

Medicare Utilization of Vertebral Augmentation 2001 to 2014: Effects of Randomized Clinical Trials and Guidelines on Vertebroplasty and Kyphoplasty

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Abstract

Purpose: Vertebral fractures have a substantial impact on the health and quality of life of elderly individuals as one of the most common complications of osteoporosis. Vertebral augmentation procedures including vertebroplasty and kyphoplasty have been supported as means of reducing pain and mitigating disability associated with these fractures. However, use of vertebroplasty is debated, with negative randomized controlled trials published in 2009 and divergent clinical guidelines. The effect of changing evidence and guidelines on different practitioners' utilization of both kyphoplasty and vertebroplasty in the years after these developments and publication of data supporting their use is poorly understood.

Methods: Using national aggregate Medicare claims data from 2002 through 2014, vertebroplasty and kyphoplasty procedures were identified by provider type. Changes in utilization by procedure type and provider were studied.

Results: Total vertebroplasty billing increased 101.6% from 2001 (18,911) through 2008 (38,123). Total kyphoplasty billing frequency increased 17.2% from 2006 (54,329) through 2008 (63,684). Vertebroplasty billing decreased 60.9% from 2008 through 2014 to its lowest value (14,898). Kyphoplasty billing decreased 8.4% from 2008 (63,684) through 2010 (58,346), but then increased 7.6% from 2010 to 2013 (62,804).

Conclusions: Vertebroplasty billing decreased substantially beginning in 2009 and continued to decrease through 2014 despite publication of more favorable studies in 2010 to 2012, suggesting studies published in 2009 and AAOS guidelines in 2010 may have had a persistent negative effect. Kyphoplasty did not decrease as substantially and increased in more recent years, suggesting a clinical practice response to favorable studies published during this period.

Key Words: Kyphoplasty, vertebroplasty, vertebral augmentation procedures, Medicare, utilization, radiology, orthopedic surgery

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INTRODUCTION

Efforts to prevent and treat vertebral fractures are of substantial importance to individual patients and society at large, with over 1.4 million clinical vertebral fractures diagnosed annually worldwide and over 5 billion USD spent in the United States annually on vertebral fracture treatment [1-3]. Minimally invasive vertebral

augmentation interventions to treat pain and mitigate risk of further height loss have been promoted due to a more favorable adverse event profile compared with open surgical fusion [4-6]. The first of such procedures, vertebroplasty, was invented in the late 1980s and adopted in clinical practice in the 1990s with favorable early studies [7-11]. In vertebroplasty, polymethyl methacrylate cement is injected percutaneously into a vertebral fracture under fluoroscopic guidance [12,13]. Kyphoplasty is a modification of vertebroplasty involving the additional use of an inflatable balloon to create a cavity for cement injection to restore vertebral body height [4,14].

The selection of which vertebral augmentation procedure to use, vertebroplasty or kyphoplasty, is controversial [15-17]. In 2009, three separate randomized controlled trials published findings suggesting no

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significant differences between vertebroplasty and sham surgery or conservative medical management [18-20]. Multiple recommendations exist regarding the use of vertebroplasty and kyphoplasty from orthopedic, anesthesiology, neurosurgery, and radiology societies, including the ACR [21-23].

This study seeks to examine trends in vertebral augmentation intervention utilization by analyzing national aggregate Medicare claims data from 2002 through 2014 to better understand changes in how vertebral fractures are treated by different groups of providers in the United States in the context of differing recommendations and changing clinical evidence.

METHODS

This HIPAA-compliant study analyzed de-identified aggregated Medicare claims data from CMS-designated public-use files and was determined to be review exempt by the Institutional Review Board of the ACR. The study used claims data from the CMS Physician Supplier Procedure Summary Master Files for the years 2001 to 2014. The CMS Physician Supplier Procedure Summary database contains aggregate claims data for 100% of the Part B Medicare claims submitted by health care providers for reimbursement. The database includes fields for Current Procedural Terminology (CPT) codes, provider specialty, and the number of procedures for which claims were submitted. This method of tracking national trends is based on previously described models for studying interventional imaging procedures [24,25].

For each year, we identified the total number of vertebroplasty procedures (CPT codes 22520, 22521, 22522) and kyphoplasty procedures (CPT codes 22523, 22524, 22525) performed by radiologists, orthopedic surgeons, neurosurgeons, and all other specialties. We then calculated the annual percent change for each of the four specialties for each year. The analysis was performed using SAS 9.4 (SAS Institute Inc, Cary, North Carolina, USA) with final tables prepared in Microsoft Excel (Microsoft Corporation, Redmond, Washington, USA).

RESULTS

Vertebroplasty was first allowed as a billable code in 2001, and kyphoplasty codes were first used in 2006. The total numbers of vertebral augmentation procedure codes billed by provider specialty and year are reported in Table 1. These data are also displayed in graphical form in Figure 1. Percentage change in total

Table 1. Total number of Medicare-billed vertebral augmentation procedures by performing specialty and procedure code, 2001 to 2014

Procedure	Specialty	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Vertebroplasty	Radiology	12,812	18,098	23,275	26,364	27,215	27,481	26,355	25,790	23,802	20,181	17,378	13,987	12,698	11,279
	Orthopedic surgery	2,812	3,408	3,913	3,515	3,351	2,952	3,134	3,764	3,624	3,064	2,099	1,347	1,018	925
	Neurosurgery	1,444	1,936	2,212	2,238	2,375	1,870	1,602	2,052	2,483	2,068	1,757	1,552	1,498	1,527
	All others	1,843	1,961	2,291	2,519	3,197	4,140	5,992	6,517	6,262	4,146	3,170	2,102	1,686	1,167
Kyphoplasty	Vertebroplasty	18,911	25,403	31,691	34,636	36,138	36,443	37,083	38,123	36,171	29,459	24,404	18,988	16,900	14,898
	Radiology	.	.	.	.	.	13,388	17,401	18,584	19,049	16,944	18,598	20,226	20,553	20,043
	Orthopedic surgery	.	.	.	.	.	25,279	26,382	25,979	24,151	21,116	19,994	19,357	18,582	18,009
	Neurosurgery	.	.	.	.	.	13,325	15,338	14,941	14,624	13,364	13,615	13,402	13,370	13,224
All others		2,337	3,584	4,180	5,630	6,922	8,109	8,850	10,299	10,251
	Kyphoplasty	54,329	62,705	63,684	63,454	58,346	60,316	61,835	62,804	61,527

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