Health Policy Perspective

Utilization of Interventional Techniques in Managing Chronic Pain In Medicare Population from 2000 to 2014: An Analysis of Patterns of Utilization

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Background: The increase in the utilization of various techniques in managing chronic pain, including interventional techniques, is a major concern for policy-makers and the public at large. Consequently, multiple regulations have been instituted to reduce health care expenditures in general and expenditures related to interventional techniques in particular. Previous investigations have shown significant increases of utilization of interventional techniques across the board with minor decreases noted in 2007, 2010, 2012 and 2013.

Objective: To assess the patterns of utilization of interventional techniques in chronic pain management in the fee-for-service (FFS) Medicare population.

Study Design: Analysis of utilization patterns of interventional techniques from 2000 to 2014 in Fee-for-Services (FFS) Medicare beneficiaries in managing chronic pain.

Methods: The analyzed data was derived from the Centers for Medicare and Medicaid Services (CMS) Physician/Supplier Procedure Summary Master Data from 2000 to 2014.

Results: The analysis of data from 2000 to 2014 in FFS Medicare beneficiaries showed overall utilization of interventional techniques increasing at a rate of 153% and an annual average growth rate of 6.9% per 100,000 Medicare population with increase in services of 242%. This showed a 3% decrease per 100,000 Medicare population, compared to the data from 2000 through 2013, even though services increased by 6% due to the increase in the number of Medicare recipients in the FFS beneficiary group. The overall increases in epidural and adhesiolysis procedures were 165% with a rate of 96% per 100,000 Medicare population with an average annual increase of 4.9%. Facet joint interventions and sacroiliac joint blocks increased at a rate of 313% per 100,000 population with an annual average increase of 10.7%. Disc procedures and other types of nerve blocks increased at a much lesser pace than epidural and adhesiolysis procedures or facet joint interventions with an increase of 54% per 100,000 Medicare population and annual increase of 3.1%. A decrease in utilization was noted in 5 of 14 years ranging from 1.2% to 3.8%.

Limitations: The limitations of this updated utilization patterns of interventional techniques in managing chronic pain are multiple with lack of inclusion of participants from Medicare Advantage Plans, lack of complete and accurate data for statewide utilization, and potential errors in coding, billing, and documentation.

Conclusion: This overall analysis of patterns of utilization in managing chronic pain with interventional techniques showed a continued and significant increase in FFS Medicare beneficiaries from 2000 to 2014 with an increase of 153% per 100,000 Medicare population and at a rate of 6.9% on average per year. However, there were decreases of 2.9% in 2007, 3.8% in 2010, and 1.3%, 3.4%, and 1.2% from 2012 to 2014.

Key words: Interventional pain management, chronic spinal pain, interventional techniques, epidural injections, adhesiolysis, facet joint interventions, sacroiliac joint injections, disc procedures, other types of nerve blocks

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Patterns of utilization of multiple modalities of treatments in managing chronic pain range are increasing, from over the counter medications to complex surgical fusions (1-14). Despite numerous modalities of treatments, prevalence of chronic pain and, more importantly, disability and the adverse economic impact continue (15-27). In fact, spinal pain related disability, has contributed to 3 of the 5 disorders in the United States including low back pain, other musculoskeletal disorders, and neck pain (17-23). Consequently, costs of utilization and the complications have been the focus of major discussions (2,11-16,28-45). Further, the published reports show that utilization of interventional techniques in managing chronic pain has been increasing over the years, despite multiple warnings and regulations (11,12,14,36-40,42-45). Manchikanti et al (11,14,38,42) have shown these increases in various assessments, along with increasing expenditures. The recent assessment (14), which included the data from 2000 to 2013, showed a 156% increased utilization of interventional techniques per 100,000 Medicare population with an annual increase of 7.5% compared to a 12% increase in the U.S. population with an annual increase of 0.9% and a 31% increase in the Medicare population with an annual increase of 2.1%. In addition, there have been assessments and recommendations from the Office of Inspector General (OIG) in reference to transforaminal epidural injections and facet joint injections (39,40).

Interventional pain management was recognized as a specialty in 2002 with a definition of interventional techniques in 2001 and membership on the Carrier Advisory Committee (CAC) in 2005 (14,38,42). Developments have been associated with excessive utilization, discordant Local Coverage Determinations (LCDs) and inability to focus on appropriateness of interventional techniques (38,42).

With the enactment of the Affordable Health Care Act, Medicare has become an organization establishing standards (41,46). In addition, in the era of evidence-based medicine (EBM), there has been lack of agreement between proponents (47-62) and opponents resulting in discordant opinions and conclusions in reference to effectiveness and appropriateness of multiple interventional techniques (63-65). It has also been emphasized that there is significant evidence of conflicts or confluence of interest in assessments leading to inappropriate conclusions as the basis of discordant results (58,60,66-69).

This assessment is undertaken to analyze utilization patterns of interventional techniques in chronic pain from 2000 through 2014.

Methods

This analysis was performed utilizing Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidance (70). Approval by the Institutional Review Board was not required for the present analysis which encompassed de-identified data which is non-attributable and non-confidential, available through the Centers for Medicare and Medicaid Services (CMS) database (71).

Study Design

This analysis of the utilization patterns and variables of interventional techniques from 2000 to 2014 in the Medicare fee-for-service (FFS) population in the United States included all interventional techniques, but excluded continuous epidurals, neurolytic procedures, trigger point injections, vertebral augmentation procedures, and implantables.

Setting

This analysis was performed in a tertiary referral center of interventional pain management services in the United States utilizing National Database of Specialty Utilization Data Files from CMS, for FFS Medicare (71).

Participants

Participants in this database included all FFS Medicare recipients from 2000 to 2014.

Measures

Allowed services were calculated from services submitted minus services denied and services with zero payments. Allowed services were assessed for each procedure and rates were calculated based on Medicare beneficiaries for the corresponding year and are reported as procedures per 100,000 Medicare beneficiaries.

CPT Codes Assessed

For this study of utilization patterns, the Current Procedural Terminology procedure codes for interventional techniques [Epidural and Adhesiolysis procedures (62310, 62311, 64479, 64480, 64483, 64484, 62263, 62264); Facet Joint interventions and SI joint blocks (64470, 64472, 64475, 64476, 64490, 64491-new, 64492-new, 64493-new, 64494-new, 64495-new, 64622, 64623, 64626, 64627, 64633-new, 64634-new, 64635-new,

64636-new, 27096); Discography and Disc decompression (62290, 62291, 62287); other type of nerve blocks (64400, 64402, 64405, 64408, 64410, 64412, 64413, 64417, 64420, 64421, 64425, 64430, 64445, 64505, 64510, 64520, 64530, 64600, 64605, 64610, 64613, 64620, 64630, 64640, 64680)] were utilized for years 2000 through 2014. The data were then tabulated based on the place of service – facility (ambulatory surgery center, hospital outpatient department) or non-facility (office).

Interventional techniques were performed historically by various types of providers even though the majority of them are performed by specialists representing interventional pain management, pain medicine, anesthesiology, and physical medicine and rehabilitation. These specialties were identified by Medicare designation and were grouped into interventional pain management, surgical group, radiologic specialties, other physicians, and other providers as follows: Various specialties were described as providers: interventional pain management -09, pain medicine -72, anesthesiology -05, physical medicine and rehabilitation -25, neurology -13, psychiatry -26, all constituting interventional pain management; orthopedic surgery -20, general surgery -17, and neurosurgery -14 as a surgical group; radiology specialties as a separate group (-30 diagnostic radiology, -94 interventional radiology); all other physicians as another group; and all other providers were considered as other providers.

Assessment of State Utilization Data

In determination of utilization for the states, the data was based on Medicare Part B carriers for 2014. This data is provided only from 2008 to 2014.

Data Sources

For this analysis of patterns of utilization, physician supplier procedure summary master data from 2000 through 2014 from the CMS was utilized (71).

Bias

The data was purchased by the American Society of Interventional Pain Physicians. This analysis was conducted without external funding or support, with the internal resources of the primary author's practice. It has been shown that the 100% data set is expected to be unbiased and unpredictable in terms of any patient characteristics and provides accurate information (11,14,72,73). In this analysis we have utilized all patients enrolled in FFS Medicare, instead of only patients aged 65 or older as in other evaluations (72,73), due to the finding that a significant proportion of patients below the age of 65 undergo interventional techniques (11,74). With emerging Affordable Care coverage, increasing disability, and increasing population over the age of 65, Medicare represents the single largest health care payer in the United States, with over 53.8 million beneficiaries in 2014 (74). Consequently, the interventional techniques performed on Medicare beneficiaries increasingly represent a large proportion of the procedures for chronic pain in the United States.

Study Size

This analysis included a large population – recipients of FFS Medicare in the United States undergoing interventional techniques from 2000 to 2014 with 39.6 million beneficiaries in 2000, increasing to 53.8 million beneficiaries in 2014 (75).

Statistical Analysis

The data were analyzed using SPSS 9.0 statistical software (SPSS, Inc., Chicago, IL) Microsoft Access 2003, and Microsoft Excel 2003 (Microsoft, Redmond, WA).

Results

Population Characteristics

Table 1 shows the growth of the U.S. population and Medicare beneficiaries along with overall utilization patterns of IPM services and rate for 100,000 FFS Medicare population. Overall the U.S. population increased 13%, whereas the population over 65 years of age increased 31.7% with an annual increase of 0.9% for the overall population and 2% for those over 65 years of age. The elderly population over 65 years of age constituted 12.4% of the population in 2000 increasing to 14.48% with a proportional increase of 16.8% from 2000 to 2014. Medicare beneficiaries including those over 65 years of age and also disabled individuals less than 65 years of age increased from 14% of the U.S. population in 2000 to 16.8% in 2014 with a proportion of change of 19.8%. Disabled individuals increased 65.7% compared to 30.2% for the elderly with an annual increase of 3.7% for disabled individuals and 1.9% for the elderly. Overall utilization of interventional techniques increased by 153% with an annual increase of 6.9%.

Utilization Characteristics

Table 2 and Fig. 1 show the summary of frequency of utilization in various categories of interventional

Table 1. *Summary of the frequency of utilization of various categories of interventional procedures in the Medicare population from 2000 to 2014.*

Year	U.S. Population			Fee-for-service Medicare Beneficiaries				IPM Services			
	Total Population (,000)	≥ 65 Years (,000)		Number of individuals participating in Medicare	% to U.S. population	≥ 65 years (,000) (Percent)	< 65 years (,000) Percent	Services	% of Change from Previous Year	Per 100,000 population	% of Change from Previous Year
		Number	% of US population								
Y2000	282,172	35,077	12.40%	39,632	14.0%	34,262 (86.5%)	5,370 (13.5%)	1,469,495	-	3,708	-
Y2001	285,040	35,332	12.40%	40,045	14.0%	34,478 (86.1%)	5,567 (13.9%)	1,760,456	19.8%	4,396	18.6%
Y2002	288,369	35,605	12.30%	40,503	14.0%	34,698 (85.7%)	5,805 (14.3%)	2,183,052	24.0%	5,390	22.6%
Y2003	290,211	35,952	12.40%	41,126	14.2%	35,050 (85.2%)	6,078 (14.8%)	2,559,323	17.2%	6,223	15.5%
Y2004	292,892	36,302	12.40%	41,729	14.2%	35,328 (84.7%)	6,402 (15.3%)	3,335,047	30.3%	7,992	28.4%
Y2005	295,561	36,752	12.40%	42,496	14.4%	35,777 (84.2%)	6,723 (15.8%)	3,660,699	9.8%	8,614	7.8%
Y2006	299,395	37,264	12.40%	43,339	14.5%	36,317 (83.8%)	7,022 (16.2%)	4,146,124	13.3%	9,567	11.1%
Y2007	301,290	37,942	12.60%	44,263	14.7%	36,966 (83.5%)	7,297 (16.5%)	4,111,127	-0.8%	9,288	-2.9%
Y2008	304,056	38,870	12.80%	45,412	14.9%	37,896 (83.4%)	7,516 (16.6%)	4,433,411	7.8%	9,763	5.1%
Y2009	307,006	39,570	12.90%	45,801	14.9%	38,177 (83.4%)	7,624 (16.6%)	4,645,679	4.8%	10,143	3.9%
Y2010	308,746	40,268	13.00%	46,914	15.2%	38,991 (83.1%)	7,923 (16.9%)	4,578,977	-1.4%	9,760	-3.8%
Y2011	311,583	41,370	13.28%	48,300	15.5%	40,000 (82.8%)	8,300 (17.2%)	4,815,673	5.2%	9,970	2.2%
Y2012	313,874	43,144	13.75%	50,300	16.0%	41,900 (83.3%)	8,500 (16.9%)	4,947,974	2.7%	9,837	-1.3%
Y2013	316,129	44,704	14.14%	51,900	16.4%	43,100 (83.0%)	8,800 (17.0%)	4,932,950	-0.3%	9,505	-3.4%
Y2014	318,892	46,179	14.48%	53,500	16.8%	44,600 (83.4%)	8,900 (16.5%)	5,025,904	1.9%	9,394	-1.2%
Change	13.0%	31.7%	16.8%	35.0%	19.8%	30.2%	65.7%	242%	-	153%	-
GM	0.9%	2.0%		2.2%		1.9%	3.7%	9.2%	-	6.9%	-

*(Excluding continuous epidurals, intraarticular injections, trigger point and ligament injections, peripheral nerve blocks, vertebral augmentation procedures, and implantables)

techniques in Medicare beneficiaries from 2000 to 2014 with distribution of procedural characteristics.

As shown in Table 2, the overall rate of increase for all procedures of all interventional techniques was 153% with an annual increase of 6.9%, with epidural and adhesiolysis procedures increasing 96% and 4.9%, facet joint interventions and sacroiliac joint blocks increasing 313% and 10.7%, and other types of nerve blocks increasing 54% and 3.1%.

Continuous epidurals, intraarticular injections, trigger point and ligament injections, peripheral nerve blocks, vertebral augmentation procedures, and implantables were excluded from this analysis.

Similar to Table 2, Fig. 1 shows the distribution of procedural characteristics from 2000 to 2014 with epidural and adhesiolysis procedures declining from 58.6% of overall utilization to 45.2% in 2014, whereas facet joint nerve blocks and sacroiliac joint

Table 2. *Utilization/frequency of interventional techniques in the fee-for-service Medicare population from 2000 to 2014*

	Epidural and adhesiolysis procedures		Facet joint interventions and SI joint blocks		Disc Procedures and other types of nerve blocks		Utilization of all interventional techniques*			
	Services (Facility %)	Rate	Services (Facility %)	*Rate*	Services (Facility %)	*Rate*	Services (Facility %)	*% of Change in services*	Rate	% of Change in Rate
2000	860,787 (79%)	2,172	424,796 (67%)	*1,072*	183,912 (87%)	*464*	1,469,495 (72%)		3,708	
2001	1,013,552 (78%)	2,531	543,509 (62%)	*1,357*	203,395 (87%)	*508*	1,760,456 (69%)	*19.8%*	*4,396*	18.6%
2002	1,199,324 (74%)	2,961	708,186 (58%)	*1,748*	275,542 (81%)	*680*	2,183,052 (64%)	*24.0%*	*5,390*	22.6%
2003	1,370,862 (71%)	3,333	884,035 (53%)	*2,150*	304,426 (80%)	*740*	2,559,323 (60%)	*17.2%*	*6,223*	15.5%
2004	1,637,494 (65%)	3,924	1,354,242 (46%)	*3,245*	343,311 (79%)	*823*	3,335,047 (54%)	*30.3%*	*7,992*	28.4%
2005	1,776,153 (65%)	4,180	1,501,222 (47%)	*3,533*	383,324 (78%)	*902*	3,660,699 (54%)	*9.8%*	*8,614*	7.8%
2006	1,870,440 (63%)	4,316	1,896,688 (40%)	*4,376*	378,996 (75%)	*874*	4,146,124 (49%)	*13.3%*	*9,567*	11.1%
2007	1,940,454 (62%)	4,384	1,820,695 (46%)	*4,113*	349,978 (73%)	*791*	4,111,127 (52%)	*-0.8%*	*9,288*	-2.9%
2008	2,041,155 (61%)	4,495	1,974,999 (46%)	*4,349*	417,257 (70%	*919*	4,433,411 (51%)	*7.8%*	9,763	5.1%
2009	2,136,035 (59%)	4,664	2,111,700 (46%)	*4,611*	397,944 (69%)	*869*	4,645,679 (49%)	*4.8%*	*10,143*	3.9%
2010	2,226,486 (57%)	4,746	1,937,582 (48%)	*4,130*	414,909 (62%)	*884*	4,578,977 (52%)	-1.4%	*9,760*	-3.8%
2011	2,309,906 (58%)	4,782	2,064,227 (50%)	*4,274*	441,540 (61%)	*914*	4,815,673 (48%)	*5.2%*	*9,970*	2.2%
2012	2,324,563 (58%)	4,621	2,159,057 (50%)	*4,292*	464,354 (57%)	*923*	4,947,974 (53%)	*2.7%*	*9,837*	-1.3%
2013	2,278,790 (58%)	4,391	2,197,766 (51%)	*4,235*	456,394 (51%)	*879*	4,932,950 (53%)	*-0.3%*	*9,505*	-3.4%
2014	2,273,104 (57%)	*4,249*	2,370,000 (50%)	*4,430*	382,800 (47%)	*716*	5,025,904 (52%)	*1.9%*	*9,394*	-1.2%
Change	165%	96%	458%	313%	108%	54%	242%		153%	
Average	7.2%	4.9%	13.1%	10.7%	5.4%	3.1%	9.2%		6.9%	

Rate - IPM services per 100,000 Medicare Beneficiaries

*(Excluding continuous epidurals, intraarticular injections, trigger point and ligament injections, peripheral nerve blocks, vertebral augmentation procedures, and implantables)

injections increased from 28.9% in 2000 to 47.2% in 2014. In addition, disc procedures and other types of nerve blocks also decreased from 11.5% in 2000 to 7.3% in 2014. Over the years even though epidural injections have increased in growth, they started declining from 48% in 2011, to 47% in 2012, 46.2% in 2013, and 45.2% in 2014. In contrast, the proportion of facet joint nerve blocks in overall utilization patterns decreased to 42.3% in 2010, but increased to 42.9% in 2011, 43.6% in 2012, 44.6% in 2013, and 47.2% in 2014. In 2014 there was lower utilization per 100,000 population of 4,430 compared to 4,611 of 2009 with highest utilization. Decreases in overall utilization were also noted in 2007, 2010, and 2012 through 2014.

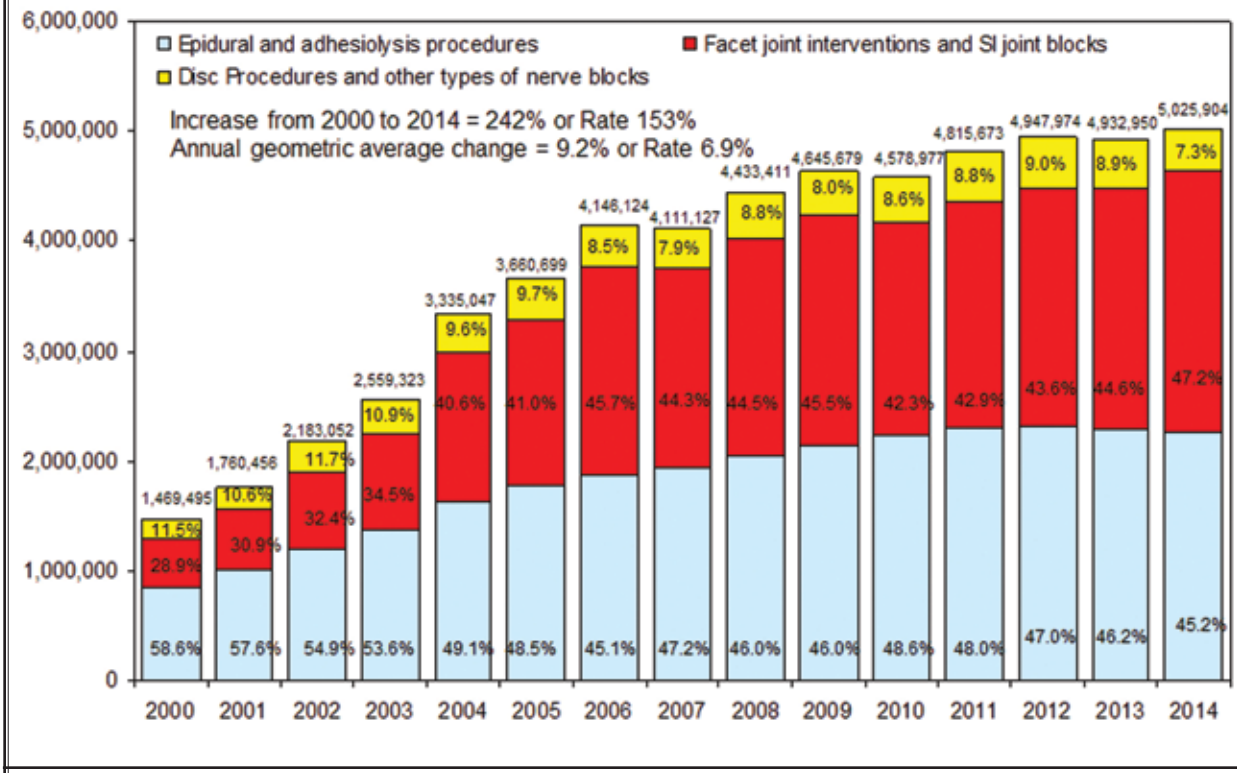


Fig. 1. *Distribution of procedural characteristics by type of procedures from 2000 to 2014.*

Specialty Characteristics

Fig. 2, Table 3, and Appendix 1 show frequency of utilization of interventional pain management techniques based on specialty designation. Similar to previous results (11,14), specialties incorporated into interventional pain management performed the majority of the procedures and also showed significant increases in utilization patterns. As shown in Fig. 2, surgical specialties continue to perform these procedures at a proportion of 3.8%, radiologic specialties at 2.4%, and all other physicians at 4.2%; however, other providers has been declining with their performance of less than 1% of the procedures which was the same as in 2000.

State Distribution Characteristics

Table 4 and Appendix 2, Appendix 3, Appendix 4, Appendix 5 and Appendix 6 show frequency of utilization of interventional techniques in managing chronic pain from 2008 to 2014.

Table 4 shows rates (per 100,000 Medicare beneficiaries) grouped by 2014 Medicare contractor carriers. Changes from 2008 to 2014 ranged from the highest decrease of 30.6% for the State of Tennessee (Cahaba) to the highest increase of 39.5% for the State of Utah (Noridian). There was no consistent pattern of increase or decrease based on Medicare Part B carrier in 2014. Despite numerous changes initiated and implemented by Noridian, utilization was higher in Noridian states compared to national averages.

Discussion

This assessment of utilization patterns of interventional techniques in the FFS Medicare population from 2000 to 2014 showed rather dramatic increases. The overall increases were present in all groups of patients for all types of procedures with an overall increase of 153% per 100,000 Medicare population reflected by an annual increase of 6.9%. Growth patterns showed the lowest increase for disc procedures and other types of nerve blocks with an annual rate of 3.1% and from 2000 to 2014 of 54%. The next category with an increase of 4.9% annual rate and overall increase of 96% is epi-

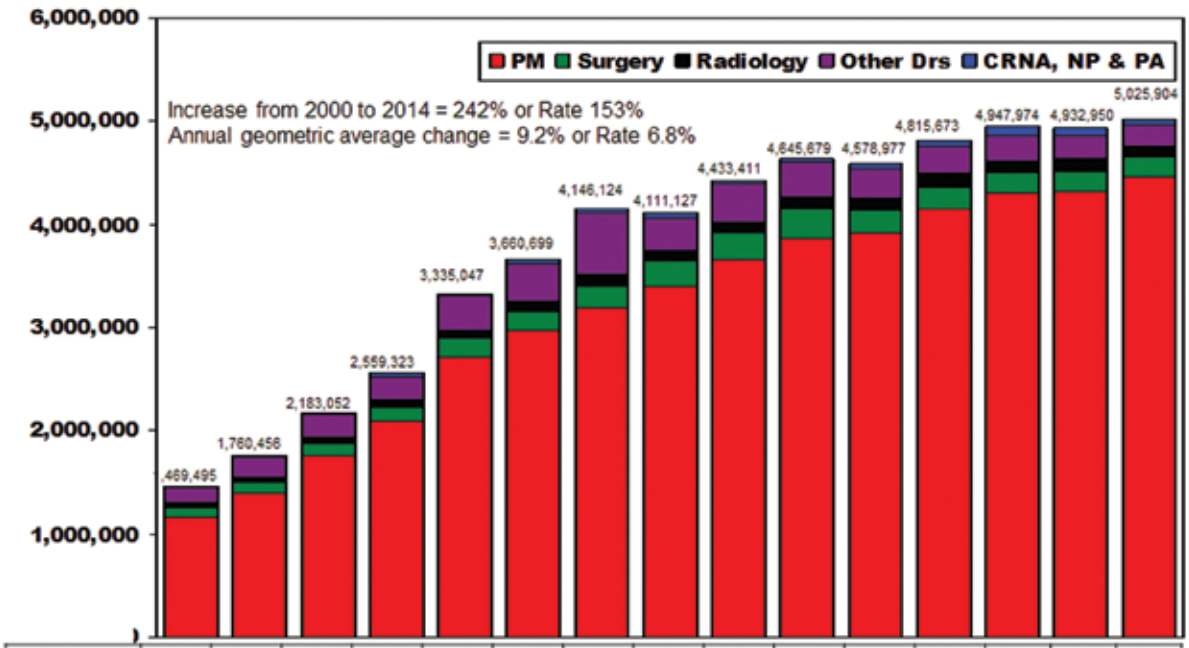
Table 3. *Frequency of utilization of interventional pain management techniques from 2000 to 2014, in fee-for-service Medicare recipients.*

Specialty	Interventional Pain Management #		Surgical (neuro, general, & orthopedic)		Radiology (interventional & diagnostic)		Other Physicians		Other Providers (CRNA, NP & PA)		Total	
	Services	Rate	Services	Rate	Services	Rate	Services	Rate	Services	Rate	Services*	Rate
2000	1,176,541 (80.1%)	2,969	92,126 (6.3%)	232	40,491 (2.8%)	102	145,100 (9.9%)	366	15,237 (1.0%)	38	1,469,495	3,708
2001	1,389,569 (78.9%)	3,470	105,075 (6.0%)	262	48,978 (2.8%)	122	196,311 (11.2%)	490	20,524 (1.2%)	51	1,760,456	4,396
2002	1,755,521 (80.4%)	4,334	123,403 (5.7%)	305	62,295 (2.9%)	154	218,870 (10.0%)	540	22,963 (1.1%)	57	2,183,052	5,390
2003	2,098,053 (82.0%)	5,102	133,165 (5.2%)	324	77,160 (3.0%)	188	229,010 (8.9%)	557	21,935 (0.9%)	53	2,559,323	6,223
2004	2,718,622 (81.5%)	6,515	168,669 (5.1%)	404	91,892 (2.8%)	220	329,705 (9.9%)	790	26,519 (0.8%)	64	3,335,047	7,992
2005	2,976,908 (81.3%)	7,005	183,972 (5.0%)	433	101,586 (2.8%)	239	367,303 (10.0%)	864	30,930 (0.8%)	73	3,660,699	8,614
2006	3,196,190 (77.1%)	7,375	211,580 (5.1%)	488	110,472 (2.7%)	255	589,835 (14.2%)	1361	38,047 (0.9%)	88	4,146,124	9,567
2007	3,405,892 (82.8%)	7,695	231,170 (5.6%)	522	111,423 (2.7%)	252	323,021 (7.9%)	730	39,621 (1.0%)	90	4,111,127	9,288
2008	3,670,828 (82.8%)	8,083	247,125 (5.6%)	544	117,388 (2.6%)	258	354,877 (8.0%)	781	43,193 (1.0%)	95	4,433,411	9,763
2009	3,879,520 (83.5%)	8,470	273,436 (5.9%)	597	123,228 (2.7%)	269	324,729 (7.0%)	709	44,766 (1.0%)	98	4,645,679	10,143
2010	3,917,426 (85.6%)	8,350	222,784 (4.9%)	475	121,127 (2.6%)	258	265,771 (5.8%)	567	51,869 (1.1%)	111	4,578,977	9,760
2011	4,159,585 (86.4%)	8,612	206,805 (4.3%)	428	127,614 (2.6%)	264	259,177 (5.4%)	537	62,492 (1.3%)	129	4,815,673	9,970
2012	4,302,121 (86.9%)	8,553	197,982 (4.0%)	394	129,823 (2.6%)	258	244,626 (4.9%)	486	73,422 (1.5%)	146	4,947,974	9,837
2013	4,331,789 (87.8%)	8,346	185,630 (3.8%)	358	119,172 (2.4%)	230	231,899 (4.7%)	447	64,460 (1.3%)	124	4,932,950	9,505
2014	4,467,374 (88.9%)	8,350	183,111 (3.6%)	342	119,684 (2.4%)	224	209,379 (4.2%)	391	46,356 (0.9%)	87	5,025,904	9,394
Change	280%	181%	117%	61%	196%	119%	37%	1%	204%	125%	242%	153%
Geometric average annual change	10.0%	7.7%	5.7%	3.4%	8.0%	5.8%	2.3%	0.1%	8.3%	6.0%	9.2%	6.9%

Rate - IPM services per 100,000 Medicare Beneficiaries ; ( ) percentage of row total

(interventional pain management, pain medicine, anesthesiology, physiatry, neurology, and psychiatry)

*(Excluding continuous epidurals, intraarticular injections, trigger point and ligament injections, peripheral nerve blocks, vertebral augmentation procedures, and implantables)



Specialty (%)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Pain Management	80.1%	78.9%	80.4%	82.0%	81.5%	81.3%	77.1%	82.8%	82.8%	83.5%	85.6%	86.4%	86.9%	87.8%	88.9%
Surgery	6.3%	6.0%	5.7%	5.2%	5.1%	5.0%	5.1%	5.6%	5.6%	5.9%	4.9%	4.3%	4.0%	3.8%	3.6%
Radiology	2.8%	2.8%	2.9%	3.0%	2.8%	2.8%	2.7%	2.7%	2.6%	2.7%	2.6%	2.6%	2.6%	2.4%	2.4%
Other Physicians	9.9%	11.2%	10.0%	8.9%	9.9%	10.0%	14.4%	7.9%	8.0%	7.0%	5.8%	5.4%	4.9%	4.7%	4.2%
CRNA, NP & PA	1.0%	1.2%	1.1%	0.9%	0.8%	0.8%	0.9%	1.0%	1.0%	1.0%	1.1%	1.3%	1.5%	1.3%	0.9%

Fig. 2. *Utilization of interventional pain management techniques by specialty from 2000 to 2014, in Medicare recipients.*

dural and adhesiolysis procedures. Facet joint interventions and SI joint blocks showed the most significant increases of 313%, or an annual increase of 10.7%. The proportion of epidural procedures from overall interventional techniques decreased from 58.6% in 2000 to 45.2% in 2014. In contrast, facet joint interventions and sacroiliac joint injections increased from 28.9% to 47.2% similar to epidural and adhesiolysis procedures. Disc procedures and other types of nerve blocks constituted 11.5% of overall interventional techniques in 2000 which decreased to 7.3% in 2014. Utilization decreased in 5 of 14 years: 2.9% in 2007, 3.8% in 2010, and 1.3%, 3.4%, and 1.2% from 2012 to 2014.

The results also showed similar patterns in place of service as shown in earlier assessments (11) with migration of procedures from hospital outpatient departments to ambulatory surgical centers and offices as shown in Table 5 and Figure 3.

The results of this evaluation of growth patterns are similar to previous evaluations (11,14); however, they differed from some assessments performed by Friedly et al (72,73) which were old studies and also focused only on the escalating use of injection therapies in chronic low back pain. They also attempted to couple increases with lack of evidence and geographic variation (76). Consequently, these results may not reflect the present atmosphere as numerous new codes have been issued, along with multiple regulations and LCDs with changing health care dynamics. Abbott et al (12) hypothesized utilizing an inappropriate concept leading to conclusions which may not be applicable in clinical practice today.

In addition, it also differs from a recent manuscript on patterns of increase for facet joint interventions (77) which miscalculated results by utilizing disallowed services and duplication by utilizing ambulatory surgical

Table 4. *Rate of utilization of interventional pain management techniques from 2008 to 2014, in fee-for-service Medicare recipients by 2016 Medicare Carriers contractors*

State	2008	2009	2010	2011	2012	R2013	R2014	Change	GM
Cahaba									
Alabama	12,700	13,026	13,278	13,704	14,007	12,666	12,494	-1.6%	-0.3%
Georgia	12,897	14,447	12,889	13,799	13,786	12,574	12,459	-3.4%	-0.6%
Tennessee	12,310	12,482	12,030	12,844	12,987	10,165	8,548	-30.6%	-5.9%
Total	12,645	13,398	12,704	13,452	13,577	11,788	11,157	-11.8%	-2.1%
%CFPY		6%	-5%	6%	1%	-13%	-5%		
CGS									
Kentucky	10,552	10,683	10,602	11,199	12,197	12,302	11,590	9.8%	1.6%
Ohio	8,808	9,420	9,176	9,156	9,364	9,138	8,806	0.0%	0.0%
Total	9,303	9,779	9,583	9,741	10,177	10,050	9,608	3.3%	0.5%
%CFPY				2%	4%	-1%	-4%		
First Coast									
Florida	16,940	16,071	14,175	14,188	14,104	13,237	13,194	-22.1%	-4.1%
%CFPY		-5%	-12%	0%	-1%	-6%	0%		
NGS									
Connecticut	6,489	6,392	6,503	6,955	7,100	7,124	7,326	12.9%	2.0%
Illinois	8,926	9,607	8,807	8,898	9,308	9,044	8,715	-2.4%	-0.4%
Massachusetts	6,899	7,379	7,891	8,828	9,423	9,420	9,172	32.9%	4.9%
Maine	6,069	6,186	6,055	6,570	6,920	6,823	7,488	23.4%	3.6%
Minnesota	5,436	5,561	5,381	5,453	5,504	5,173	4,826	-11.2%	-2.0%
New Hampshire	9,007	10,014	11,096	11,853	11,846	11,027	10,092	12.1%	1.9%
New York	6,141	5,866	5,929	5,993	6,080	6,498	6,745	9.9%	1.6%
Rhode Island	7,425	7,021	7,665	7,471	6,502	5,420	5,392	-27.4%	-5.2%
Vermont	5,832	6,258	6,080	6,066	5,839	6,119	6,246	7.1%	1.1%
Wisconsin	7,742	7,697	7,593	7,944	8,151	7,889	7,459	-3.7%	-0.6%
Total	7,020	7,151	7,082	7,335	7,542	7,529	7,447	6.1%	1.0%
%CFPY		2%	-1%	4%	3%	0%	-1%		
Noridian									
Alaska	5,955	5,342	5,686	5,627	5,478	6,389	6,721	12.9%	2.0%
Arizona	9,704	11,267	11,906	12,627	12,950	13,152	13,414	38.2%	5.5%
California	7,735	8,022	7,733	7,826	7,824	7,711	7,173	-7.3%	-1.2%
Idaho	7,022	7,407	7,187	7,829	7,599	7,537	7,839	11.6%	1.9%
Montana	7,603	7,600	6,647	7,276	7,050	6,979	6,842	-10.0%	-1.7%
North Dakota	7,639	8,124	7,681	6,961	7,110	7,452	7,603	-0.5%	-0.1%
Nevada	9,768	10,506	11,541	12,062	12,761	12,451	12,004	22.9%	3.5%
Oregon	3,934	4,228	4,271	4,448	4,587	4,804	4,612	17.2%	2.7%
South Dakota	11,022	11,980	10,233	10,006	9,106	9,220	8,843	-19.8%	-3.6%
Utah	10,631	11,133	11,430	11,897	13,446	13,843	14,834	39.5%	5.7%
Washington	5,779	6,164	5,958	5,787	5,318	5,341	4,985	-13.7%	-2.4%
Wyoming	6,777	7,071	7,423	6,569	6,687	7,557	8,016	18.3%	2.8%
Total	7,641	8,104	7,994	8,163	8,209	8,211	7,923	3.7%	0.6%
%CFPY		6%	-1%	2%	1%	0%	-4%		

Table 4 (cont.). *Rate of utilization of interventional pain management techniques from 2008 to 2014, in fee-for-service Medicare recipients by 2016 Medicare Carriers contractors*

State	2008	2009	2010	2011	2012	R2013	R2014	Change	GM
Novitas									
Arkansas	13,431	12,978	12,319	11,130	11,269	11,654	12,246	-8.8%	-1.5%
Colorado	6,914	7,218	7,465	7,800	8,439	8,469	8,655	25.2%	3.8%
DC	50,336	50,647	52,070	57,626	57,006	71,556	75,143	49.3%	6.9%
Delaware	10,662	9,341	9,169	9,479	9,741	10,457	11,203	5.1%	0.8%
Louisiana	10,991	10,800	10,654	11,289	11,701	12,175	12,161	10.6%	1.7%
Maryland	9,477	9,213	8,798	9,619	9,639	10,384	10,941	15.5%	2.4%
Mississippi	10,931	12,668	11,957	12,422	12,799	12,545	11,760	7.6%	1.2%
New Jersey	7,644	7,446	7,577	7,924	7,841	8,580	8,635	13.0%	2.1%
New Mexico	6,658	6,420	6,525	6,886	7,039	6,761	6,579	-1.2%	-0.2%
Oklahoma	9,179	9,923	9,862	10,561	11,055	11,356	12,511	36.3%	5.3%
Pennsylvania	7,215	6,878	7,075	7,298	7,409	7,791	7,868	9.0%	1.5%
Texas	15,436	16,025	13,916	13,839	12,916	12,214	12,291	-20.4%	-3.7%
Total	10,806	10,952	10,366	10,622	10,502	10,654	10,834	0.3%	0.0%
%CFPY		1%	-5%	2%	-1%	1%	2%		
Palmetto GBA									
North Carolina	10,375	10,677	10,265	10,448	10,613	9,977	9,274	-10.6%	-1.9%
South Carolina	12,111	12,800	13,018	13,756	14,276	14,423	14,399	18.9%	2.9%
Virginia	6,917	7,259	6,873	7,307	7,361	7,837	8,335	20.5%	3.2%
West Virginia	5,907	6,475	6,747	7,115	7,742	8,082	7,886	33.5%	4.9%
Total	9,219	9,648	9,451	9,850	10,103	10,098	9,947	7.9%	1.3%
%CFPY		5%	-2%	4%	3%	0%	-1%		
WPS									
Iowa	6,191	6,025	6,061	6,405	6,415	6,317	6,027	-2.6%	-0.4%
Indiana	11,318	11,191	11,484	12,158	12,278	11,607	11,819	4.4%	0.7%
Kansas	10,428	10,747	10,819	11,306	11,113	11,013	10,968	5.2%	0.8%
Michigan	14,047	14,822	14,915	14,751	14,660	14,309	14,332	2.0%	0.3%
Missouri	11,623	12,001	11,874	12,112	12,205	11,581	11,767	1.2%	0.2%
Nebraska	7,555	8,013	7,535	7,471	7,770	7,624	7,786	3.1%	0.5%
Total	11,449	11,806	11,864	12,083	12,103	11,711	11,778	2.9%	0.5%
%CFPY		3%	0.5%	2%	0%	-3%	1%		
US total	9,763	10,143	9,760	9,970	9,837	9,505	9,394	-3.8%	-0.6%
%CFPY		4%	-4%	2%	-1%	-3%	-1%		

center and physician services.

Analysis of the present data in reference to utilization patterns of various procedures, specialties, and geographic utilizations yield interesting results. Fig. 1 with proportionate distribution of procedural groups, namely epidural and adhesiolysis procedures, facet joint interventions, and SI joint blocks, disc procedures, and other types of nerve blocks, shows dynamic changes in utilization patterns of various procedures. As an example, in 2000, epidural and adhesiolysis procedures constituted 58.6% of the total procedures and in 2014, their proportion decreased to 45.2%. Facet joint interventions and SI joint blocks increased from 28.9% in 2000 to 47.2% in 2014. Similar to epidural injections, disc procedures and other types of nerve blocks also decreased from a total of 11.5% in 2000 to 7.3% in 2014. These increases for facet joint interventions and SI joint blocks is despite an overall strategy to reduce utilization

of facet joint interventions based on OIG study results released in September 2008 (39) and bundling of facet joint nerve blocks to include fluoroscopy in 2009 (78), showed decrease in utilization of facet joint injections in 2010. Bundling of radiofrequency neurotomy and sacroiliac joint injections in 2012 (79), change of definition of sacroiliac joint injections in 2002 (80), and transforaminal epidural injections in 2010 (81) seems to have made no significant difference in overall utilization patterns. In addition, multiple aggressive approaches utilized by Medicare carriers in various jurisdictions with development of LCDs and multiple rather inappropriate steps taken by the collaboration between Noridian and the Multi-society Pain Workgroup (MPW) (38,42,82,83) may or may not have influenced utilization patterns. However, significant payment reductions, FDA warnings, and fungal infections in 2014 reduced overall utilization of epidural injections in 2014 (38,42,82-84).

There were no surprises in reference to the specialties performing interventional techniques. The majority of the procedures (88.9%) were performed by groups labeled as pain management, while all other specialties, including non-physician professionals, performed 11.1%.

Examination of the state utilization data based on assignment of Medicare Part B carriers showed wide fluctuations with a decrease of 30% utilization to an increase of 30% utilization from 2008 to 2014. However, with most stringent LCDs, in jurisdictions developed by Noridian Health Services with the support of MPW with lack of of LCD process as recommended by Medicare Integrity Manual (38,42,82,86,87) have shown an overall increase of 3.7%. In contrast, overall utilization nationwide decreased 3.8%. In addition, 2 states with highest utilization (Utah and Arizona) were from Noridian Health Services.

Some critics have claimed that increased utilization is based on simple over utilization. These allegations seem to be based on misinterpretation of evidence which often appears to be biased and contain numerous conflicts of interest (63-66). However, appropriate evidence synthesis, utilizing modern principles of analysis of comparative effectiveness research without conflicts of interest and prepossession, has shown contrasting results with moderate evidence of effectiveness for multitude of interventional techniques (54-62). Further, the prevalence of pain, and disability secondary to chronic pain and its health economic impact continue to increase at an unsustainable rate (1-27). Increasing prevalence and disability have been highlighted by numerous epidemiological studies in the United States and across the world, leading to multiple types of interventions (1-27). Freburger et al (19), in assessing the prevalence of low back pain in North Carolina over a span of 14 years from 1992 to 2006, showed an increase from 3.9% to 10.2% or 162%. Multiple manuscripts have shown increasing disability. In addition, understanding of the impact of chronic pain continues to evolve, along with the patients' right movement with focusing on pain relief.

In fact, government agencies themselves have promoted the escalating prevalence of pain and disability, often with misinformation (88) based on flawed studies from IOM and Gaskin and Richard (15,16) which combined multiple other conditions of disability into chronic pain. Even then, spinal pain appears to be responsible for the burden of disability in a significant proportion of patients along with health care expenditures of approximately $100 billion a year instead of $650 billion as reported by IOM and Gaskin and Richard in the United States (15-27).

This comprehensive analysis attempted to utilize the best available data on utilization by all the patients on Medicare, but is limited by some deficiencies. One of the advantages is inclusion of all Medicare patients below and above the age of 65 due to the fact that a significantly higher proportion of patients that receive interventional techniques are those aged less than 65 years (74). However, the limitations are the lack of inclusion of Medicare advantage patients, and multiple other providers including Medicaid, Workers' Compensation, and other private carriers. The data from the FDA (30) also affirms these results which showed utilization of epidural injections of 6.6 million to 1.4 million patients over the age of 65 years over a 5-year period. Thus, this data may also have missed those on Medicare with disability and those patients on Medicare Advantage plans. FDA data also showed that among other payers from age 0 to 59 years, 150,572 patients received 262,301 epidural injections in 2012.

In summary, interventional techniques continue to grow at a rapid pace. Thus, application of principles of accountable and value-based interventional pain management with a focus on medical necessity and proper indications is crucial to provide appropriate interventions and curb growth, while maintaining appropriate access. However, multiple other issues including reducing overregulation and applying proper regulations with appropriate reimbursement will also prevent the shifting of services from one sector to the other.

Conclusion

From 2000 to 2014, interventional techniques increased significantly in FFS Medicare beneficiaries at a rate of 153% and an annual average growth of 6.9% per 100,000 Medicare population. The study also showed disproportional increases in facet joint interventions and sacroiliac joint blocks.

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Appendix 1. *Frequency of utilization of interventional techniques for chronic pain from 2000 to 2014, in fee-for-service Medicare recipients based on specialty.*

CLICK HERE to view Appendix 1.

Appendix 2. *Utilization of interventional pain management techniques services from 2008 to 2014, in fee-for-service Medicare recipients by 2016 Medicare Carriers contractors*

CLICK HERE to view Appendix 2.

Appendix 3. *Rate of utilization of interventional pain management techniques from 2008 to 2014, in fee-for-service Medicare recipients by states alphabetical order*

CLICK HERE to view Appendix 3.

Appendix 4. *Utilization of services of interventional pain management techniques from 2008 to 2014, in fee-for-service Medicare recipients by states alphabetical order*

CLICK HERE to view Appendix 4

Appendix 5. *Rate of utilization of interventional pain management techniques from 2008 to 2014, in fee-for-service Medicare recipients by percentage of change from 2008 to 2014 in declining order*

CLICK HERE to view Appendix 5

Appendix 6. *Utilization of services of interventional pain management techniques from 2008 to 2014, in fee-for-service Medicare recipients by percentage of change from 2008 to 2014 in declining order*

CLICK HERE to view Appendix 6.

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