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HEALTH SERVICES RESEARCH

Medicare Utilization and Reimbursement for Vertebroplasty and Kyphoplasty

A National Analysis From 2012–2017

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Study Design. Retrospective cohort study

Objective. This study seeks to identify recent trends in utilization and reimbursements of these procedures between 2012and 2017, a period which experienced a change in national guideline recommendations for these procedures.

Summary of Background Data. Minimally invasive vertebral augmentation procedures, including vertebroplasty and kyphoplasty, have been typically reserved for fractures associated with refractory pain, deformity, or progressive neurological symptoms. However, controversy exists regarding the safety and effectiveness of these procedures, in particular vertebroplasty.

Methods. Annual Medicare claims and payments to surgeons were aggregated at the county level to assess regional trends. Descriptive statistics and multivariate regression models were used to evaluate trends in procedure volume, utilization rates, and reimbursement rates, and to examine associations between county-specific variables and outcome variables.

Results. A total of 24,316 vertebroplasties and 138,778 kyphoplasties were performed in the Medicare population between 2012 and 2017. Annual vertebroplasty volume fell by 48.0% from 5744 procedures in 2012 to 2987 in 2017, with a compound annual growth rate (CAGR) of −12.3%. Annual kyphoplasty volume also declined by 12.7% (CAGR −2.7%), from 24,986 in 2012 to 21,681 in 2017. Surgeon reimbursements for vertebral augmentation procedures increased by a weighted average of 93.7% (inflation-adjusted increase of 78.2%) between 2012 and 2017, which was primarily driven by a dramatic 113.3% (inflation-adjusted increase of 96.2%) increase in mean reimbursements for kyphoplasty procedures from an average of $895 to $1764, between 2012 and 2017, respectively.

Conclusion. This large national Medicare database study found that vertebroplasty and kyphoplasty procedure volume and utilization of both procedures have declined significantly. Although average reimbursements to surgeons for vertebroplasties have significantly declined, payments for kyphoplasty procedures have risen significantly. Although vertebroplasty volume has significantly decreased, it is still being performed and being reimbursed for, in spite of its controversial role in its treatment of vertebral fractures.

Key words: health care costs, kyphoplasty, medicare, osteoporosis, pathologic fracture, reimbursements, spine surgery, utilization, vertebral augmentation, vertebral compression fracture, vertebroplasty.

Level of Evidence: 3

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With an increasingly aging US population, the incidence of osteoporotic fractures such as vertebral compression fractures (VCFs) continues to rise.[1,2] VCF is one of the most common sequalae of osteoporosis and comprises almost a half of all osteoporotic fractures in the United States each year,[3–5] with direct inpatient treatment costs of over five billion dollars annually.[6–8] Treatment options for VCF include analgesics, bracing, medical management, physical therapy, and surgery. Minimally invasive vertebral augmentation procedures, including vertebroplasty and kyphoplasty, have been typically reserved for osteoporotic or pathologic (including metastatic) fractures associated with significant and persistent pain, deformity, or with progressive neurological deficit. However, controversy exists regarding the effectiveness of these procedures,[9–11] especially given the publication of three separate randomized controlled clinical trials which reported findings suggesting no significant

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differences in outcomes between vertebroplasty and sham surgery or conservative management.[12–14] In 2010, the American Academy of Orthopedic Surgeons (AAOS) released new guidelines strongly recommending against the use of vertebroplasty while providing a moderate recommendation for kyphoplasty as a treatment option due to two level II studies showing benefit against conservative treatment, however, with conflicting results when compared head-to-head against vertebroplasty.[15–20]

Given the increasing focus on value-based care in recent years, understanding the scope of the volume and cost of vertebral augmentation procedures may be beneficial in enhancing cost-efficiency and care delivery. This is of particular interest as well given the recent changes in AAOS recommendations of vertebroplasty and kyphoplasty. Previous studies focusing on trends in the volume and utilization of vertebral augmentation procedures have reported significant declines in vertebroplasty procedures since 2009, following publication of negative trials on vertebroplasty, and stagnant growth of kyphoplasty procedures.[21–23] The most recent study on nationwide trends in vertebral augmentation surgeries, by Laratta *et al*, found that the number of both vertebroplasty and kyphoplasty procedures performed using the National Inpatient Sample (NIS) decreased significantly, falling by 53% and 17%, respectively, from 2008 to 2014.[24] However, the NIS captures only inpatient procedures and may have excluded minimally invasive vertebral augmentation procedures performed on an outpatient basis which are common.

There remains a paucity of studies analyzing recent trends in vertebral augmentation volume, utilization, and reimbursements. As such, the purpose of this study is to define the costs of vertebral augmentation procedures, as well as identify trends and variations in the volume, utilization, and surgeon reimbursement rates among Medicare patients between 2012 and 2017. We hypothesized that vertebral augmentation procedure volume and surgeon reimbursements declined during the study period to reflect changes in national guideline recommendations.

MATERIALS AND METHODS

Medicare is the single largest insurer for >40 million Americans age 65 years and older and these are also the patients most at risk of having a VCF. Part B covers payments to providers for services and procedures, as well as any outpatient care required during post-surgical follow-up. As part of the Affordable Care Act's (ACA) efforts to reduce health care costs and increase transparency of health care expenditures, Medicare released publicly available databases of annual procedure volume, reimbursement, and inpatient charge data. In this study, we tracked and analyzed Part B Medicare databases (Physician and Other Supplier Public Use File) from 2012 to 2017, which contains annual claims data for each provider (with annual case volume of at least 10). Claims data were organized by unique National Provider Identifier numbers, in addition to information about the place of service, including zip code, city, and state, and they contain information on procedure volume and physician reimbursement (average Medicare payment), organized by Healthcare Common Procedure Coding System (HCPCS) code, also known as CPT codes. The average Medicare payment amount is defined as the average amount that Medicare paid to physicians for a service, after deductible and coinsurance amounts have been deducted. This represents Medicare's allocation of expenditures for physician reimbursement, after controlling for patient contributions.

The Part B database was queried for providers who performed vertebroplasty and kyphoplasty procedures by filtering with HCPCS codes 22520–22522 for vertebroplasty during 2012 to 2014 and 22510–22512 for vertebroplasty during 2015 to 2017. HCPCS codes 22523–22525 were used for kyphoplasty during 2012 to 2014 and codes 22513–22515 during 2015 to 2017. In addition, procedures that were performed at ambulatory surgical centers (ASCs) were recorded. Procedures codes involving imaging-guidance, including 77,291 and 72,292, were not included in this analysis as they were added on to the primary vertebral augmentation codes and were discontinued in 2015. We reviewed provider claims data from 2012 to 2017 and for each procedure type we measured total annual claims at the county (or municipal) level. The mean reimbursement per case was calculated using reimbursement data and claims data. Descriptive statistics were used to analyze trends in procedure volume, utilization rates (per 10,000 Medicare beneficiaries), and average payment per case at the national level. They were stratified by US Census region (Northeast, Midwest, South, West) and by urban and rural counties. Urban counties were defined as those within a Census-defined Metropolitan Statistical Area (MSA), and counties that were not part of an MSA were considered rural. Major metropolitan areas ("Major MSA") were defined as MSAs with a total population over one million. Small- and mid-sized metropolitan areas ("Mid-Sized MSA") were defined as MSAs with a total population below one million.

In our analysis of claims volume and utilization, we controlled for the number of surgeons receiving Medicare reimbursements and total Medicare beneficiaries within each county. In our analysis of Medicare payments, we used economic principles to analyze annual financial trends over the study period. For example, we calculated the growth in Medicare payments between 2012 and 2017 using compound annual growth rate (CAGR), which provides average year over year growth during a defined time period. In addition, we factored for the effect of inflation in the United States during the study period by using the consumer price index, provided by the US Bureau of Labor and The World Bank, to calculate inflation-adjusted Medicare payment figures.[25,26] All statistical analyses were performed using Stata (version 15.1, College Station, TX), which was used to create adjusted linear regression models to examine associations between county-specific variables (*i.e.*, urban or rural, average household income, poverty rate, percent

Medicare population, race/ethnicity demographics) and procedure volume, utilization, and reimbursement rates. We included county-level covariates, fixed effects, and a linear time trend in all our regression models to account for possible confounding variables and other geographic-specific factors. County-level and state-level data were obtained from a publicly available database published online by the US Census Bureau (data.census.gov).[27] All data were retrieved de-identified and are publicly available.

RESULTS

Volume and Utilization

A total of 163,094 vertebral augmentation procedures, including 24,316 vertebroplasties (14.9%) and 138,778 kyphoplasties (85.1%), were performed in the Medicare population from 2012 to 2017. There was an overall 19.3% decline in annual procedure volume from 30,730 in 2012 to 24,802 in 2017, producing a CAGR of −4.2%. (Table 1) Annual vertebroplasty volume fell by 48.0% (CAGR −12.3%), from 5744 procedures in 2012 to 2987 in 2017. Kyphoplasty volume also declined by 12.7% (CAGR −2.7%) between 2012 and 2017, from 24,986 in 2012 to 21,681 in 2017. Vertebroplasty utilization decreased by 55.4%, from 11.8 surgeries per 100,000 Medicare beneficiaries in 2012 to 5.3 in 2017 (CAGR of −14.9%). Kyphoplasty utilization decreased by approximately one-quarter, or 25.1% (CAGR of −5.6%), from 51.3 per 100,000 Medicare beneficiaries in 2012 to 39.2 in 2017. The annual utilization of vertebroplasties and kyphoplasties performed at ASCs each declined significantly, by 63.1% and 32.9%, respectively, between 2012 and 2017 (Table 2).

Differences in geographic utilization rates of vertebral augmentation procedures were also noted. Vertebroplasty had the highest utilization in the Midwest (20.6 procedures per 100,000 Medicare beneficiaries), whereas kyphoplasty had the highest utilization in the South (93.7) (Table 3). Significant variation also existed between rural and metropolitan areas in utilization of vertebroplasty ($P = 0.009$) and kyphoplasty ($P < 0.001$). Multiple linear regression analysis confirmed significantly higher vertebroplasty utilization in the Midwest compared to other regions ($P = 0.005$) and in mid-sized metropolitan areas compared to major metro areas or rural areas ($P < 0.001$). Although regression analysis showed no significant difference in kyphoplasty utilization across regions, utilization was significantly greater in mid-sized metro areas compared to other areas ($P < 0.001$). Utilization for each procedure was also significantly higher in counties with a greater per capita density of ambulatory surgery centers (ASCs) ($P = 0.032$; $P < 0.001$, respectively), and ASC utilization for kyphoplasty procedures was significantly greater in the Southern United States compared to other regions ($P = 0.016$). There was a significant negative yearly trend in utilization of both vertebroplasty ($P = 0.032$) and kyphoplasty procedures ($P = 0.006$).

Medicare Reimbursements

The mean Medicare reimbursements per case received by surgeons (Part B) for vertebral augmentation procedures nominally increased by a weighted average of 93.7% (inflation-adjusted increase of 78.2%) between 2012 and 2017,

TABLE 1. Annual Trends in Medicare Volume and Utilization of Vertebroplasty and Kyphoplasty (2012–2017)

Procedure Types	Volume (Total Medicare Procedures)						% Change	CAGR (%)
	2012	2013	2014	2015	2016	2017		
Vertebroplasty	5744	4660	4177	3617	3131	2987	−48.0	−9.6
Single-level	5133	4098	3881	3105	2621	2425	−52.8	−10.6
Multilevel	611	562	296	512	510	562	−8.0	−1.6
Kyphoplasty	24,986	24,871	24,206	21,219	21,681	21,815	−12.7	−2.5
Single-level	21,485	21,597	20,818	17,530	17,650	17,658	−17.8	−3.6
Multilevel	3501	3274	3388	3689	4031	4157	18.7	3.7
Total	30,730	29,531	28,383	24,836	24,812	24,802	−19.3	−3.9

Procedure Types	Utilization (Procedures Per 10,000 Medicare Beneficiaries)						% Change	CAGR (%)
	2012	2013	2014	2015	2016	2017		
Vertebroplasty	11.8	9.2	8.0	6.8	5.7	5.3	−55.4	−11.1
Single-level	10.5	8.1	7.5	5.8	4.7	4.3	−59.5	−11.9
Multilevel	1.3	1.1	0.6	1.0	0.9	1.0	−21.1	−4.2
Kyphoplasty	51.3	49.3	46.5	39.7	39.2	38.4	−25.1	−5.0
Single-level	44.1	42.8	40.0	32.8	31.9	31.1	−29.5	−5.9
Multilevel	7.2	6.5	6.5	6.9	7.3	7.3	1.9	0.4
Total	63.1	58.5	54.6	46.4	44.8	43.7	−30.8	−6.2

CAGR indicates compound annual growth rate.

TABLE 2. Annual Trends in Medicare Volume and Utilization of Vertebroplasty and Kyphoplasty performed at ASCs (2012–2017)

Procedure Types	Volume (Total Medicare Procedures)						% Change	CAGR (%)
	2012	2013	2014	2015	2016	2017		
Vertebroplasty	121	71	96	12	11	52	−57.0	−11.4
Single-level	121	55	96	12	11	52	−57.0	−11.4
Multilevel	0	16	0	0	0	0	—	—
Kyphoplasty	541	708	680	603	424	423	−21.8	−4.4
Single-level	519	607	680	603	424	423	−18.5	−3.7
Multilevel	22	101	0	0	0	0	−100.0	−20.0
Total	662	779	776	615	435	475	−28.2	−5.6
Procedure Types	**Utilization (Procedures per 10,000 Medicare beneficiaries)**						**% Change**	**CAGR (%)**
	2012	**2013**	**2014**	**2015**	**2016**	**2017**		
Vertebroplasty	2.5	1.4	1.8	0.2	0.2	0.9	−63.1	−12.6
Single-level	2.5	1.1	1.8	0.2	0.2	0.9	−63.1	−12.6
Multilevel	0.0	0.3	0.0	0.0	0.0	0.0	—	—
Kyphoplasty	11.1	14.0	13.1	11.3	7.7	7.4	−32.9	−6.6
Single-level	10.7	12.0	13.1	11.3	7.7	7.4	−30.1	−6.0
Multilevel	0.5	2.0	0.0	0.0	0.0	0.0	−100.0	−20.0
Total	13.6	15.4	14.9	11.5	7.9	8.4	−38.5	−7.7

CAGR indicates compound annual growth rate.

which was primarily driven by a dramatic 113.3% (inflation-adjusted increase of 96.2%) increase in mean reimbursements for kyphoplasty procedures from a weighted average of $895 in 2012 to $1764 in 2017 (Table 4). Mean reimbursements for single- and multi-level kyphoplasties both increased by 107.9% and 129.1%, respectively. In

TABLE 3. Geographic Variation in Medicare Volume, Utilization, and Reimbursement for Vertebral Augmentation Procedures (2012–2017)

Procedure Volume	Urban/Rural				U.S. Census Region					National
	MMA	Non-MMA	Rural	*P*	Midwest	Northeast	South	West	*P*	
Vertebroplasty	8753	13,947	1616	—	10,032	1336	11,808	1140	—	24,316
Single-level	7554	12,211	1498	—	9022	1120	10,108	1013	—	21,263
Multilevel	1199	1736	118	—	1010	216	1700	127	—	3053
Kyphoplasty	58,174	67,009	13,583	—	34,207	13,649	78,505	12,405	—	138,766
Single-level	48,335	56,615	11,776	—	28,927	11,363	66,022	10,414	—	116,726
Multilevel	9839	10,394	1807	—	5280	2286	12,483	1991	—	22,040
Utilization*										
Vertebroplasty	8.4	19.4	2.6	0.009	20.6	2.7	14.1	2.0	<0.001	10.1
Single-level	7.2	17.0	2.4	0.010	18.5	2.3	12.1	1.7	<0.001	8.9
Multilevel	1.1	2.4	0.2	0.251	2.1	0.4	2.0	0.2	0.339	1.3
Kyphoplasty	55.5	93.0	21.4	<0.001	70.2	27.6	93.7	21.4	0.180	57.8
Single-level	46.1	78.6	18.6	<0.001	59.3	22.9	78.8	17.9	0.153	48.6
Multilevel	9.4	14.4	2.9	0.382	10.8	4.6	14.9	3.4	0.381	9.2
Avg Reimbursement (USD)										
Vertebroplasty	$457	$424	$356	0.543	$383	$389	$444	$764	0.069	$431
Single-level	$439	$408	$349	0.514	$371	$371	$426	$751	0.061	$415
Multilevel	$571	$534	$442	0.423	$497	$477	$556	$873	0.444	$542
Kyphoplasty	$1433	$1243	$897	<0.001	$825	$769	$1503	$1769	0.011	$1287
Single-level	$1328	$1153	$831	<0.001	$784	$712	$1383	$1653	0.016	$1193
Multilevel	$1947	$1733	$1328	0.001	$1045	$1054	$2137	$2378	0.006	$1784

MMA indicates major metropolitan area; USD, United States Dollar ($).

**Utilization is per 10,000 Medicare beneficiaries. P value calculated by analysis of variance testing.*

TABLE 4. Annual Trends in Average Medicare (Part B) Reimbursements to Surgeons for Vertebroplasty and Kyphoplasty (2012–2017)

Procedure Types	Mean Medicare Payment per Case (USD)						% Change	Inflation Adjusted (%)	CAGR (%)
	2012	2013	2014	2015	2016	2017			
Vertebroplasty	$521	$451	$432	$391	$417	$427	−18.0	−24.6	−3.9
Single-level	$506	$435	$423	$376	$397	$404	−20.1	−26.5	−4.4
Multilevel	$140	$130	$136	$110	$126	$121	−13.9	−20.8	−3.0
Kyphoplasty	$895	$1139	$1317	$1540	$1769	$1908	113.3	96.2	16.4
Single-level	$848	$1077	$1232	$1434	$1637	$1764	107.9	91.3	15.8
Multilevel	$331	$467	$607	$612	$710	$758	129.1	110.7	18.0
Total							93.7	13.3	78.2

CAGR indicates compound annual growth rate; USD, United States Dollar ($).

contrast, reimbursements for vertebroplasty procedures declined significantly, at a nominal rate of −18.0% and inflation-adjusted rate of −24.6%, from a weighted average of $521 per procedure in 2012 to $427 in 2017 (Table 4). Mean reimbursements for single- and multilevel vertebroplasties both declined by 20.1% and 13.9%, respectively. Multiple linear regression analysis found that mean reimbursements for vertebroplasty and kyphoplasty each had significant negative and positive yearly trends, respectively ($P < 0.001$ for each).

Vertebroplasty reimbursements were highest in major metropolitan areas ($457 per procedure) and in the West ($764 per procedure), although analysis of variance (ANOVA) testing did not find either the geographic or regional differences to be statistically significant (Table 3). By comparison, ANOVA testing confirmed significant regional and geographic variability in mean reimbursements for kyphoplasty procedures, which were also highest in major metro areas ($1433) and in the West ($1769) (Table 3). Multivariate regression analysis found that mean reimbursements for kyphoplasty procedures were significantly higher, on average, in major metropolitan areas compared to mid-sized metro areas and rural areas ($P = 0.035$), and they were significantly associated with the average household income within a county ($P = 0.033$). However, regression analysis found no significant differences in reimbursements of either vertebroplasty or kyphoplasty procedures, based on US region.

DISCUSSION

This present study identified a continued decline of vertebral augmentation procedures between 2012 and 2017 in a Medicare population.[12–14] Vertebroplasty had the most significant decline in volume and utilization during the study period in the setting of guideline changes; however, kyphoplasty also experienced a fall in procedures, although at a less dramatic pace. These recent trends in procedure volume and utilization indicate continuing shift away vertebral augmentation procedures, as part of a trend which emerged in 2009 following the publication of several randomized controlled trials which showed no benefit of vertebroplasty over a sham procedure for the treatment of VCFs. The findings of this study may inform decisions made by policy makers and health care providers with regard to efficient resource allocation and better addressing the needs of an aging population.

A recent study by Lindquester *et al* using the Medicare Part B Physician and Supplier Procedure Summary Master File (PSPSMF) reported on trends in Medicare procedure volume and reimbursement for kyphoplasty and vertebroplasty between 2010 and 2018, finding that vertebroplasties decreased by 61.2%, whereas kyphoplasties modestly increased by 14.4%.[28] Their analysis compared procedure trends by physician specialty, showing that radiologists performed an increasing share of both procedures. However, their study using the PSPSMF lacked provider-level data which resulted in a lack of granularity and an inability to assess reimbursement, volume, and utilization trends on a geographic basis. Our study also reports significant declines in vertebroplasty volume, but with a modest fall in kyphoplasties, while also including statistical analysis based on geographic and demographic county-level factors such as average household income and population density (metropolitan versus rural areas).

Vertebroplasty may offer pain control by stabilizing the vertebral body using percutaneous injection of bone cement into the fractured vertebra. However, given the high pressure with which cement is injected, it has been associated with complications such as catastrophic neurologic deficit from cement extrusion into the spinal canal.[29–32] Kyphoplasty also stabilizes fractured vertebrae but instead involves balloon inflation in the vertebral cavity, allowing cement injection to be done at a lower pressure while still providing structural stability.[33] Although the efficacy of vertebroplasty has been questioned, several studies have demonstrated efficacy of kyphoplasty in treating VCF, including in alleviation of cancer-related pain.[15–19,34] As a result of these reports, surgeons have appeared to shift away from vertebroplasty and toward kyphoplasty as the surgical treatment of choice for VCF. A retrospective analysis by Goz *et al* found that kyphoplasty was associated with lower complication rates and shorter hospital length of stay compared to vertebroplasty, and they also reported a significant decrease in utilization of both vertebroplasty and kyphoplasty since

2009.[35] Manchikanti *et al* performed an analysis using a 5% national sample of Medicare patients and found that between 2002 and 2010, there was a significant 42.4% overall decline in vertebroplasty procedures, whereas kyphoplasty procedures experienced stagnant overall growth at 0.8%.[23] Similarly, in another analysis using a 5% Medicare sample between 2005 and 2012, Rabei *et al* reported a significant shift by providers in favor of kyphoplasty over vertebroplasty, although overall vertebral augmentation procedures did not change significant during the study period.[21] Our present study is in concordance with these previous studies, and illustrates national shifts away from vertebroplasty in the setting of questionable efficacy and safety profile.

This present study reported significant geographic and regional variation in utilization of vertebroplasty and kyphoplasty in the United States. Vertebroplasty was found to have highest utilization in the Midwest, whereas kyphoplasty had the highest utilization in the South. A study of the NIS from 2005 to 2014 found that in 2014, patients in the US South Atlantic region comprised 28% of kyphoplasty procedures, far more than any other region. The same study also reported that 75% of vertebroplasty and kyphoplasty procedures were utilized in areas designated as "not low income."[24] Although our study did not find significant differences in utilization based on an area's average income, there were significantly more vertebroplasty and kyphoplasty procedures performed in metropolitan areas compared to rural areas, which have on average a lower median household income compared to metropolitan areas.[36]

Regarding Medicare payments, the results of the present study show that although average reimbursements to surgeons for vertebroplasties have significantly declined, payments for kyphoplasty procedures have actually risen significantly. Although the reasons for the significant increase in surgeon reimbursements for kyphoplasty procedures are unknown, changes in the reimbursement policies by several insurance companies significantly limited reimbursements for vertebroplasties.[8] Previous studies have reported that kyphoplasty costs up to $6000 more than vertebroplasty per level treated,[8,24] and which may be due primarily to the considerable expense of balloons.[37] However, the increasing Medicare reimbursement rates for kyphoplasty may have incentivized surgeons to transition away from vertebroplasty procedures and toward kyphoplasty, although overall utilization for both procedures has continued to fall, across all specialties. Changes in evidence-based guidelines and recommendations have evidently played an important role in practice patterns regarding the surgical treatment of painful VCF.[20,38]

This study has certain limitations. First, the Medicare database did not provide patient-level information regarding concomitant procedures or the number of vertebrae levels that were surgically treated per patient. Therefore, we were unable to capture concomitant procedures such as interbody or posterior fusion which are occasionally done in conjunction with vertebral augmentation.[39] Because individual patient data were not available in the database, our analysis did not include fracture frequency or repeat fracture cases. Although vertebral fracture incidence may be decreasing due to better awareness and treatment of osteoporosis, no published data exist reporting recent trends in the United States. However, the findings of this study are strengthened by a presumed increase in compression fractures among Medicare patients, given the aging population. Our study was limited to Medicare patients, but it is important to consider that private insurance reimbursement is usually correlated to a Medicare multiplier. Furthermore, we were unable to capture procedures performed in patients with non-Medicare insurance. However, Medicare has been reported previously as the insurer for 83% of inpatient vertebral augmentation procedures, and this study likely captured a majority of the procedures performed in the studied time period.[24]

In conclusion, this study of trends in utilization and reimbursement of vertebroplasty and kyphoplasty procedures using a large national Medicare database found that procedure volume and utilization of both procedures have declined significantly. Although average reimbursements to surgeons for vertebroplasties have significantly declined, payments for kyphoplasty procedures have surprisingly risen significantly. Although vertebroplasty volume has significantly decreased, it is still being performed in spite of its controversial role in the treatment of vertebral fractures.

➢ Key Points

- ❑ Controversy exists regarding the safety and effectiveness of vertebral augmentation procedures, in particular vertebroplasty.
- ❑ Vertebroplasty and kyphoplasty procedure volume and utilization of both procedures have declined significantly between 2012 and 2017.
- ❑ Although average reimbursements to surgeons for vertebroplasties have significantly declined, payments for kyphoplasty procedures have risen significantly.
- ❑ Although vertebroplasty volume has significantly decreased, it is still being performed and reimbursed for, in spite of guidelines recommending against it.

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