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Health Policy Review

Analysis of the Growth of Epidural Injections and Costs in the Medicare Population: A Comparative Evaluation of 1997, 2002, and 2006 Data

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Background: Interventional techniques for the treatment of spinal techniques are commonly used and are increasing exponentially. Epidural injections and facet joint interventions are the 2 most commonly utilized procedures in interventional pain management. The current literature regarding the effectiveness of epidural injections is sparse with highly variable outcomes based on the technique, outcome measures, patient selection, and methodology.

Multiple reports have illustrated the exponential growth of lumbosacral injections with significant geographic variations in the administration of epidural injections in Medicare patients. However, an analysis of the growth of epidural injections and costs in the Medicare population has not been performed with recent data and has not been looked at from an interventional pain management perspective.

Study Design: Analysis of epidural injection growth and costs in Medicare's population 1997, 2002, and 2006.

Objectives: The primary purpose of this study was to evaluate the use of all types of epidural injections (i.e. caudal, interlaminar, and transforaminal in lumbar, cervical and thoracic regions), and other epidural procedures, including epidural adhesiolysis. In addition, the purpose was to identify trends in the number of procedures, reimbursement, specialty involvement, fluoroscopy use, and indications from 1997 to 2006.

Methods: The Centers for Medicare and Medicaid Services (CMS) 5% national sample carrier claim record data from 1997, 2002, and 2006 was utilized.

Outcomes Assessment: Outcome measures included Medicare beneficiaries' characteristics receiving epidural injections, epidural injections by place of service, type of specialty, reimbursement characteristics, and other variables.

Results: Epidural injections increased significantly in Medicare beneficiaries from 1997 to 2006. Patients receiving epidurals increased by 106.3%; visits per 100,000 population increased 102.7%.

Hospital outpatient department (HOPD) payments increased significantly; ASC average payments decreased; overall payments increased. The increase in procedures performed by general physicians outpaced that of interventional pain management (IPM) physicians.

Limitations: Study limitations include no Medicare Advantage patients; potential documentation, coding, and billing errors.

Conclusions: Epidural injections grew significantly. This growth appears to coincide with chronic low back pain growth and other treatments for low back pain. Since many procedures are performed without fluoroscopy, continued growth and inappropriate provision of services might reduce access.

Key words: Epidural injections, interventional techniques, interventional pain management, chronic pain, ambulatory surgery center (ASC), hospital outpatient department (HOPD)

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Health care spending in the United States grew 6.1% to $2.2 trillion or $7,421 per person in 2007 with spending as a share of the gross domestic product (GDP) reaching 16.2% — an increase over the 16.0% share in 2006 (1). At the same time, Medicare spending increased 7.2% in 2007 to $431.2 billion, with heightened concerns about the long-range fiscal sustainability of Medicare (2). In a recent report accounting for the cost of U.S. health care and why Americans spend more (2), it was found that in 2006 the United States spent $650 billion more on health care than any of its peer countries in the Organisation for Economic Co-operation and Development (OECD) even after adjusting for wealth. This was an increase from $477 billion in 2003. Of this amount, outpatient care, which includes same-day hospital visits and is by far the largest and fastest growing part of the U.S. health system, accounted for $436 billion or two-thirds of spending above what would be expected based on OECD expenses. The postulated factors for this increased growth include: provider capacity growth and response to high outpatient margins; judgement based on the nature of physician care; technological innovation that drives prices higher rather than lower; demand growth that appears to be due to greater availability of supplies; and relatively price-insensitive patients with limited out-of-pocket costs (2).

Expenditures in managing spinal pain are substantial and increasing (3-8). However, the treatment of spinal pain is controversial, as evidenced by wide variability in the treatment methods used and alleged lack of evidence of efficacy (8). The rising prevalence of chronic low back pain has been demonstrated (9,10) with continuing high levels of disability and health care use. Freburger et al (10) showed an increase of 11.6% of chronic low back pain and contributed a substantial portion of the rise in low back pain care costs over the past 2 decades to the rising prevalence. Overall, the prevalence studies have shown that in the adult population, chronic spinal pain ranges from 54% to 80% (11-18). Further, the prevalence of chronic persistent spinal pain has been shown to be associated with functional and psychological disabilities, and health, social, and economic impact, especially in the elderly (11-22).

Interventional techniques for the treatment of spinal pain are commonly used (3,23-41). Epidural injections and facet joint interventions are the 2 most commonly utilized procedures in interventional pain management (IPM) (3,4,11,23-54). The current literature regarding the effectiveness of epidural injections is sparse with highly variable outcomes based on the technique, outcome measures, patient selection, and methodology (23-35,55-62). However, recent evaluations with contemporary IPM practice methods utilizing fluoroscopy have shown emerging evidence of effectiveness (30,33,46-51,55-62).

Friedly et al (7), in an evaluation of lumbosacral injections in the Medicare population from 1994 to 2001, demonstrated a dramatic 271% increase in lumbar epidural steroid injections, along with increasing costs. Manchikanti et al (3), in an analysis of the growth of interventional techniques in managing chronic pain in the Medicare population from 1997 to 2006, showed an increase of 137% in patients utilizing IPM services, compared to an increase of 197% utilizing IPM services per 100,000 Medicare beneficiaries. In this study (3), the majority of the increase was attributed to the exponential growth in the performance of facet joint interventions. Of important note, it has been demonstrated that there are significant geographic variations in the administration of epidural steroid injections in Medicare patients with southern states tending to have the highest procedure rates, and northeastern states the lowest procedure rates (37).

The primary purpose of this study was to evaluate the use of all types of epidural injections (i.e., caudal, interlaminar, and transforaminal in lumbar, cervical, and thoracic regions), and other epidural procedures including epidural adhesiolysis using current procedural terminology (CPT) codes 62310, 62311, 64479, 64480, 64483, 64484, 62263, and 62264. In addition, we sought to identify trends in the number of procedures, reimbursement, specialty involvement, fluoroscopy use, and indications from 1997 to 2006. We also sought to explore the association between overall injection costs and the volume of services provided in hospital outpatient department (HOPD) settings, ambulatory surgery centers (ASCs), and in-office settings.

Methods

This evaluation was performed utilizing the standard 5% national sample from the Centers for Medicare and Medicaid Services (CMS) carrier claim record (formerly physician/supplier Part B) for 1997, 2002, and 2006. This data set provides a sample of those enrolled in the fee-for-service Medicare program (7,37). The 5% sample data set is therefore unbiased and unpredictable in terms of any patient characteristics, but does allow for tracking patients over time and provides data for individual states. CMS makes the 5% sample available, since

the 100% data set is too large and is not feasible to use for research purposes. Previous studies (7,37) used only patients 65 or older; in this study, we have used all patients enrolled in Medicare. A significant proportion of patients younger than 65 received epidural procedures. Medicare represents the single largest health care payor in the United States, with over 43 million beneficiaries in 2006 (63). Results from the 5% sample were multiplied by 20 to yield estimates of the entire Medicare beneficiary population. Rates were calculated based on Medicare beneficiaries for the corresponding year and are reported as per 100,000 Medicare beneficiaries.

For analysis, the CPT procedure codes for epidural injections were identified for years 1997, 2002, and 2006. The data were tabulated based on the place of service — HOPD, ASC, or office. Facility charges were identified for HOPDs, ASCs, and offices (office facility portion as overhead expense equals total office payment minus physician payment). HOPD facility payments were estimated based on national payment rates with consideration of modifiers due to the non-availability of HOPD data in carrier claim records. Allowed charges were used to estimate the costs of Medicare for these procedures. Costs were also adjusted for health care inflation using the U.S. Bureau of Labor Statistics Consumer Price Index (CPI) for medical care services and represent costs for 2006 (64).

To analyze the data based on the specialty, the IPM specialties were described as those providers designated in IPM -09, pain medicine -72, anesthesiology -05, physical medicine and rehabilitation -25, neurology -13, psychiatry -26, orthopedic surgery -20, and neurosurgery -14 (65). General physicians were described as those with designations of general practice -01, family practice -08, and internal medicine -11. All other providers were considered as other physicians and providers.

Statistical Analysis

The data were analyzed using SPSS (9.0) statistical software, Microsoft Access 2003, and Microsoft Excel (2003). For the comparison, the Z test was used. The procedure rates were calculated per 100,000 Medicare beneficiaries.

Results

Population Characteristics

Table 1 illustrates the characteristics of Medicare beneficiaries and epidural procedures. The U.S. population 65 or older increased 6.3% from 1997 to 2006, whereas Medicare beneficiaries increased 8% in the category of 65 or older, and increased 45.5% for those in the category of younger than 65. During the same period, the number of Medicare patients receiving epi-

Table 1. *Characteristics of Medicare beneficiaries and epidural procedures.*

				% of increase from	
	1997	2002	2006	2002–2006	1997–2006
US Population (thousands)	267,784	288,369	299,395	3.8%	11.8%
≥ 65 years (thousands)	34,933	35,602	37,125	4.3%	6.3%
Medicare Beneficiaries (thousands)	38,465	40,503	43,339	7.0%	12.7%
% of Medicare population to US population	14.40%	14.00%	14.50%	3.6%	0.7%
≥ 65 years (thousands)	33,636	34,698	36,317	4.7%	8.0%
Percent	87.40%	85.70%	83.80%	-2.2%	-4.1%
< 65 years (thousands)	4,829	5,805	7,022	21.0%	45.4%
Percent	12.60%	14.30%	16.20%	13.3%	28.6%
Epidural procedures					
Number of Medicare patients receiving epidural procedures	335,100	529,940	778,920	47.0%	132.4%
% of Medicare population	0.87%	1.31%	1.80%	37.4%	106.3%
Epidural patients per 100,000	871	1,308	1,797	37.4%	106.3%
Number of visits	683,920	1,061,000	1,561,980	47.2%	128.4%
Epidural procedure visits per 100,000	1,778	2,620	3,604	37.6%	102.7%
Services	757,760	1,181,140	1,888,140	59.9%	149.2%
Epidural procedures per 100,000	1,970	2,916	4,357	49.4%	121.2%
Average visits per patient	2.0	2.0	2.0	0%	0%

dural procedures increased 106.3%, while epidural procedure visits increased 102.7% per 100,000 population. There was no significant change in average visits per patient which remained at 2 in 1997, 2002, and 2006.

Figure 1 illustrates the number of Medicare patients receiving epidural procedures with visits and services per 100,000 Medicare beneficiaries.

Utilization Characteristics

Table 2 illustrates the utilization of epidural ser-

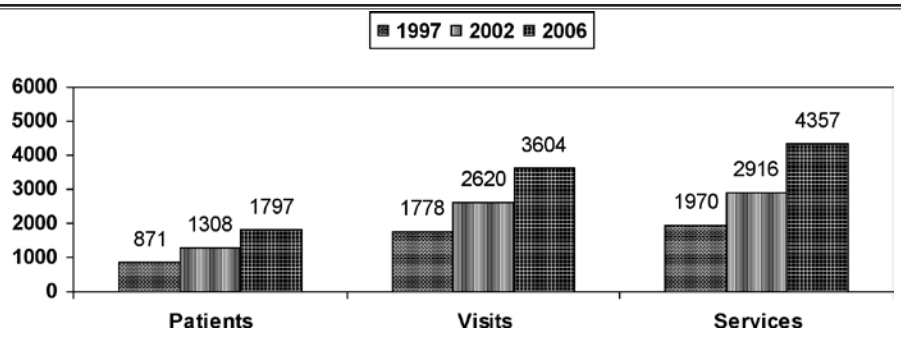


Fig. 1. *Number of Medicare patients receiving epidural procedures, visits, and services per 100,000 beneficiaries.*

Table 2. *Utilization IPM services by demographic characteristics.*

	Patients					Services				
	1997	2002	2006	Change from 2002 to 2006	Change from 1997 to 2006	1997	2002	2006	Change from 2002 to 2006	Change from 1997 to 2006
Total	335,100	529,940	778920	47%	132%	757,760	1,181,140	1,888,140	60%	149%
Per 100,000	871	1,308	1797	37%	106%	1970	2,916	4357	49%	121%
Age (years)										
< 65	45,260	82,860	137,300	66%	203%	110,620	194,440	359,720	85%	225%
% over Total	13.51%	15.64%	17.63%	13%	31%	14.60%	16.46%	19.05%	16%	31%
Per 100,000	937	1427	1955	37%	109%	2291	3345	5123	53%	124%
≥ 65	289,840	447,080	641,620	44%	121%	647,140	986,700	1,528,420	55%	136%
% over Total	86.49%	84.36%	82.37%	-2%	-5%	85.40%	83.54%	80.95%	-3%	-5%
Per 100,000	862	1288	1767	37%	105%	1924	2844	4209	48%	119%
Gender										
Male	122,080	185,940	270,920	46%	122%	276,760	408,280	649,660	59%	135%
% over Total	36.43%	35.09%	34.78%	-1%	-5%	36.52%	34.57%	34.41%	0%	-6%
Per 100,000	780	1047	1415	35%	82%	1768	2299	3394	48%	92%
Female	213,020	344,000	508,000	48%	138%	481,000	772,860	1,238,480	60%	157%
% over Total	63.57%	64.91%	65.22%	0%	3%	63.48%	65.43%	65.59%	0%	3%
Per 100,000	934	1513	2099	39%	125%	2109	3398	5118	51%	143%
Race										
African-American	17,620	29,160	46,760	60%	165%	40,640	63,320	114,040	80%	181%
% over Total	5.26%	5.50%	6.00%	9%	14%	5.36%	5.36%	6.04%	13%	13%
Per 100,000	533	753	1082	44%	103%	1229	1635	2640	61%	115%
White	301,040	480,900	699,360	45%	132%	667,800	1,073,860	1,689,780	57%	153%
% over Total	89.84%	90.75%	89.79%	-1%	0%	88.13%	90.92%	89.49%	-2%	2%
Per 100,000	901	1505	1930	28%	114%	1998	3361	4663	39%	133%
Other	16,440	19,880	32,800	65%	100%	49,320	43,960	84,320	92%	71%
% over Total	4.91%	3.75%	4.21%	12%	-14%	6.51%	3.72%	4.47%	20%	-31%
Per 100,000	950	425	1178	177%	24%	2849	940	3029	222%	6%

vices by demographic characteristics. Overall, services per 100,000 Medicare beneficiaries increased 124% for those younger than 65 years, and only 119% for patients 65 or older (Fig. 2). The proportion of patients receiving epidural injections was 1,924 for patients aged 65 or older per 100,000 population compared to 2,291 for patients under 65.

Female Medicare beneficiaries represented a larger proportion and received epidurals more frequently than male beneficiaries (157% vs. 135%) from 1997 to 2006.

Table 3 shows the summary of frequency of utilization of various epidural procedures in Medicare beneficiaries based on place of service in 2002 and 2006. Due to the data being non-comparable and non-comprehensive in 1997, the data from 2002 and 2006 were utilized. Overall, 89% of the procedures included the lumbar region. The most commonly performed pro-

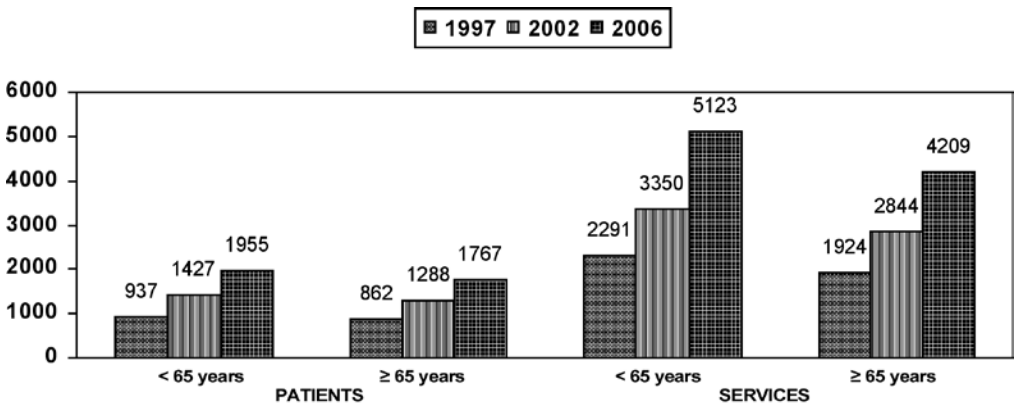


Fig. 2. *Illustration of number of Medicare patients and epidural procedures by age group (< 65 or ≥ 65) per 100,000 Medicare beneficiaries.*

Table 3. *Summary of the frequency of utilizations of various epidural procedures in Medicare beneficiaries based on place of service in 2002 and 2006.*

	2002					2006				
	HOPD	**Office**	**ASC**	**Total**	**Percent**	**HOPD**	**Office**	**ASC**	**Total**	**Percent**
62310	53,980	22,620	20,600	97,200	77.3%	56,200	51,260	36,900	144,360	71.8%
64479	6,200	8,860	2,740	17,800	14.2%	7,580	17,740	6,740	32,060	15.9%
64480	2,680	6,900	1,180	10,760	8.6%	3,740	16,700	4,300	24,740	12.3%
Cervical	62,860	38,380	24,520	125,760	100.0%	67,520	85,700	47,940	201,160	100.0%
Percent	50%	31%	19%			34%	43%	24%		
Per 100,000	155	95	61	310		156	198	111	464	
62311	450,760	179,160	150,160	780,080	73.9%	427,760	317,300	215,020	960,080	56.9%
64483	84,140	56,040	41,860	182,040	17.2%	142,000	190,180	127,600	459,780	27.3%
64484	35,040	27,600	15,860	78,500	7.4%	70,360	114,180	65,080	249,620	14.8%
62263 or 4	8,620	1,840	4,300	14,760	1.4%	7,820	4,440	5,240	17,500	1.0%
Lumbar	578,560	264,640	212,180	1,055,380	100.0%	647,940	626,100	412,940	1,686,980	100.0%
Percent	55%	25%	20%			38%	37%	24%		
Per 100,000	1,428	653	524	2,606		1,495	1,445	953	3,893	
Total	641,420	303,020	236,700	1,181,140		715,460	711,800	460,880	1,888,140	
Percent	54%	26%	20%			38%	38%	24%		
Per 100,000	1,584	748	584	2,916		1,651	1,642	1,063	4,357	

cedure was lumbar interlaminar or caudal epidural at greater than 50% of all the procedures. Adhesiolysis procedures constituted less than 1% of the epidural procedures with an increase of 18% from 14,760 in 2002 to 17,500 in 2006. Significant increases were seen in the rate of lumbar transforaminal epidural injections (CPT 64483); first procedures increased by 152% and for additional procedures (CPT 64484) there was an increase of 218%. Cervical transforaminals also increased significantly compared to either lumbar interlaminar or cervical interlaminar. In 2002, lumbar interlaminar epidurals (CPT 62311) constituted over 66% of the procedures, whereas it reduced to 50.8% in 2006. In contrast, lumbar transforaminal epidural injections (CPT 64483 & 64484) increased from 22% of all epidural procedures to 37.6% in 2006.

Reimbursement Characteristics

Table 4 illustrates physician and facility reimbursement by place of service adjusted for inflation. In 2002, the majority of services were provided in an HOPD, which was higher than ASCs and physician offices combined. In 2006, ASC services were lower than either HOPD or in-office settings. As seen in Table 4, facility average charges decreased by 13% in ASCs, but, allowed charges increased by 69%. At the same time, the HOPD average and allowed charges increased by 56% and 74%, respectively for in-office settings the average overhead portion increased by 26%, total charges by 196%. Figure 3 illustrates that the allowed charges per procedure declined by 9% in ASC settings, whereas they increased by 41% in HOPD and 20% for in-office settings.

Specialty Characteristics

Figure 4 illustrates the utilization of epidural procedures by specialty groups assigned as IPM, general practice and others. The increases was greatest for general physicians (including physicians of general practice, family practice, and internal medicine physicians) from 56 to 108 procedures per 100,000 Medicare population from 2002 to 2006 for an increase of 92%.

Fluoroscopy Utilization

Figure 5 illustrates the percentage of visits utilizing fluoroscopy based on specialty. Overall, fluoroscopy increased from a low of 20% for neurosurgery in 2002 to a high of 84% for pain management in 2006. When transforamial epidurals are considered, 27% of them in 2002 and 14% in 2006 were performed without fluoroscopy. As a rule, transforaminal epidurals should not be performed without fluoroscopy.

Characteristics by State

Table 5 illustrates epidural procedures in each state. Based on each 100,000 Medicare beneficiaries,

Table 4. *Characteristics of physician and facility reimbursement by place of services (allowed charges adjusted to inflation).*

	2002					2006					Change from 2002	
Physician	**Patients**	**Visits**	**Services**	**Total Allowed Charges**	**Average Per Service**	**Patients**	**Visits**	**Services**	**Allowed Charges Total**	**Average Per Service**	**Total Allowed Charges**	**Average Charges**
ASC	101,060	214,000	236,700	$25,408,524	$ 107.3	184,580	376,720	460,880	$51,438,640	$ 111.6	102%	4%
HOPD	309,560	587,300	641,420	$63,778,735	$ 99.4	338,260	623,620	715,460	$75,710,180	$ 105.8	19%	6%
Office	119,280	259,700	302,960	$29,558,720	$ 97.6	256,080	561,640	711,800	$75,786,002	$ 106.5	156%	9%
Total	529,900	1,061,000	1,181,080	$118,745,979	$ 100.5	778,920	1,561,980	1,888,140	$202,934,822	$ 107.5	71%	7%
Facility												
ASC	101,060	214,000	236,700	$81,812,109	$ 345.6	184,580	376,720	460,880	$137,867,620	$ 299.1	69%	-13%
HOPD	309,560	587,300	641,420	$145,539,363	$ 226.9	338,260	623,620	715,460	$253,131,140	$ 353.8	74%	56%
Office overhead	119,280	259,700	302,960	$50,618,044	$ 167.1	256,080	561,640	711,800	$149,841,920	$ 210.5	196%	26%
Total	529,900	1,061,000	1,181,080	$277,969,515	$ 235.4	778,920	1,561,980	1,888,140	$540,840,680	$ 286.4	95%	22%
Total												
ASC	101,060	214,000	236,700	$107,220,633	$ 453.0	184,580	376,720	460,880	$189,306,260	$ 410.7	77%	-9%
HOPD	309,560	587,300	641,420	$209,318,098	$ 326.3	338,260	623,620	715,460	$328,841,320	$ 459.6	57%	41%
Office	119,280	259,700	302,960	$80,176,763	$ 264.6	256,080	561,640	711,800	$225,627,922	$ 317.0	181%	20%
Total	529,900	1,061,000	1,181,080	$396,715,494	$ 335.9	778,920	1,561,980	1,888,140	$743,775,502	$ 393.9	87%	17%

Charges - Allowed charges including fluoroscopic charges

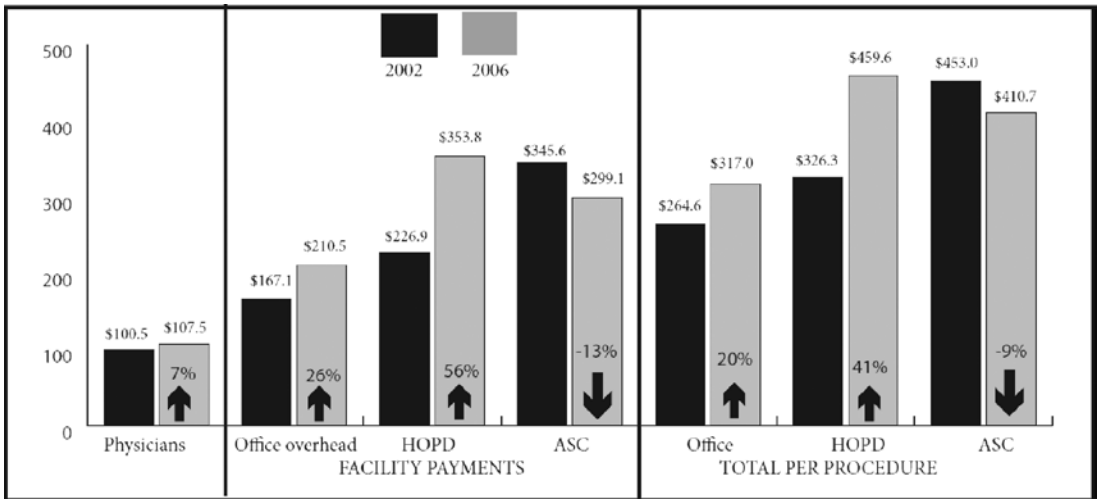


Fig. 3. *Allowed charges per procedure (inflation adjusted, change from 2002 to 2006.*

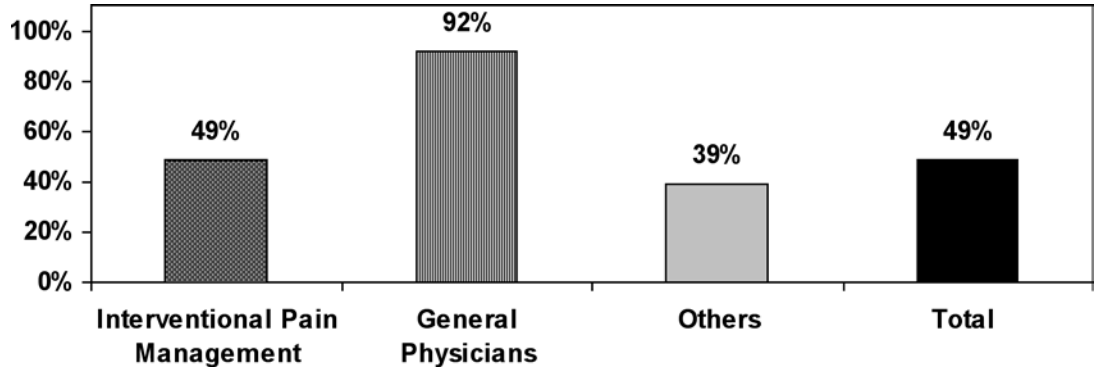
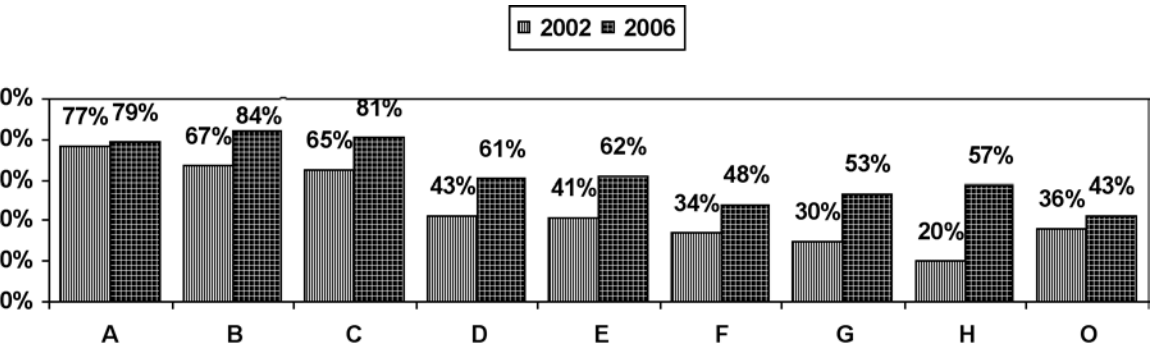


Fig. 4. *Percentage of increase in epidural procedures per 100,000 Medicare recipients from 2002 to 2006.*



A-Diagnostic Radiology; B-Pain Management; C-Physical Medicine and Rehabilitation; D-Orthopedic Surgery; E-Anesthesiology; F-Neurology; G-Family & General Practice/Internal Medicine; H-Neurosurgery; O-Others

Fig. 5. *Percentage of visits utilizing fluoroscopy based on specialty.*

Alaska had the highest increase from 2002 to 2006 at 141%; Wisconsin had the lowest percentage increase at 6%. In 2006, Hawaii had the lowest rate. In contrast, Alabama's rate was 7.6 times that of Hawaii; South Carolina, 7 times; Kansas, 6.9 times; Florida 6.7 times; and Michigan, 5.8 times.

Table 5. *Number of epidural procedures and procedures per 100,000 Medicare beneficiaries by state.*

	2002			2006			% change in rate from 2002	Fold difference from lowest state
State	Services	Percent	Rate	Services	Percent	Rate		
Alaska	680	0.1%	1,485	1,780	0.1%	3,584	141%	3.7
Connecticut	8,860	0.8%	1,629	16,720	0.9%	3,155	94%	3.3
New Mexico	5,380	0.5%	1,830	9,380	0.5%	3,401	86%	3.5
Massachusetts	14,860	1.3%	1,670	30,120	1.6%	3,068	84%	3.2
Texas	82,760	7.0%	3,538	163,680	8.7%	6,234	76%	6.5
Vermont	1,400	0.1%	1,532	2,480	0.1%	2,694	76%	2.8
South Carolina	26,460	2.2%	3,903	45,380	2.4%	6,733	73%	7.0
Louisiana	21,280	1.8%	3,535	37,680	2.0%	6,037	71%	6.3
New Hampshire	4,100	0.3%	2,500	8,440	0.4%	4,266	71%	4.4
Florida	117,380	9.9%	3,887	198,000	10.5%	6,430	65%	6.7
Arkansas	12,500	1.1%	2,567	20,420	1.1%	4,212	64%	4.4
Colorado	15,820	1.3%	3,158	26,540	1.4%	4,916	56%	5.1
West Virginia	5,840	0.5%	1,622	9,120	0.5%	2,524	56%	2.6
Ohio	45,220	3.8%	2,910	80,140	4.2%	4,507	55%	4.7
Maryland	18,780	1.6%	2,876	31,360	1.7%	4,429	54%	4.6
Rhode Island	2,880	0.2%	1,673	3,920	0.2%	2,536	52%	2.6
Delaware	3,380	0.3%	3,018	6,000	0.3%	4,551	51%	4.7
Michigan	47,880	4.1%	3,744	83,960	4.4%	5,558	48%	5.8
New York	51,540	4.4%	1,969	81,000	4.3%	2,888	47%	3.0
North Carolina	39,080	3.3%	3,284	63,100	3.3%	4,788	46%	5.0
California	81,340	6.9%	2,154	132,720	7.0%	3,104	44%	3.2
Kansas	17,620	1.5%	4,674	27,020	1.4%	6,648	42%	6.9
Arizona	22,100	1.9%	2,790	32,240	1.7%	3,955	42%	4.1
Alabama	39,320	3.3%	5,215	56,980	3.0%	7,378	41%	7.6
Utah	7,800	0.7%	4,063	14,120	0.7%	5,741	41%	5.9
Kentucky	19,660	1.7%	3,067	30,120	1.6%	4,334	41%	4.5
Illinois	52,940	4.5%	3,272	78,500	4.2%	4,583	40%	4.7
Virginia	27,280	2.3%	3,062	42,580	2.3%	4,183	37%	4.3
South Dakota	3,820	0.3%	3,164	5,140	0.3%	4,314	36%	4.5
Oklahoma	19,180	1.6%	3,753	27,960	1.5%	5,051	35%	5.2
Pennsylvania	54,260	4.6%	2,669	77,620	4.1%	3,600	35%	3.7
North Dakota	3,540	0.3%	3,430	4,500	0.2%	4,595	34%	4.8
New Jersey	37,140	3.1%	2,993	49,480	2.6%	3,985	33%	4.1
Maine	4,900	0.4%	2,140	6,780	0.4%	2,818	32%	2.9
Oregon	6,300	0.5%	1,291	9,420	0.5%	1,704	32%	1.8
Nebraska	9,340	0.8%	3,650	11,860	0.6%	4,766	31%	4.9
Mississippi	15,740	1.3%	4,067	24,460	1.3%	5,298	30%	5.5
Minnesota	13,320	1.1%	2,273	20,840	1.1%	2,922	29%	3.0
Georgia	37,200	3.1%	4,281	58,980	3.1%	5,485	28%	5.7
Tennessee	23,760	2.0%	3,237	39,120	2.1%	4,121	27%	4.3

Table 5 (cont.). *Number of epidural procedures and procedures per 100,000 Medicare beneficiaries by state.*

	2002			2006			% change in rate from 2002	Fold difference from lowest state
State	Services	Percent	Rate	Services	Percent	Rate		
Hawaii	1,300	0.1%	759	1,640	0.1%	965	27%	1.0
Indiana	34,960	3.0%	4,113	47,840	2.5%	5,186	26%	5.4
District of Columbia	1,440	0.1%	1,941	1,480	0.1%	2,436	26%	2.5
Missouri	34,760	2.9%	4,666	53,240	2.8%	5,728	23%	5.9
Wyoming	2,880	0.2%	4,276	3,620	0.2%	5,274	23%	5.5
Montana	5,800	0.5%	3,694	6,660	0.4%	4,389	19%	4.5
Iowa	14,740	1.2%	3,381	19,200	1.0%	3,883	15%	4.0
Washington	18,120	1.5%	2,649	25,780	1.4%	3,044	15%	3.2
Idaho	7,080	0.6%	4,098	8,500	0.5%	4,540	11%	4.7
Nevada	8,780	0.7%	3,313	10,880	0.6%	3,547	7%	3.7
Wisconsin	28,640	2.4%	4,086	36,240	1.9%	4,315	6%	4.5
US	1,181,140	100.0%	2,916	1,888,140	100.0%	4,357	49%	4.5

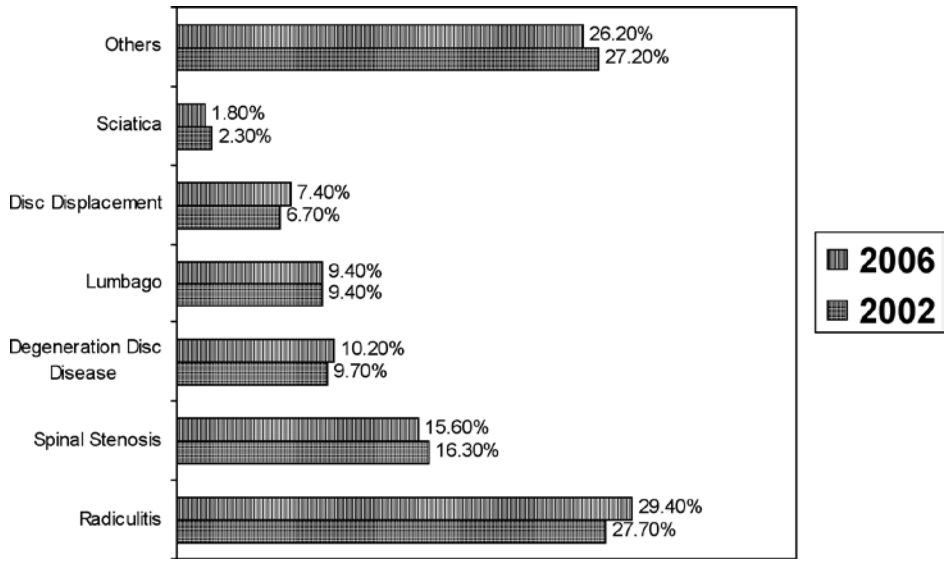


Fig. 6. *Lumbar diagnosis for epidural procedures.*

Diagnostic Characteristics

Approximately 40 different ICD-9 diagnostic codes were utilized. The majority of the procedures were performed in the lumbar region. Lumbar radiculitis, disc displacement, spinal stenosis, and sciatica accounted for 53% of all epidural injections in 2002 and 54% in 2006 (Fig. 6).

Overall Growth Patterns

Figure 7 illustrates overall growth patterns with an annual increase of epidural visits of 10.3% in the Medicare population, and an annual increase of chronic low back pain of 11.6% in the general population.

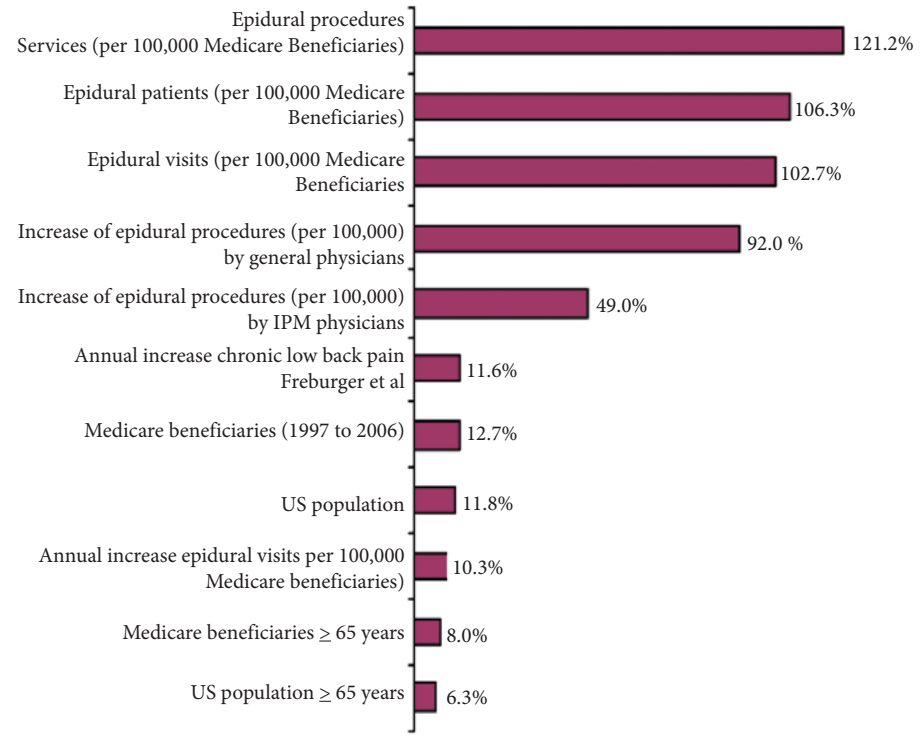


Fig. 7. *Illustration of overall growth patterns from 1997 to 2006.*

Discussion

Epidural injection rates for spinal disorders increased from 1997 to 2006 with an increase of 121.2% and an annual growth rate of 13.5%. This increase resulted in $396.7 million in Medicare expenditures in 2002 and $743.78 million in 2006, an annual increase of 21.8%. There was a significant increase of 92% (annual increase of 23%) in the utilization of epidural injections by general physicians comprised of general practice, family practice, and internal medicine compared to an annual increase of 12.2% for IPM physicians from 2002 to 2006. But, in spite of the growth in epidural procedures, they paled by comparison to the exponential increase (3) of 543% in facet joint interventions per 100,000 Medicare beneficiaries – an annual growth rate of 60%.

There was a 7.6-fold difference between the state with the lowest rate and the state with the highest rate in utilization patterns of epidural injections for 2006 (Hawaii vs. Alabama). The results of this evaluation of epidural injection growth patterns are similar to some previous evaluations (37-41), but in disagreement with others (7,37). Friedly et al (7,37) focused on the escalating use of lumbosacral injections coupled with a lack of evidence in managing chronic low back pain and geographic variation in epidural steroid injections. It appears that they have reached inaccurate conclusions (66), by not taking into consideration the increasing prevalence of low back pain (10), diagnosis, and effectiveness. Friedly et al (7) stated that previous literature suggested that epidural steroid injections may be helpful for short-term pain relief in radiculopathy, whereas the literature was far less clear for other diagnoses. However, epidural injections are indicated in spinal stenosis as well as post lumbar laminectomy syndrome. In fact, Staal et al (25) concluded that specific subgroups of patients might respond to a specific type of injection therapy. Recent systematic reviews and randomized double-blind equivalence trials have shown better evidence for cervical interlaminar (34), lumbar transforaminal epidural (33), caudal epidural

injections (30,46-49), and adhesiolysis (35,50,51). There is also emerging evidence of the effectiveness of epidural injections for patients without disc herniation or radiculitis, spinal stenosis and postlumbar laminectomy syndrome (30,46-49).

Friedly et al (7) suggested that less than half of all procedures were performed using fluoroscopy; approximately 45% of epidural visits were performed utilizing fluoroscopy in 2002, increasing to 70% in 2006. While the use of fluoroscopy varied widely among specialists, 27% of transforaminal procedures in 2002 and 14% in 2006 were performed without fluoroscopy. This indicates not only an abuse pattern, but also a dangerous one for transforaminal epidurals, a procedure associated with high risk (23,33,34,67,68).

Friedly et al (7) showed an annual growth of 38.7% with a shift of cases into ASC settings. From 2002 to 2006 services provided in all settings increased with the highest increases being in in-office settings; there were increases of services of 4% in HOPD settings, 82% in ASC settings, and 120% in in-office settings for an overall increase of 49%. Even so, HOPD patients constituted 43% in 2006. Overall charges increased 87% from 2002 to 2006 increasing from $396.7 million in 2002 to $743.78 million in 2006, while per visit charges increased 27% and per procedure charges increased 17%. Per patient facility charges decreased 8% in ASC settings, but they increased 59% in HOPD settings and 38% in in-office settings. Even though the highest increases were seen in in-office settings, the majority of facility revenues went to hospital settings, constituting 47% of the total revenues spent at facilities in 2006. Thus, our data is not in agreement with Friedly et al (7).

Based on the current data, it appears that the annual increase in the population with chronic low back pain is 11.6% (10), and the increase in epidural visits is 11.4%. The increased procedure count might be caused by multiple procedures (involving multiple regions) often being performed in a single setting (9,10,12,69-79).

Geographic variations were seen in this study similar to Friedly et al's (37). In a comparison of state-wide characteristics for 2006 per 100,000 Medicare beneficiaries, Florida provided 6,430 epidural services, whereas Hawaii provided 965 services — a 6.7-fold difference in utilization patterns from the highest state to the lowest state.

There are several limitations to our study. These include evaluation limits because we only looked at teh Medicare population, non-inclusion of participants in Medicare Advantage plans (which includes approximately 10% of enrollees) (63), and potential coding errors (7). However, in contrast to previous studies (7,37), in this study, we used all patients receiving Medicare. This inclusion is important because patients below the age of 65 represent a significant proportion of patients receiving epidural injections, with a higher frequency of 2.62 versus 2.38 services per patient in 2006. Since the data does not contain HOPD facility charges, we had to estimate the facility charges for outpatient hospital charges, similar to Friedly et al (7). Another limitation is that some of the variation may be related to coding errors and diagnostic ambiguity.

McKinsey Global Institute (2) postulated multiple factors for the increased growth of healthcare expenditures in the United States, specifically in providing outpatient care. As postulated in this report, first provider capacity growth and response to high outpatient margins is illustrated in this study based on significant increases in in-office settings and also performing these procedures. In addition, in outpatient settings, more efficient services are provided as a result of specialized staff and equipment, location convenience, short waiting times, and better physician production (80,81). The second factor relates to the judgment based on the nature of physician care. Over the years there has been significant growth in IPM due to improved education and more IPM practioners. The third factor described relates to technological innovation that drives prices higher rather than lower. This factor does not appear to apply to epidural procedures as prices are lower rather than higher, except in HOPD settings. The fourth factor relates to demand growth that appears to be due to greater availability of supplies. While this is accurate, there is also demand due to access and the increasing prevalence of low back pain. The final factor relates to relatively price-insensitive patients with limited out-of-pocket costs. In the Medicare population this factor is not applicable. In a study comparing quality at an ambulatory surgery center and a hospital-based facility (82), the performance at the ASC generally exceeded the hospital-based outpatient facility. The results showed differences in total charges and timeliness of finishing cases by the scheduled time. Total charges were 12% to 23% less at the ASC. A total of 77% of ASC cases finished within the scheduled time compared to 38% at the hospital outpatient facility.

Multiple recommendations have been made to slow the growth of health care costs in general (83) and interventional techniques in particular (3,4). Fisher et al (83) recommended that to slow spending growth we need policies that encourage high-growth or high-cost regions to behave more like low-growth, low-cost re-

gions and to encourage low-cost, slow-growth regions to sustain their current trends for interventional techniques. The Office of Inspector General (OIG) has recommended strengthening program safeguards to prevent improper payments. Others (3) also have recommended stronger regulations on medical necessity indications, accreditation provisions in the settings performed, and training and qualification of the physicians performing the procedures.

Conclusion

This study has demonstrated a significant rise in the number of epidural injections, but also demonstrated that the growth was within the range of the increase in the proportion of patients receiving epidural procedures and increasing prevalence of spinal pain. However, multiple problems with ambiguity of diagnosis, lack of fluoroscopic use, disproportionate increase in procedures, and increasing costs continue to exist.

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