.218$). Fellowship trained spinal surgeons also, on average, were reimbursed more from Medicare (\$125,407 vs. \$76,551) in 2012, but again this was not statistically significant ($P = 0.112$). A surgeon in private practice, on

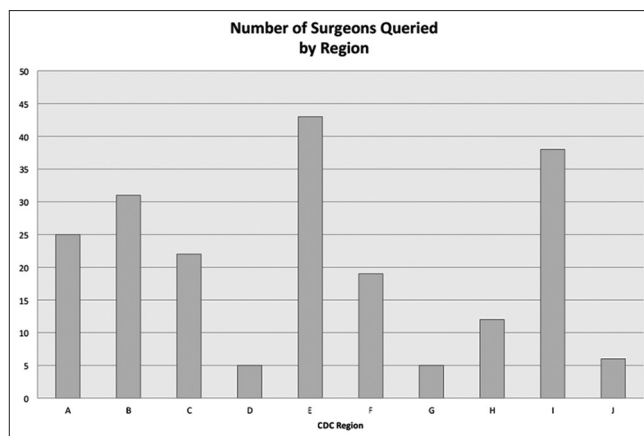


Figure 1: Number of surgeons per center for disease control geographic region. A: Northeast, B: Mid-Atlantic, C: Southeast, D: South, E: Midwest, F: Central South, G: Central, H: Mountain, I: West, J: Northwest

average, was reimbursed \$137,495 while their academic counterparts were reimbursed \$103,144 ($P = 0.127$). A visual representation of surgeon-specific demographics affecting total reimbursement is seen in Figure 3.

Procedural reimbursement

Comparison of per procedure reimbursement for common spinal operations is found in Table 3. Spinal surgeons performing cervical fusions in the West Region received less reimbursement than those surgeons in other parts of the country, and this was found to be statistically significant ($P = 0.015$). Surgeons in the West were reimbursed on average \$849 for CPT code 22551 while those in the Midwest received \$1475 per procedure. No statistically significant difference was found on the reimbursement of standard laminectomy ($P = 0.5$), lumbar fusion ($P = 0.4$), or additional laminectomy ($P = 0.403$) based on geographic location. This is seen in Figure 4.

Orthopedic surgeons had a statistical trend illustrating increased reimbursement for lumbar fusions compared to their neurosurgeon counterparts, \$1187 versus \$1073 ($P = 0.07$). Orthopedic and neurosurgeons received similar compensation across different procedure types: \$600 versus \$624 for lumbar laminectomy ($P = 0.377$), \$1295 versus \$1307 for cervical fusion ($P = 0.9$), and add-on level of laminectomy \$168 versus \$167. Fellowship training and academic affiliation did not illustrate any statistically significant difference between the amount of reimbursement per procedure type. Data affecting surgeon specific procedural reimbursement are represented in Figure 5.

DISCUSSION

Medicare data provide a snapshot of one fraction of total healthcare spending, representing only 21% of a total

\$2.8 trillion national healthcare expenditure in 2012.^[13] Using physician-specific 2012 Medicare reimbursement data to investigate and imagine total healthcare cost is difficult and cumbersome. Predictably, a complex rubric of internal and external factors molds the physicians' and patients' treatment selection and ultimately Medicare reimbursement. Indeed, in a review of our own data, trends cannot be ascertained to support or refute different influences with only a single year of reimbursement data. However, utilization of CPT-coding in Medicare data shows promise in demonstrating treatment preferences between groups of physicians at least at the geographic

level. This, coupled with reimbursement data, could prove invaluable in helping physicians evaluate the cost efficacy of equivalent procedures.

Orthopedic/neurosurgery comparison

In our study, orthopedic surgeons saw increased reimbursement for lumbar spinal fusions compared to their neurosurgeon counterparts, but these data may further represent a number of influences. In the future, continued emphasis will be placed on lumbar fusions given that Medicare's rate of spending for spinal surgery has doubled in the past decade.^[2] According to the Dartmouth Atlas project, spending for lumbar fusion increased from \$75 million dollars to \$482 million dollars over the in the first decade of the third millennium.

In 2014, Mroz *et al.* compared different approaches to single and recurrent lumbar disc herniations. According to Mroz, orthopedic and neurosurgeons did not show a statistically significant difference in selection of revision microdiscectomy, revision microdiscectomy with posterolateral fusion using pedicle screws, revision microdiscectomy with posterior lumbar interbody fusion/transforaminal lumbar interbody fusion, or anterior lumbar interbody fusion for management of this pathology. Furthermore, Mroz found no statistically significant difference based on region, fellowship training, or practice type; they did, however, find that more senior surgeons (which were defined as a surgeon practicing >15 years) were more likely to offer revision discectomy without supplemental fusion.^[15] Predictably, the overall consensus described by Mroz is that the management of spinal pathology is very complex with multi-factorial influences.

Regional variation

Regional variations do exist in the application of healthcare that extends beyond simple reimbursement to the physician. Bederman *et al.*, in 2011, noted significant regional variation in spine surgery. In Bederman's study, counties with higher rates of surgery had, among

Table 2: Evaluation of 2012 Medicare reimbursement for all procedures among 206 spinal experts

Variable	Mean total bill [§]	P
Surgical specialty		
Orthopedics	110,920.26	0.218
Neurosurgery	142,075.56	
Fellowship training		
No	76,551.01	0.112
Yes	125,407.99	
Academic affiliation		
No	137,495.54	0.127
Yes	103,144.19	
Geographic region		
A (Northeast)	61,252.23	0.478
B (Mid-Atlantic)	134,718.90	
C (Southeast)	140,270.33	
D (South)	103,215.54	
E (Midwest)	105,256.77	
F (Central South)	112,875.31	
G (Central)	47,375.25	
H (Mountain)	97,532.03	
I (West)	164,087.58	
J (Northwest)	107,957.46	

[§]United States dollar currency

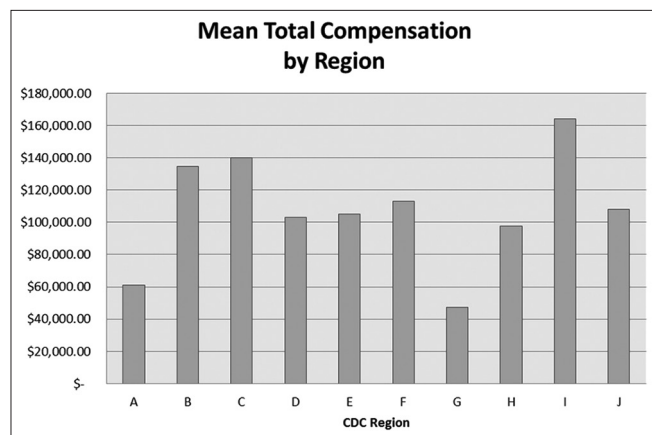


Figure 2: Mean total compensation by region. A: Northeast, B: Mid-Atlantic, C: Southeast, D: South, E: Midwest, F: Central South, G: Central, H: Mountain, I: West, J: Northwest

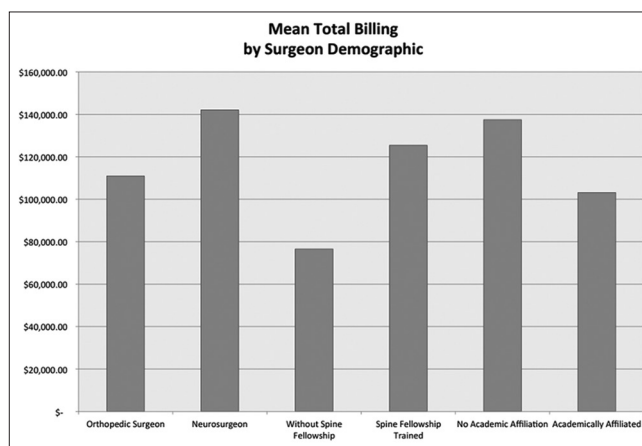


Figure 3: Mean total billing by surgeon demographic

Table 3: Evaluation of specific per-procedure Medicare reimbursement among spinal experts for all procedures in 2012

Variable	Removal of spinal lamina		Neck spine/fuse/removal		Lumbar spinal fusion		Remove spinal lamina add-on	
	Mean ^s	P	Mean ^s	P	Mean ^s	P	Mean ^s	P
Geographic region								
A (Northeast)	623.06	0.547	NA	0.015	1212.36	0.403	171.31	0.406
B (Mid-Atlantic)	630.99		1349.88		1222.70		169.02	
C (Southeast)	549.43		1342.92		1146.66		166.88	
D (South)	593.48		1222.95		NA		152.39	
E (Midwest)	643.90		1475.21		1241.80		179.61	
F (Central South)	574.56		1252.34		1077.85		159.83	
G (Central)	675.00		1207.50		NA		148.64	
H (Mountain)	565.58		1365.18		1178.39		159.66	
I (West)	576.60		849.70		1069.65		158.94	
J (Northwest)	615.15		1213.58		1196.19		169.34	
Specialty								
Orthopedics	600.75	0.377	1295.87	0.906	1187.41	0.076	168.09	0.980
Neurosurgery	624.90		1307.37		1073.56		167.94	
Fellowship training								
No	628.82	0.474	1469.95	0.135	1034.95	0.118	156.74	0.179
Yes	603.08		1271.36		1176.48		169.02	
Academic affiliation								
No	589.66	0.232	1252.61	0.303	1117.92	0.173	166.28	0.604
Yes	618.88		1348.18		1191.53		169.06	

NA: Not available, no surgeons in that region received Medicare reimbursement for that procedure, \$ P-value <0.05 considered significant

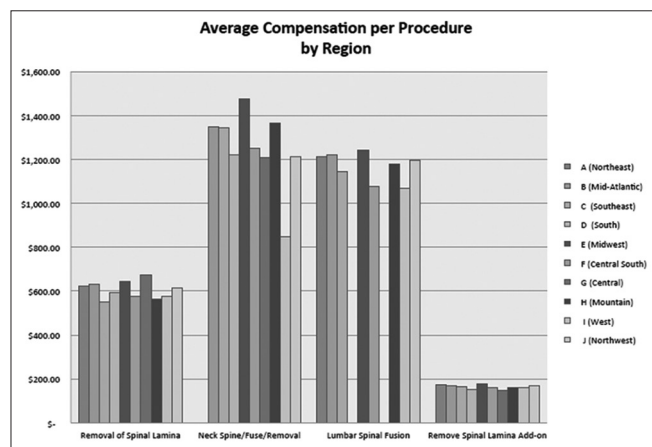


Figure 4: Average compensation per procedure by region. Fuse: Fusion

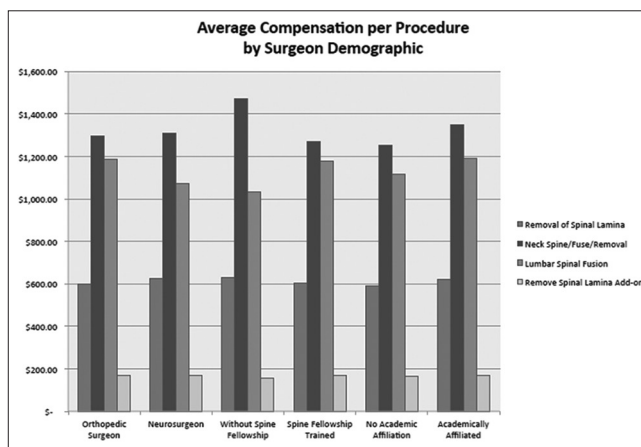


Figure 5: Average compensation per procedure by surgeon demographic. Fuse: Fusion

other factors, demographic differences in the patient population (older male patients and lower income) and the increased presence of magnetic resonance imaging scanners as compared to counties with lower surgical rates.^[3] These factors may never be properly reflected within the Medicare data.

The American Board of Orthopedic Surgeons (AAOS) reports the overall prevalence of cervical fusion procedures has increased 41% from 1999 to 2008, while anterior cervical plating increased between 1999 and 2008 from 39% to 79% of cases performed. Meanwhile,

the use of allograft also skyrocketed from 14% to 59% in this time period as well. Cervical fusion as a procedure did show some regional preferences within AAOS data with the Southwest being most likely to use interbody devices while the Midwest region was more likely to use allograft. The Southeast was also more likely to use anterior cervical plating than the Midwest region demonstrated.^[6,11] Geographically, within our data, spinal surgeons in the West Region received less reimbursement for cervical fusion, with, by geography, one of the largest groups of surgeons, 18.4% of those on Becker's List; this

may represent some regional preference in treatment approaches or differences between neurosurgeons and orthopedists (orthopedic surgeons were 23 of 38 Becker's list surgeons in the region).

The US government does make Medicare program data available to the public through the Centers for Medicare and Medicaid Services, and information available does show regional differences in *per capita* Medicare spending. Gottlieb, *et al.*, in 2010, demonstrated that the regions containing New York and Florida utilize more resources and require greater spending than is compensated by increased costs of goods and services within those regions or account for localized inflation. From 1992 to 2006, for example, Miami boasted a 5.0% *per capita* inflation adjusted yearly spending increase as compared to 2.3% in Salem, Oregon,^[8] and although these factors are known to exist, they cannot be accurately accounted-for within our study data.

Physician data

Furthermore, focused analysis of healthcare spending upon the utilization of physician resources presents a warped picture of the problems facing healthcare in the United States. Physician services account for approximately 20% of healthcare billing in the US and even then, there is a great divergence of reimbursement between different medical and surgical specialties.^[16,17] Neurosurgeons, in particular, rank as the 37th billing specialty to Medicare. Neurosurgeons billed Medicare a total of \$310 million in 2012; this is less than the \$495 million billed by chiropractors and far less than the \$839 million billed by pain management and physical medicine specialists. Only two of the top 10 specialties that billed Medicare in 2012 are surgical subspecialties. The average amount reimbursed from Medicare per neurosurgeon was \$75,513 in 2012 while it was \$366,677 for an oncologist.^[19] These amounts are also independent of hospital reimbursement which contributes the additional 80% of healthcare costs. Even in bundled payment structures meant to contain costs, hospitals account for 76% of payments.^[18] According to Merritt Hawkins data, in 2010 a neurosurgeon, on average, generated \$2,815,650 in hospital revenue to bundled payment systems; in 2013, this declined to \$1,684,523.^[16] Future Medicare research should seek to, at a fundamental level, understand the clinical decision-making (if there is any) that contributes to these changes in revenue.

Limitations

Our data have a number of limitations in application. The list of spinal surgeons used is intended to sample leadership in the field of spine surgery as viewed by the public. Becker's list is a socioeconomic publication, and it heavily favored orthopedic surgeons (70.9% of those listed). A significant limitation to this data analysis is that, in querying only the Medicare data, it specifically

excludes all other payer sources. This disproportionately illustrates higher spending by surgeons performing operations for degenerative conditions and serving in those areas with lower socioeconomic indicators or more elderly populations. Medicare data largely ignore pediatric population, and reimbursements by experts within this field are minimally represented within our results since they did not perform common spinal procedures billed to Medicare.

CONCLUSION

Regardless of the data's shortcomings, these are the data the public is seeing, Congress is politicizing, and lawyers are analyzing. Neurosurgeons must appreciate these data in the context of spinal surgery. Neurosurgeons, not just public policy makers, must take ownership to analyze, investigate, and interpret these data as it will affect policy moving forward.

Disclosures

The authors report no conflict of interest concerning the materials or methods used in the study or the findings specified in this paper. The views expressed in this study are the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the US Government.

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