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Health Policy Research

Updated Analysis of Decline of 16.8% in Utilization of Interventional Pain Management Techniques Among Traditional (Fee-for-Service) Medicare Beneficiaries from 2019 to 2024

Laxmaiah Manchikanti, MD[1], Vidyasagar Pampati, MSc[1], Mahendra R. Sanapati, MD[2], Nebojsa Nick Knezevic, MD, PhD[3], Alan D. Kaye, MD, PhD[4], Amol Soin, MD[5], Alaa Abd-Elsayed, MD, MPH[6], and Joshua A. Hirsch, MD[7]

From: [1]Pain Management Centers of America, Paducah, KY; [2]University of Louisville School of Medicine, Louisville, KY, and Indiana University School of Medicine, Evansville, IN; [3]Advocate Illinois Masonic Medical Center and College of Medicine, University of Illinois, Chicago, IL; [4]Louisiana State University Health Sciences Center at Shreveport, Shreveport, LA, Tulane School of Medicine, and LSU School of Medicine, New Orleans, LA; [5]Ohio Pain Clinic and Wright State University, Dayton, OH; [6]UW Pain Clinic and University of Wisconsin, Madison, WI; [7]Massachusetts General Hospital/Harvard Medical School, Boston, MA

Address Correspondence:
Laxmaiah Manchikanti, MD
67 Lakeview Drive
Paducah, Kentucky 42001
E-mail: drlm@thepainmd.com

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Conflict of interest: Dr. Soin has several patents in non-opioid pain pharmaceuticals and neuromodulation (SCS and PNS) and artificial intelligence, has stock options with Neuros Medical, has received equipment, materials, drugs, medical writing, gifts or other services from Avanos for research, and has other financial or nonfinancial interests with Alyea Therapeutics, Neuros Medical, Neuronoff, and Avanos. Dr. Abd-Elsayed is a consultant for Medtronic, Curonix, Avanos, and Averitas.Dr. Hirsch receives grants or contracts from the Neiman Health Policy Institute, is a Medtronic, Relievant, and Sanofi consultant, and is the Chair of CSMB of neurovascular studies for Balt: Rapid Medical. All other authors certify that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted article.

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Background: In recent years, rising costs associated with managing spinal pain and other musculoskeletal disorders have been well documented. Prior to the COVID-19 pandemic, the use of interventional techniques to manage spinal pain and other musculoskeletal disorders had steadily increased. However, the pandemic disrupted chronic pain management, including interventional procedures and opioid use, reflecting a broader reduction in healthcare services.

Objectives: To provide an updated assessment of interventional technique utilization for chronic pain management in the U.S. Medicare population from 2000 to 2024.

Study Design: Retrospective cohort study examining trends and factors influencing interventional technique use for chronic pain management within the traditional fee-for-service (FFS) Medicare population in the United States between 2000 and 2024.

Methods: Data were obtained from the Centers for Medicare & Medicaid Services (CMS) master database, specifically the physician/supplier procedure summary, covering the years 2000 through 2024.

Results: Service rates for interventional pain management per 100,000 Medicare beneficiaries significantly declined by 16.8% cumulatively from 2019 to 2024, corresponding to an average annual decrease of 3.6%. This contrasts with the 2010-2019 period, during which a cumulative increase of 14.5% was observed, along with an average annual growth rate of 1.5%. The steepest decline occurred between 2019 and 2020, with a 15.4% reduction coinciding with the onset of the COVID-19 pandemic.

Limitations: The analysis is limited to traditional (FFS) Medicare beneficiaries, excluding Medicare Advantage Plans, which represented nearly 54% of Medicare enrollment in 2024. Additionally, as with all retrospective claims-based studies, inherent limitations of coding accuracy and incomplete clinical detail apply.

Conclusion: From 2019 to 2024, the use of interventional pain management techniques declined significantly. Contributing factors likely include the lingering effects of COVID-19, economic pressures, the Affordable Care Act, and evolving local coverage determination (LCD) policies.

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, economic decline, Affordable Care Act (ACA)

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A variety of changes that have taken place since the passage of the Affordable Care Act (ACA) impacting patients suffering from treatable pain (1-4). These include the Inflation Reduction Act in 2022 (4,5), expanded Medicare Advantage Plans (6-8), and the 21st Century Cures Act (9) expedited regulations amid rising costs and reduced healthcare utilization (9-13). Patients have been burdened by high deductibles, coinsurances, and rising copays (9-13). Pain practices have faced increasing operational costs, including hiring staff to explain insurance plans, managing patient complaints regarding rising expenses, and responding to greater scrutiny from audits and an increased number of audits (9-33). The COVID-19 pandemic accelerated the decline in healthcare utilization, alongside increased cannabis use and sustained opioid-related deaths (34-50). With rising unemployment, inflation, workforce changes, and supply chain disruptions, these economic challenges have intensified (6-8,40-43).

Healthcare spending in the United States was projected to grow by 7.5% in 2023, outpacing the nominal gross domestic product (GDP) growth rate of 6.1%, resulting in an increased share of the nation's economy devoted to healthcare, reaching 7.6% growth (51,52). Experts forecast continued growth in national health expenditures, averaging 5.6% growth, which is expected to exceed the nominal GDP growth rate of 4.3%. This rapid increase, driven by an aging population and rising healthcare demand exceeding income growth, is projected to consume 19.7% of the U.S. economy by 2032. In 2022, U.S. healthcare spending increased by 4.1%, to $4.5 trillion, up from a 3.2% growth rate in 2021. While this was significantly lower than the 10.6% surge in 2020 due to the COVID-19 pandemic, healthcare spending for 2023 is expected to reach $4.8 trillion, with per capita spending projected at $14,423. Medicare enrollees demonstrate higher per capita costs, with 2022 figures showing $6,838 for private health insurance, $15,689 for Medicare, and $9,336 for Medicaid. By 2032, projected per capita spending is expected to rise to $10,576 for private health insurance, $24,921 for Medicare, and $15,632 for Medicaid.

Medicare Part B physician and clinical services, representing approximately 20% of total spending, grew 7.4% to $978.0 billion in 2023, exceeding the 4.6% increase in 2022. Private insurance spending for these services increased by 9.4% (compared to 8.5% in 2022), and out-of-pocket spending rose by 7.0% (compared to 4.6%). The faster growth in 2023 was primarily driven by greater service use and intensity, while price growth remained low at 0.6% (53).

The COVID-19 pandemic had a lasting impact on interventional pain management practices (34-48). Previous analyses have documented a significant reduction in the use of interventional techniques for managing chronic pain in the Medicare population since 2020 (37-43). Even prior to the pandemic, growth patterns for interventional techniques were changing and, at times, declining in the Medicare population following ACA implementation (37-43).

Consistent with rising national healthcare expenditures, U.S. spending on personal and public healthcare for back and neck pain reached $134.5 billion in 2016, representing a 53.5% increase from $87.6 billion in 2013 (54).

Independent physicians are struggling to remain financially viable (6-8,26,55-60). The Physicians Advocacy Institute's latest Avalere report indicates rural U.S. areas lost nearly 2,500 physicians (5% of rural doctors) and almost 3,300 medical practices (an 11% decrease) from 2019 to 2024, with a 43% decline in independent physicians and over 40% of independent practices closed or absorbed by corporations. Ownership and employment by hospitals, health systems, insurers, and private equity firms surged, with 76% of rural physicians now employed by non-physician entities, and 61% of practices being non-physician-owned (61). Even with these shifts, Centers for Medicare & Medicaid Services (CMS) policies continue to affect independent practices (6-8,24-26) adversely.

Despite these challenges, extensive literature supports the clinical and cost-effectiveness of various interventional techniques through randomized controlled trials, systematic reviews, cost-utility analyses, and real-world evidence (17-22,25,62-93). Nevertheless, opinions remain divided, with some critics questioning the effectiveness of these techniques, while proponents argue that many opposing conclusions are based on inappropriate evidence synthesis and conflicts of interest (17,18,62-68).

This retrospective cohort study provides an updated analysis of interventional technique utilization patterns in the U.S., building upon findings from a prior publication (40), traditional fee-for-service (FFS) Medicare population from 2022 to 2024, focusing on changes in rates for traditional (FFS) Medicare beneficiaries rather than total Medicare beneficiaries.

Methods

The present investigation adhered to the Strength-

ening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure clarity and reliability in reporting the results (94). The study utilized publicly available, nonidentifiable data from the CMS database, which includes non-attributable and non-confidential information (95).

Study Design

In previous analyses conducted by us and others, the traditional (FFS) Medicare population was not accurately allocated (40-43,96,97). Consequently, in this assessment, we analyzed traditional (FFS) Medicare recipients only, excluding those enrolled in Medicare Advantage plan. Since data on Medicare Advantage plans were unavailable, this study focused exclusively on traditional (FFS) Medicare utilization patterns. The study was designed to evaluate utilization patterns and variables associated with interventional techniques used in the management of chronic pain from 2000 to 2024. Most interventional techniques were included, except for continuous epidurals, neurolytic procedures, trigger point injections, vertebral augmentation procedures, and implantable devices.

Objectives

The primary objectives of this study were to assess the utilization trends of interventional techniques over time and to provide an updated analysis of these trends from 2000 to 2024 in the traditional (FFS) Medicare population.

Setting

The analysis utilized the CMS national database of specialty usage data files, focusing on the traditional (FFS) Medicare population in the United States (95).

Participants

Participants included all individuals in the traditional (FFS) Medicare population from 2000 to 2024, encompassing those receiving Medicare due to Social Security disability, Social Security insurance, or retirement.

Variables

The study evaluated the utilization of various interventional pain techniques between 2019 and 2024, analyzing trends across multiple time periods, including 2000-2010, 2010-2019, 2019-2020, 2019-2024, and overall from 2000 to 2024. Variables related to the growth and demographic characteristics of the Medicare population were also examined.

Historically, interventional procedures have been performed primarily by physicians specializing in interventional pain management (designation -09), pain medicine (-72), anesthesiology (-05), physical medicine and rehabilitation (-25), neurology (-13), and psychiatry (-26). Physicians in other specialties, such as orthopedic surgery (-20), general surgery (-17), and neurosurgery (-14), also perform these procedures, though less frequently. Radiological specialties, including diagnostic radiology (-30) and interventional radiology (-94), were also considered, while non-physician providers were categorized separately as "other providers."

The study utilized Current Procedural Terminology (CPT) codes for interventional techniques from 2000 to 2022, including:

- Epidural and adhesiolysis procedures (CPT 62280, 62281, 62282, 62310, 62320-new, 62321-new, 62311, 62322-new, 62323-new, 64479, 64480, 64483, 64484, 62263, 62264)
- Facet joint interventions and sacroiliac joint blocks (CPT 64451 (from 2020), 64470, 64472, 64475, 64476, 64490, 64491- new, 64492-new, 64493-new, 64494-new, 64495-new, 64622, 64623, 64625 (from 2020), 64626, 64627, 64633-new, 64634-new, 64635-new, 64636-new, 27096)
- Discography and disc decompression (CPT 62290, 62291, 62287)
- Other types of nerve blocks (CPT 64400, 64402, 64405, 64408, 64410, 64412, 64413, 64417, 64420, 64421, 64425, 64430, 64445, 64454 (from 2020), 64505, 64510, 64520, 64530, 64600, 64605, 64610, 64613, 64620, 64624 (from 2020), 64630, 64640, 64680).

Data were analyzed based on the place of service, differentiating between facility-based settings (ambulatory surgery centers, hospital outpatient departments) and nonfacility-based settings (offices).

Data Sources

Data for this study were extracted from the CMS Physician/Supplier Procedure Summary Master Data from 2000 to 2024 (95), which included traditional (FFS) Medicare participants, both those below and above 65 years of age, who received interventional techniques, regardless of their disability status.

Measures

The CMS dataset includes primary, add-on, and bilateral procedure codes, specialty codes, place of service,

total services provided, and both allowed and denied services. Utilization patterns were analyzed based on allowed services, excluding those with denied or zero payment. Allowed service rates were calculated per 100,000 traditional (FFS) Medicare beneficiaries for each year.

Bias

The data were purchased from CMS by the American Society of Interventional Pain Physicians (ASIPP). The research was conducted using internal resources from the primary authors' practice, with no external funding or industry grants.

Study Size

The study included a comprehensive sample, covering all traditional (FFS) Medicare patients who received interventional procedures for chronic spinal pain in all settings and regions of the United States from 2000 to 2024.

Data Compilation

Data were compiled using Microsoft Access 2510 and Microsoft Excel 2510 (Microsoft Corporation, Redmond, WA). These tools were used to process and analyze the CMS dataset, ensuring accurate and efficient handling of the data.

By adhering to these methods, the present investigation provides an in-depth analysis of interventional pain management trends within the U.S. traditional (FFS) Medicare population over 24 years.

Results

Participants

The participants in this study included all traditional (FFS) Medicare beneficiaries from 2000 to 2024.

Descriptive Data of Population Characteristics

Population growth in the United States remained relatively stable until 2019, after which notable fluctuations occurred, mainly due to the COVID-19 pandemic and its effects on healthcare access and delivery. Between 2000 and 2010, the annual growth rate of the U.S. population averaged 0.9%, whereas Medicare enrollment increased at a substantially higher rate of 1.7% per year. Between 2010 and 2019, U.S. population growth slowed to 0.7% annually, while Medicare enrollment accelerated to 3.0% annually, nearly double the pace of the preceding decade (Table 1).

During 2019-2020, the U.S. population increased by 0.8%, whereas Medicare enrollment growth slowed to 2.3% compared to the prior decade's 3.0% annual increase. Between 2019 and 2024, the annual U.S. population growth rate further declined to 0.7%, accompanied by slower Medicare population growth of 2.0% per year (Table 1).

As presented in Table 1 and depicted in Figs. 1 and 2, utilization of interventional pain management services per 100,000 Medicare beneficiaries declined by 15.4% from 2019 to 2024, representing an average annual decrease of 3.6%. This shift contrasts with the 1.5% average yearly increase observed between 2010 and 2019. A marked 15.4% reduction occurred specifically between 2019 and 2020, aligning with the onset of the COVID-19 pandemic. Subsequent annual fluctuations included a 4.5% increase from 2020 to 2021, a 7.1% decrease from 2021 to 2022, a 2.7% decline from 2022 to 2023, and a 4.1% increase from 2023 to 2024.

In contrast, from 2000 to 2010, annual rates of interventional pain management services demonstrated rapid and unsustainable growth, with a geometric mean increase of 11.2% per year. After 2010, these growth rates plateaued, with only a minimal annual increase of 1.5% observed between 2010 and 2019.

Figure 1 provides a visual comparison of Medicare population growth and interventional pain management utilization rates per 100,000 beneficiaries, illustrating shifts in the relationship between enrollment and service use and emphasizing the significant decline associated with the COVID-19 pandemic (Table 1 and Fig. 1).

Services Compared to Rate

As shown in Fig. 2, this analysis evaluates both the total number of interventional pain management services and the corresponding rates per 100,000 Medicare beneficiaries from 2000 to 2024. The total volume of services rose steadily through 2019, reflecting gradual increases in utilization. However, when adjusted for Medicare population size, the service rate per 100,000 beneficiaries exhibited a modest but consistent decline beginning around 2019.

Notably, the rate of interventional techniques in 2024 (12,148 per 100,000) is identical to the rate in 2008 (12,148 per 100,000), indicating a stagnation in population-adjusted growth despite continued increases in the absolute number of services. This divergence between total services and population-adjusted rates suggests that utilization has not kept pace with the growth of the Medicare population.

Table 1. *Trends in utilization of interventional pain management techniques, 2000-2024, among traditional (FFS) Medicare beneficiaries.*

Year	U.S. Population	≥ 65 years	Percent	All Medicare Beneficiaries	% to U.S.	MA	Traditional Medicare (TMC)	PCPY	IPM Services	PCPY	Rate (TMC)	PCPY
Y2000	282,172	35,077	12.40%	39,632	14.00%	6,240	33,392		1,469,495		4,401	
Y2001	285,040	35,332	12.40%	40,045	14.00%	5,600	34,445	3.2%	**1,760,456**	19.8%	5,111	16.1%
Y2002	288,369	35,605	12.30%	40,503	14.00%	5,500	35,003	1.6%	**2,183,052**	24.0%	6,237	22.0%
Y2003	290,211	35,952	12.40%	41,126	14.20%	4,600	36,526	4.4%	**2,559,323**	17.2%	7,007	12.3%
Y2004	292,892	36,302	12.40%	41,729	14.20%	4,700	37,029	1.4%	**3,335,047**	30.3%	9,007	28.5%
Y2005	295,561	36,752	12.40%	42,496	14.40%	4,900	37,596	1.5%	**3,660,699**	9.8%	9,737	8.1%
Y2006	299,395	37,264	12.40%	43,339	14.50%	6,900	36,439	-3.1%	**4,146,124**	13.3%	11,378	16.9%
Y2007	301,290	37,942	12.60%	44,263	14.70%	8,100	36,163	-0.8%	**4,111,127**	-0.8%	11,368	-0.1%
Y2008	304,056	**38,870**	**12.80%**	**45,412**	**14.90%**	**9,400**	**36,012**	**-0.4%**	**4,433,411**	**7.8%**	**12,311**	**8.3%**
Y2009	307,006	39,570	12.90%	45,801	14.9%	10,500	35,301	-2.0%	**4,645,679**	4.8%	13,160	6.9%
Y2010	308,746	40,268	13.00%	46,914	15.2%	11,000	35,914	1.7%	**4,578,977**	-1.4%	12,750	-3.1%
Y2011	311,583	41,370	13.28%	48,300	15.5%	11,700	36,600	1.9%	**4,815,673**	5.2%	13,158	3.2%
Y2012	313,874	43,144	13.75%	50,300	16.0%	12,800	37,500	2.5%	**4,947,974**	2.7%	13,195	0.3%
Y2013	316,129	44,704	14.14%	51,900	16.4%	14,100	37,800	0.8%	**4,932,950**	-0.3%	13,050	-1.1%
Y2014	318,892	46,179	14.48%	53,500	16.8%	15,400	38,100	0.8%	**5,025,904**	1.9%	13,191	1.1%
Y2015	320,897	47,734	14.88%	54,900	17.1%	16,400	38,500	1.0%	**5,243,036**	4.3%	13,618	3.2%
Y2016	323,127	49,244	15.24%	56,500	17.5%	17,200	39,300	2.1%	**5,509,306**	5.1%	14,019	2.9%
Y2017	326,625	51,055	15.63%	58,000	17.8%	18,500	39,500	0.5%	**5,558,893**	0.9%	14,073	0.4%
Y2018	327,167	52,423	16.02%	59,600	18.2%	20,000	39,600	0.3%	**5,639,608**	1.5%	14,241	1.2%
Y2019	328,293	54,074	16.47%	61,200	18.6%	21,900	39,300	-0.8%	**5,736,488**	1.7%	14,597	2.5%
Y2020	331,002	55,939	16.90%	62,600	18.9%	24,000	38,600	-1.8%	**4,767,369**	-16.9%	12,351	-15.4%
Y2021	332,049	55,885	16.83%	63,400	19.1%	26,400	37,000	-4.1%	**4,776,040**	0.2%	12,908	4.5%
Y2022	333,272	57,470	17.24%	64,700	19.4%	28,700	36,000	-2.7%	**4,314,925**	-9.7%	11,986	-7.1%
Y2023	334,915	59,300	17.71%	66,700	19.9%	30,900	35,800	-0.6%	**4,176,435**	-3.2%	11,666	-2.7%
Y2024	**340,100**	**61,200**	**17.99%**	**67,600**	**19.9%**	**33,100**	**34,500**	**-3.6%**	**4,190,920**	**0.3%**	**12,148**	**4.1%**
Change												
2000-2024	121%	174%		171%		530%	103%		285%		276%	
GM	0.8%	2.3%		2.3%		7.2%	0.1%		4.5%		4.3%	
2000-2010	9.4%	14.8%		18.4%		76.3%	7.6%		211.6%		189.7%	
GM	0.9%	1.4%		1.7%		5.8%	0.7%		12.0%		11.2%	
2010-2019	6.3%	34.3%		30.5%		99.1%	9.4%		25.3%		14.5%	

Table 1 cont. *Trends in utilization of interventional pain management techniques, 2000-2024, among traditional (FFS) Medicare beneficiaries.*

Year	U.S. Population	≥ 65 years	Percent	All Medicare Beneficiaries	% to U.S.	MA	Traditional Medicare (TMC)	PCPY	IPM Services	PCPY	Rate (TMC)	PCPY
GM	0.7%	3.3%		3.0%		8.0%	1.0%		2.5%		1.5%	
2019-2020	0.8%	3.4%		2.3%		9.6%	-1.8%		-16.9%		-15.4%	
2019-2024	3.6%	13.2%		10.5%		51.1%	-12.2%		-26.9%		-16.8%	
GM	0.7%	2.5%		2.0%		8.6%	-2.6%		-6.1%		-3.6%	
2020-2021	0.3%	-0.1%		1.3%		10.0%	-4.1%		0.2%		4.5%	
2021-2022	0.4%	2.8%		2.1%		8.7%	-2.7%		-9.7%		-7.1%	
2022-2023	0.5%	3.2%		3.1%		7.7%	-0.6%		-3.2%		-2.7%	
2023-2024	1.5%	3.2%		1.3%		7.1%	-3.6%		0.3%		4.1%	

IPM = interventional pain management; TMC = traditional Medicare beneficiaries; PCPY = percentage of change from previous year; GM = geometric average annual change; MA = Medicare Advantage beneficiaries

Types of procedures

From 2000 to 2010, epidural and adhesiolysis procedures experienced exponential growth, with a geometric mean annual increase of 9.2%. This growth was followed by a yearly modest decline of 1.2% from 2010 to 2019 and a further annual decline of 2.8% between 2019 and 2024. Facet joint and sacroiliac joint interventions experienced even more rapid growth early on, with a 15.5% annual increase from 2000 to 2010, followed by a slowdown to 4.1% between 2010 and 2019, and then a decline of 5.1% annually from 2019 to 2024. Disc procedures and other nerve blocks showed more moderate expansion, with annual growth rates of 7.7% from 2000 to 2010, 1.2% from 2010 to 2019, and 1.0% from 2019 to 2024 (Table 2, Figs. 3 and 4).

Specialty Utilization Data

Most interventional procedures, approximately 80% in 2000 and 90% in 2024, were performed by specialists in interventional pain management (designation 09), pain medicine (72), anesthesiology (05), physical medicine and rehabilitation (25), neurology (13), and psychiatry (26). Additional contributions came from surgical specialties such as orthopedic surgery (20), general surgery (17), and neurosurgery (14), as well as radiological specialties including diagnostic radiology (30) and interventional radiology (94) (Table 3, Fig. 5).

Service Site Data

There was a modest increase in the proportion of procedures performed in ambulatory surgery centers (ASCs), rising from 23.8% in 2000 to 26.8% in 2024. During the same period, hospital-based procedures decreased by 2.5%, and office-based procedures declined slightly by 0.5% (Table 4, Figs. 5 and 6).

Discussion

This updated evaluation of utilization data for interventional techniques used to manage chronic pain in the traditional (FFS) Medicare population spans the years 2000 to 2024, with a particular focus on changes that occurred from 2019 to 2024. This analysis presents utilization trends across three intervals: 2000-2010, 2010-2019, and 2019-2024. The study includes most interventional procedures but excludes vertebral augmentation and neuromodulation techniques such as spinal cord stimulation and intrathecal infusion systems.

The overall U.S. population demonstrated a growth rate of 0.7% from 2019 to 2024, similar to the rate from 2010 to 2019 but lower than the 0.9% observed from 2000 to 2010. The number of individuals aged 65 and older increased by 3.3% annually from 2010 to 2019, then decreased to 2.5% from 2019 to 2024. This decline is partly attributable to COVID-19-related mortality. Medicare enrollment reflected similar patterns, growing at a rate of 3.0% annually from 2010 to 2019, but slowing to 2.0% from 2019 to 2024. Both

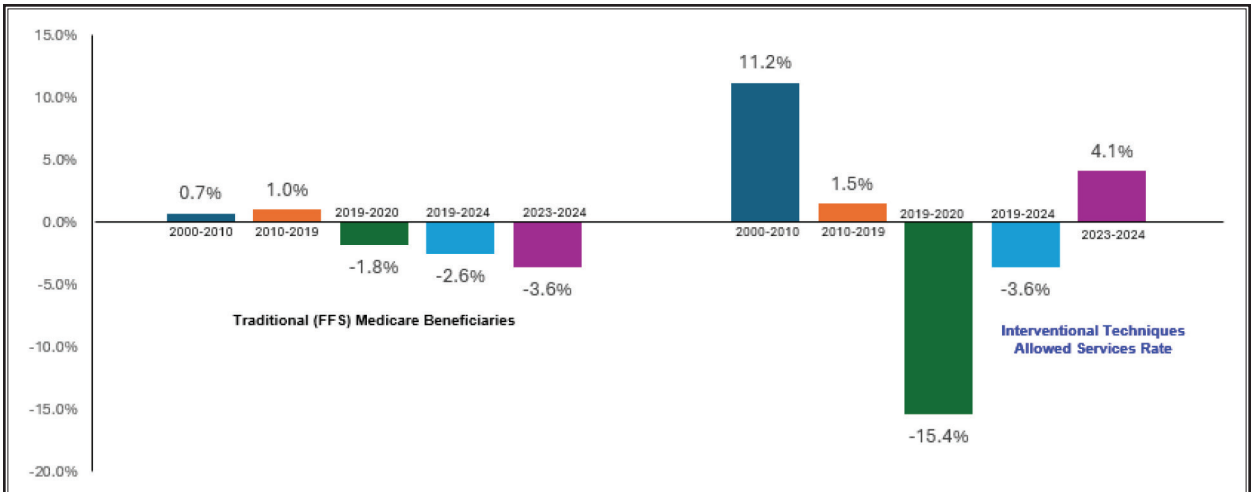

Fig. 1. *Comparative trends in interventional techniques (epidural and adhesiolysis procedures, facet joint interventions and sacroiliac joint blocks, disc procedures and other types of nerve blocks) utilization rates (per 100,000 traditional (FFS) Medicare Beneficiaries), using geometric average annual change in rates.*

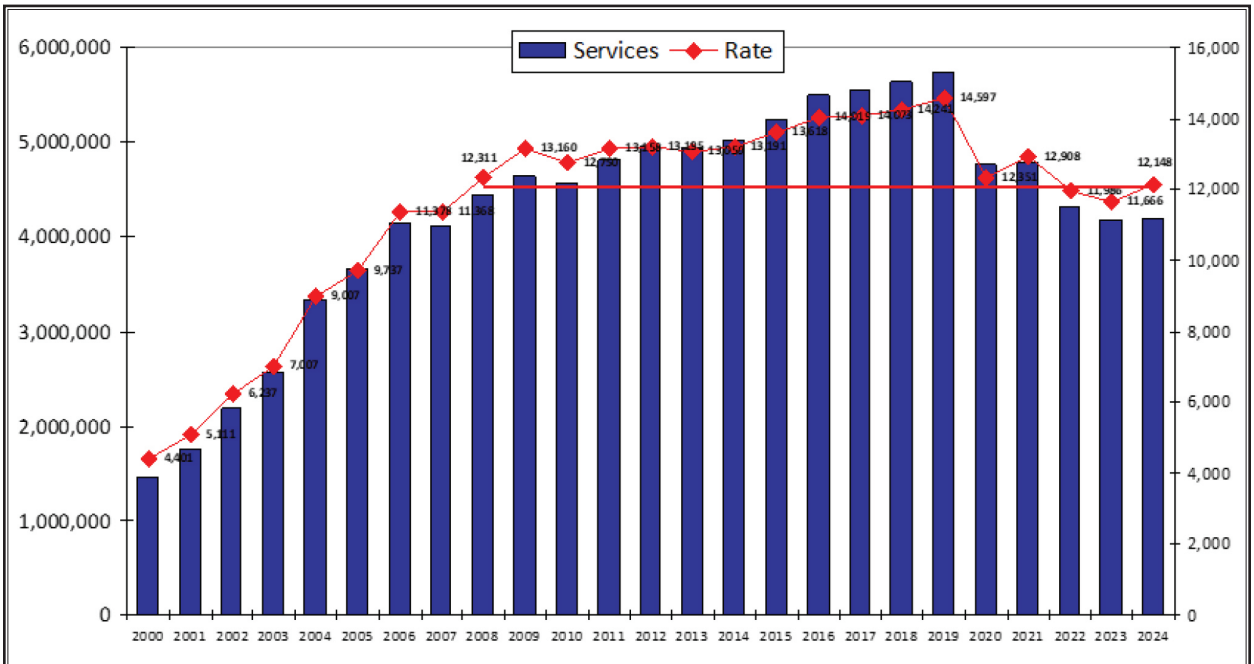

Fig. 2. *Growth of interventional pain management techniques, services, and rates from 2000 to 2024, in traditional (FFS) Medicare recipients.*

older and younger than 65 Medicare beneficiaries were affected. Specifically, those aged 65 and older grew at an annual rate of 3.4% from 2010 to 2019, decreasing to 2.5% from 2019 to 2024.

This study showed that rates of interventional pain management services per 100,000 Medicare beneficiaries declined markedly from 2019 to 2024 by 16.8%, with an average annual decline of 3.6%. This differs substantially from the 2010-2019 period, which showed a slight yearly decrease of 0.4%. The most pronounced shift occurred from 2019 to 2020, with a decline of 15.4% coinciding with the COVID-19 pandemic. A rebound of 4.5% occurred from 2020 to 2021, followed by a sharper deceleration with a 7.1% decline from 2021 to 2022.

Table 2. *Frequency of utilization interventional techniques by type procedure in the traditional (FFS) Medicare population from 2000 to 2024.*

	Epidural and Adhesiolysis procedures			Facet joint interventions and Sacroiliac joint blocks			Disc Procedures and other types of nerve blocks			Utilization of all interventional techniques*		
Year	**Services**	**PCPY**	**Rate**	**Services**	**PCPY**	**Rate**	**Services**	***Change***	***Rate***	**Services**	***Change***	***Rate***
2000	860,787	*7.2%*	*2,578*	424,796	*39.5%*	*1,272*	183,912	*14.3%*	*551*	1,469,495		*4,401*
2001	1,013,552	*17.7%*	*2,943*	543,509	*27.9%*	*1,578*	203,395	*10.6%*	*590*	1,760,456	*19.8%*	*5,111*
2002	1,199,324	*18.3%*	*3,426*	708,186	*30.3%*	*2,023*	275,542	*35.5%*	*787*	2,183,052	*24.0%*	*6,237*
2003	1,370,862	*14.3%*	*3,753*	884,035	*24.8%*	*2,420*	304,426	*10.5%*	*833*	2,559,323	*17.2%*	*7,007*
2004	1,637,494	*19.4%*	*4,422*	1,354,242	*53.2%*	*3,657*	343,311	*12.8%*	*927*	3,335,047	*30.3%*	*9,007*
2005	1,776,153	*8.5%*	*4,724*	1,501,222	*10.9%*	*3,993*	383,324	*11.7%*	*1020*	3,660,699	*9.8%*	*9,737*
2006	1,870,440	*5.3%*	*5,133*	1,896,688	*26.3%*	*5,205*	378,996	*-1.1%*	*1040*	4,146,124	*13.3%*	*11,378*
2007	1,940,454	*3.7%*	*5,366*	1,820,695	*-4.0%*	*5,035*	349,978	*-7.7%*	*968*	4,111,127	*-0.8%*	*11,368*
2008	2,041,155	*5.2%*	*5,668*	1,974,999	*8.5%*	*5,484*	417,257	*19.2%*	*1159*	4,433,411	*7.8%*	*12,311*
2009	2,136,035	*4.6%*	*6,051*	2,111,700	*6.9%*	*5,982*	397,944	*-4.6%*	*1127*	4,645,679	*4.8%*	*13,160*
2010	2,226,486	*4.2%*	*6,199*	1,937,582	*-8.2%*	*5,395*	414,909	*4.3%*	*1155*	4,578,977	*-1.4%*	*12,750*
2011	2,309,906	*3.7%*	*6,311*	2,064,227	*6.5%*	*5,640*	441,540	*6.4%*	*1206*	4,815,673	*5.2%*	*13,158*
2012	2,324,563	*0.6%*	*6,199*	2,159,057	*4.6%*	*5,757*	464,354	*5.2%*	*1238*	4,947,974	*2.7%*	*13,195*
2013	2,278,790	*-2.0%*	*6,029*	2,197,766	*1.8%*	*5,814*	456,394	*-1.7%*	*1207*	4,932,950	*-0.3%*	*13,050*
2014	2,273,104	*-0.2%*	*5,966*	2,370,000	*7.8%*	*6,220*	382,800	*-16.1%*	*1005*	5,025,904	*1.9%*	*13,191*
2015	2,291,001	*0.8%*	*5,951*	2,568,428	*8.4%*	*6,671*	383,607	*0.2%*	*996*	5,243,036	*4.3%*	*13,618*
2016	2,329,062	*1.7%*	*5,926*	2,759,559	*7.4%*	*7,022*	420,685	*9.7%*	*1070*	5,509,306	*5.1%*	*14,019*
2017	2,258,726	*-3.0%*	*5,718*	2,862,876	*3.7%*	*7,248*	437,291	*3.9%*	*1107*	5,558,893	*0.9%*	*14,073*
2018	2,196,060	*-2.8%*	*5,546*	2,970,100	*3.7%*	*7,500*	473,448	*8.3%*	*1196*	5,639,608	*1.5%*	*14,241*
2019	2192562	*-0.2%*	*5,579*	3,040,164	*2.4%*	*7,736*	503762	*6.4%*	*1282*	5,736,488	*1.7%*	*14,597*
2020	1816786	*-17.1%*	*4,707*	2,566,014	*-15.6%*	*6,648*	384,569	*-23.7%*	*996*	4,767,369	*-16.9%*	*12,351*
2021	1,935,150	*6.5%*	*5,230*	2,427,429	*-5.4%*	*6,561*	413,461	*7.5%*	*1117*	4,776,040	*0.2%*	*12,908*
2022	1,744,281	*-9.9%*	*4,845*	2,147,265	*-11.5%*	*5,965*	423,379	*2.4%*	*1176*	4,314,925	*-9.7%*	*11,986*
2023	1,688,596	*-3.2%*	*4,717*	2,047,682	*-4.6%*	*5,720*	440,157	*4.0%*	*1229*	4,176,435	*-3.2%*	*11,666*
2024	1,672,858	*-0.9%*	*4,849*	2,052,138	*0.2%*	*5,948*	465,924	*5.9%*	*1351*	4,190,920	*0.3%*	*12,148*
Change from												
2000-2024	94.3%		88.1%	383.1%		367.6%	153.3%		145.2%	185.2%		176.0%
GM	2.8%		2.7%	6.8%		6.6%	3.9%		3.8%	4.5%		4.3%
2000-2010	158.7%		140.5%	356.1%		324.1%	125.6%		109.8%	211.6%		189.7%
GM	10.0%		9.2%	16.4%		15.5%	8.5%		7.7%	12.0%		11.2%
2010-2019	-1.5%		-10.0%	56.9%		43.4%	21.4%		11.0%	25.3%		14.5%
GM	-0.2%		-1.2%	5.1%		4.1%	2.2%		1.2%	2.5%		1.5%
2019-2020	-17.1%		-15.6%	-15.6%		-14.1%	-23.7%		-22.3%	-16.9%		-15.39%
2019-2024	-23.7%		-13.1%	-32.5%		-23.1%	-7.5%		5.4%	-26.9%		-16.8%
GM	-5.3%		-2.8%	-7.6%		-5.1%	-1.5%		1.0%	-6.1%		-3.6%
2020-2021	6.5%		11.1%	-5.4%		-1.3%	7.5%		12.2%	0.2%		4.5%
2021-2022	-9.9%		-7.4%	-11.5%		-9.1%	2.4%		5.2%	-9.7%		-7.1%
2022-2023	-3.2%		-2.7%	-4.6%		-4.1%	4.0%		4.5%	-3.2%		-2.7%
2023-2024	-0.9%		2.8%	0.2%		4.0%	5.9%		9.8%	0.3%		4.1%

PCPY – percentage of change from previous year; GM = geometric average annual change

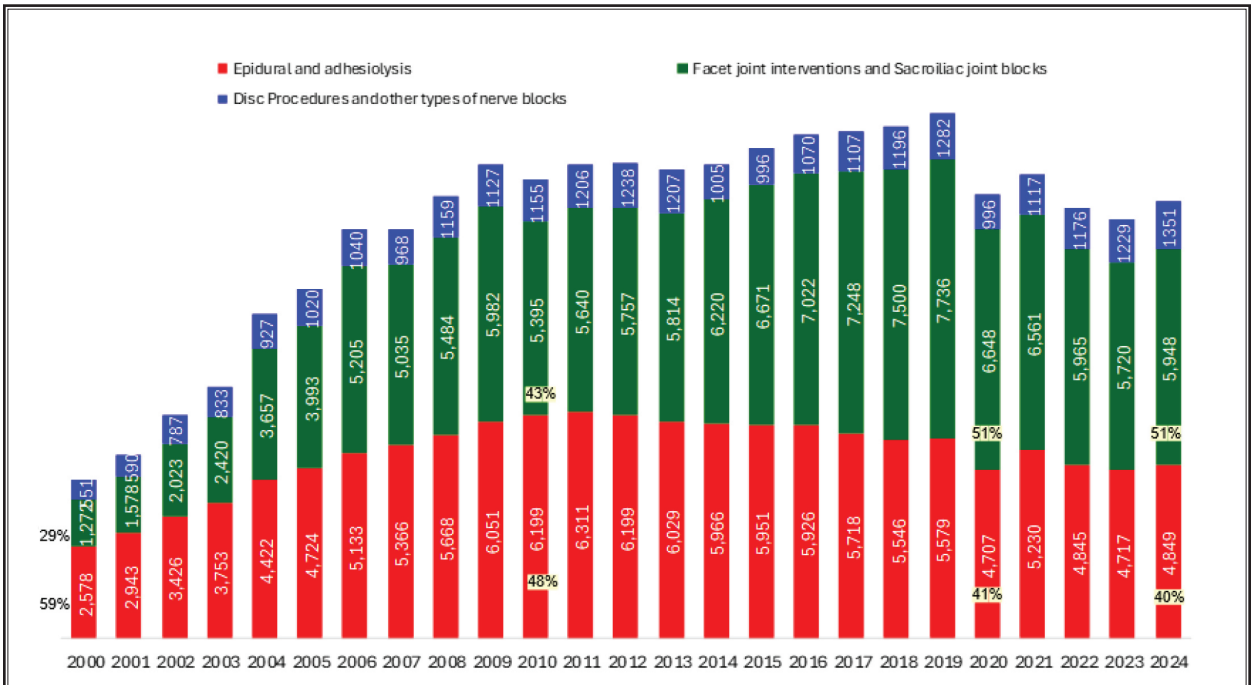

Fig. 3. *Trends in procedural rates by procedure type from 2000 to 2024, illustrating the distribution and changes in frequency of each procedure type over time in traditional (FFS) Medicare population.*

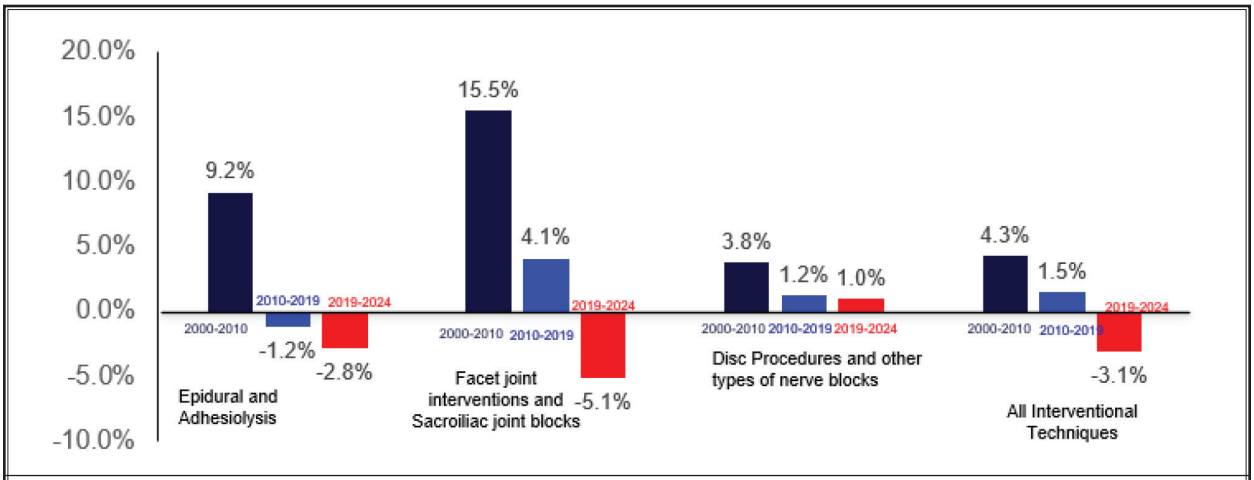

Fig. 4. *Comparison of annual growth rates for allowed interventional techniques by procedure type, 2000-2024 in traditional (FFS) Medicare population.*

Epidural and adhesiolysis utilization patterns demonstrated a 15.6% decline from 2019 to 2020, followed by an 11.1% increase from 2020 to 2021 and a subsequent 7.4% decline from 2021 to 2022. This was followed by a modest 2.7% decrease from 2022 to 2023 and a 4.1% increase from 2023 to 2024 (Table 1 and Fig. 1). From 2000 to 2010, the number of these procedures increased by 140.5%, with an annual growth rate of 9.2%. Between 2010 and 2019, a cumulative 10% decrease occurred, with a yearly reduction of 1.2% per year. From 2002 to 2023, data showed a 2.7% decline, followed by a 2.8% increase from 2023 to 2024. Overall, from 2019 to 2024, there was a cumulative decline of 13.1% per 100,000 tradi-

Table 3. *Patterns of interventional pain management utilization by specialty groups from 2000 to 2024, in traditional (FFS) Medicare recipients.*

	Interventional Pain Management #		Surgical (neuro, general, & orthopedic)		Radiology (interventional & diagnostic)		Other Physicians		Other Providers (CRNA, NP & PA)		Total	
Year	Allowed Services	Rate	Allowed Services	Rate	Allowed Services	Rate	Allowed Services	Rate	Allowed Services	Rate	Allowed Services	Rate
2000	1,176,541 (80.1%)	3,523	92,126 (6.3%)	276	40,491 (2.8%)	121	145,100 (9.9%)	435	15,237 (1.0%)	46	1,469,495	4401
2010	3,917,426 (85.6%)	**10,908**	222,784 (4.9%)	620	121,127 (2.6%)	337	265,771 (5.8%)	740	51,869 (1.1%)	144	4,578,977	12750
2011	4,159,585	11,365	206,805	565	127,614	349	259,177	708	62,492	171	4,815,673	13158
2012	4,302,121	11,472	197,982	528	129,823	346	244,626	652	73,422	196	4,947,974	13195
2013	4,331,789	11,460	185,630	491	119,172	315	231,899	613	64,460	171	4,932,950	13050
2014	4,467,374	11,725	183,111	481	119,684	314	209,379	550	46,356	122	5,025,904	13191
2015	4,693,156	12,190	181,546	472	121,344	315	202,307	525	44,683	116	5,243,036	13618
2016	4,961,640	12,625	179,880	458	126,493	322	189,573	482	51,720	132	5,509,306	14019
2017	5,038,383	12,755	171,767	435	129,098	327	165,219	418	54,426	138	5,558,893	14073
2018	5,137,539	12,974	174,072	440	127,612	322	137,855	348	62,530	158	5,639,608	14241
2019	5,218,668	13,279	173,724	442	132,762	338	139,875	356	71,459	182	5,736,488	14597
2020	4,340,386 (91.0%)	11,245	146,494 (3.1%)	380	102,369 (2.1%)	265	112,492 (2.4%)	291	65,628 (1.4%)	170	4,767,369	12351
2021	4,334,792	11,716	146,740	397	103,158	279	112,867	305	78,483	212	4,776,040	12908
2022	3,909,059	10,858	126,204	351	88,182	245	106,278	295	85,202	237	4,314,925	11986
2023	3,777,673	10,552	120,625	337	79,604	222	104,484	292	94,049	263	4,176,435	11666
2024	3,781,659 (90.2%)	**10,961**	119,163 (2.8%)	345	71,574 (1.7%)	207	109,888 (2.6%)	319	108,636 (2.6%)	315	4,190,920	12148

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

tional (FFS) Medicare beneficiaries, corresponding to an annual decline of 3.3%.

Facet joint interventions and sacroiliac joint blocks followed similar patterns, with a cumulative decline of 23.1% from 2019 to 2024, equivalent to an annual decrease of 5.1% per 100,000 beneficiaries. Data indicated a continued decline from 2020 to 2021, in contrast to the rebound observed in epidural utilization, with a 1.3% decrease followed by a 9.1% decline from 2021 to 2022, and a 4.1% decline from 2022 to 2023. There was then an increase of 4% between 2023 and 2024. From 2000 to 2010, these procedures showed a 324% increase with a 15.5% annual growth rate, which was considered unsustainable. From 2010 to 2019, the increases were more moderate, with a cumulative growth of 43.4% and an average yearly increase of 4.1%.

Disc procedures and other nerve blocks, many of which are currently under review in local coverage determination (LCD) proceedings with potential restrictions, experienced significant declines from 2019 to 2020 due to the pandemic. This was followed by an overall increase of 5.4% from 2019 to 2024, with an annual increase of 1%. This contrasts with epidural and adhesiolysis procedures, which decreased by 13.1%, and with facet joint interventions, which declined by 23.1%. From 2020 to 2021, disc and nerve block procedures increased by 12.2%. This was followed by a 5.2% increase from 2021 to 2022, a 4.5% increase from 2022 to 2023, and a 9.8% increase from 2023 to 2024. Although pandemic-related effects were significant, these procedures recovered more rapidly and did not return to negative growth. From 2000 to 2010, growth was 109.8%, with a 7.7% annual increase, which remains high. From 2010 to 2019, growth slowed substantially to 11%, with a yearly increase of 1.2%, consistent with the trends in the Medicare population.

Assessment of utilization by specialty revealed that most procedures were performed by interventional pain management specialists, including those in interventional pain management, pain management, anesthesiology, and physical medicine and rehabilita-

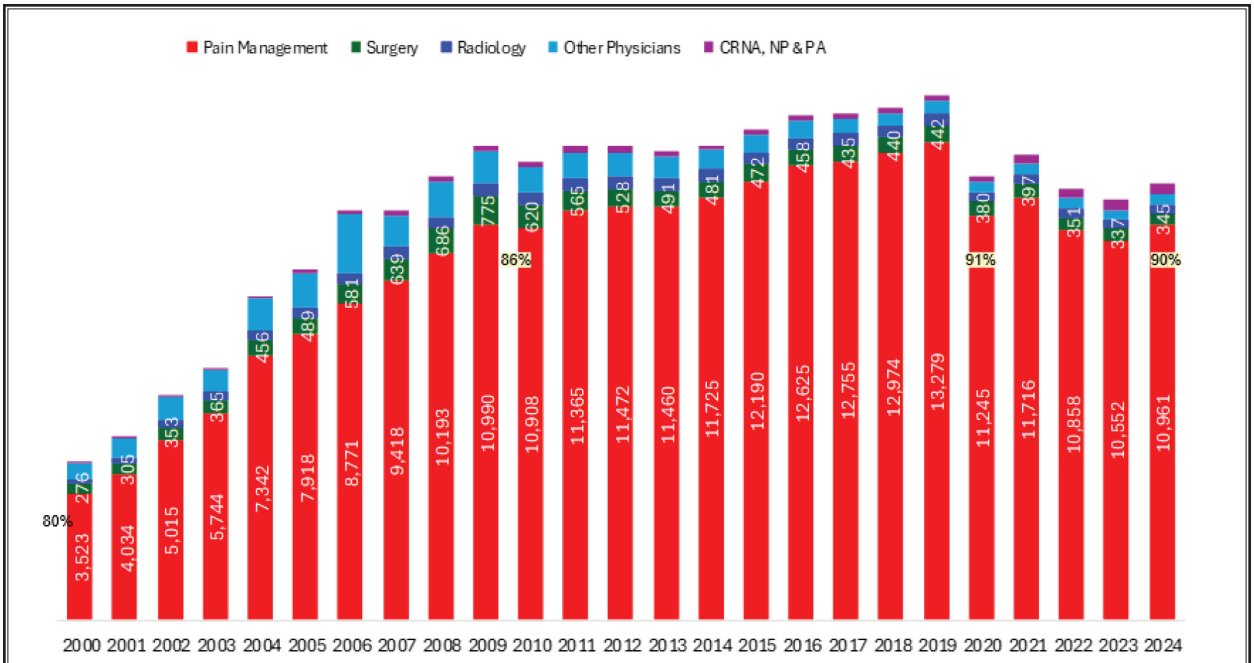

Fig. 5. *Trends in procedural rates by procedure type from 2000 to 2024, illustrating the distribution and changes in frequency of each specialty group over time in traditional (FFS) Medicare population.*

Table 4. *Distribution of interventional pain management techniques by place of service, 2000-2024, in traditional (FFS) Medicare.*

	ASC			HOPD			Office			Total	
	Allowed Services	Rate	%	Allowed Services	Rate	%	Allowed Services	Rate	%	Total	Rate
2000	1,104,440	3,307	23.8%	1,264,368	3,786	27.2%	2,276,871	6,819	49.0%	4,645,679	13,913
2010	1,103,920	3,074	24.1%	1,253,414	3,490	27.4%	2,221,643	6,186	48.5%	4,578,977	12,750
2011	1,195,161	3,265	24.8%	1,324,839	3,620	27.5%	2,295,673	6,272	47.7%	4,815,673	13,158
2012	1,257,591	3,354	25.4%	1,347,381	3,593	27.2%	2,343,002	6,248	47.4%	4,947,974	13,195
2013	1,253,743	3,317	25.4%	1,341,169	3,548	27.2%	2,338,038	6,185	47.4%	4,932,950	13,050
2014	1,286,389	3,376	25.6%	1,346,612	3,534	26.8%	2,392,903	6,281	47.6%	5,025,904	13,191
2015	1,385,653	3,599	26.4%	1,387,225	3,603	26.5%	2,470,158	6,416	47.1%	5,243,036	13,618
2016	1,498,268	3,812	27.2%	1,474,938	3,753	26.8%	2,536,100	6,453	46.0%	5,509,306	14,019
2007	1,525,223	3,861	27.4%	1,472,651	3,728	26.5%	2,561,019	6,484	46.1%	5,558,893	14,073
2018	1,561,475	3,943	27.7%	1,501,086	3,791	26.6%	2,577,047	6,508	45.7%	5,639,608	14,241
2019	1,581,451	4,024	27.6%	1,532,442	3,899	26.7%	2,622,595	6,673	45.7%	5,736,488	14,597
2020	1,261,839	3,269	26.5%	1,238,828	3,209	26.0%	2,266,702	5,872	47.5%	4,767,369	12,351
2021	1,265,808	3,421	26.5%	1,276,066	3,449	26.7%	2,234,166	6,038	46.8%	4,776,040	12,908
2022	1,129,177	3,137	26.2%	1,154,417	3,207	26.8%	2,031,331	5,643	47.1%	4,314,925	11,986
2023	1,126,161	3,146	27.0%	1,052,194	2,939	25.2%	1,998,080	5,581	47.8%	4,176,435	11,666
2024	1,121,569	3,251	26.8%	1,036,312	3,004	24.7%	2,033,039	5,893	48.5%	4,190,920	12,148

Rate - IPM services per 100,000 Medicare beneficiaries ( ) percentage of row total - GM - Geometric average annual change
ASC = ambulatory surgery center; HOPD = hospital outpatient department

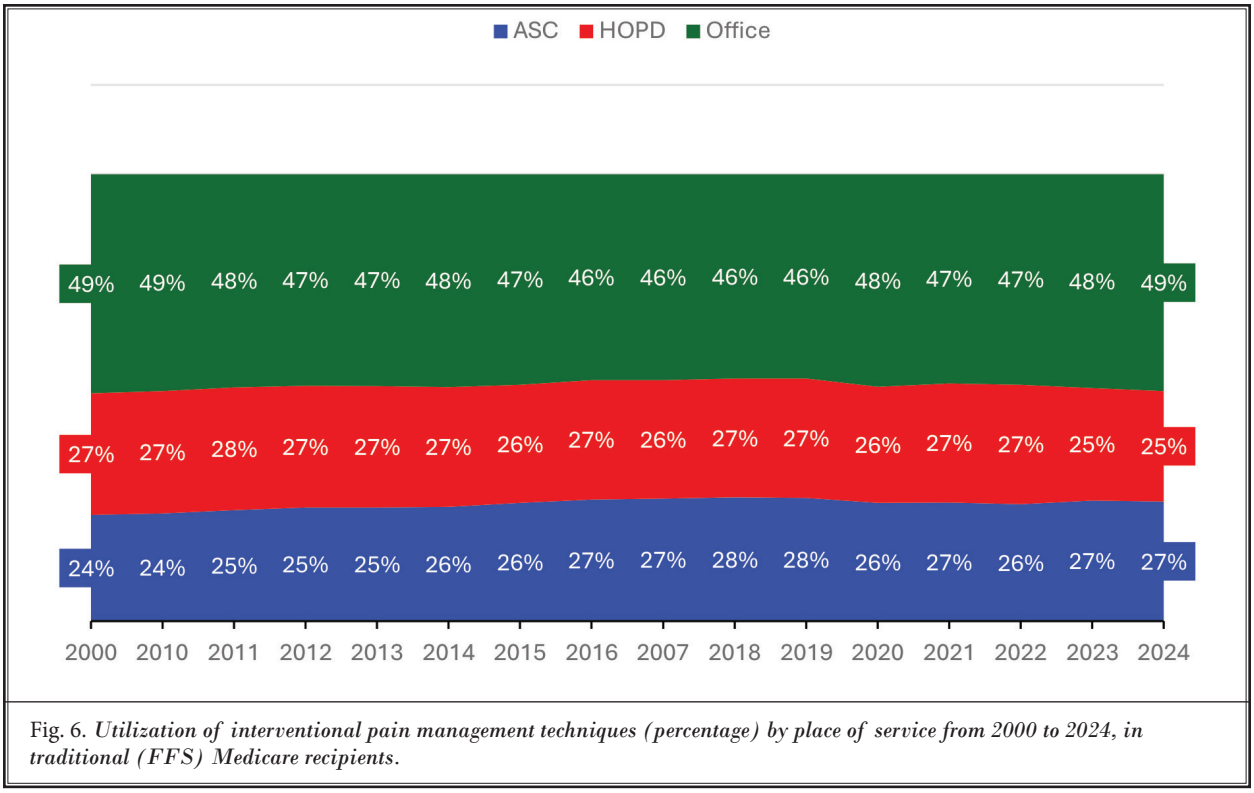

Fig. 6. *Utilization of interventional pain management techniques (percentage) by place of service from 2000 to 2024, in traditional (FFS) Medicare recipients.*

tion, accounting for over 90% of procedures. In 2020, interventional pain management specialists performed 91% of all procedures. Surgical specialties, including neurosurgery, general surgery, and orthopedic surgery, accounted for 2.8% of procedures in 2024, compared to 3.1% in 2020. Radiologists performed 1.7% of procedures in 2024, compared to 2.1% in 2020. Other physicians accounted for 2.6% of procedures in 2024 compared to 2.4% in 2020. Other providers, including certified registered nurse practitioners, nurse practitioners, and physician assistants, performed 2.6% of procedures in 2024, increasing from 1.4% in 2020.

The site of service assessment revealed that 23.8% of procedures were performed in ASCs in 2000, increasing to 25.6% in 2014, 26.5% in 2020, and 26.8% in 2024. HOPD procedures accounted for 27.2% in 2000, 26.8% in 2014, and 24.7% in 2024. Office-based procedures constituted 49% in 2000, 47.6% in 2014, and 48.5% in 2024 (Table 4 and Fig. 6).

As described in the introduction, multiple factors appear to drive the observed declines, including the prolonged economic impact of the COVID-19 pandemic, broader economic challenges, and implementation of the ACA and related policies that became effective during and after 2021 (1-50).

Changes in utilization of facet joint interventions may be influenced by a shift from facet joint nerve blocks to radiofrequency neurotomy as required by LCDs (17-29). There has also been a reduction in the allowable frequency of epidural injections, decreasing from five per year to a standard limit of four, with limited exceptions (17-29).

Like other retrospective analyses, this study has some limitations. It does not differentiate individual procedure types within each category and excludes Medicare Advantage enrollees, who constitute approximately 54% of the Medicare population. However, this study separates the FFS Medicare population from Medicare Advantage and calculates rates per 100,000 beneficiaries, providing the first such clear assessment. In addition, the analysis does not distinguish among different approaches within specific categories, such as facet joint nerve blocks versus radiofrequency neurotomy or interlaminar versus transforaminal epidural injections.

Conclusion

This analysis demonstrates a significant 16.8% decline in the use of interventional pain management techniques per 100,000 Medicare beneficiaries, with an annual decrease of 3.6% between 2019 and 2024.

Several factors likely contributed to this continued reduction, including the lasting effects of COVID-19, economic pressures, the ACA, and evolving LCD policies.

Author Contributions

The study was designed by LM, MRS, and VP.
Statistical analysis was performed by VP.
All authors contributed to the preparation of this study, reviewed, and approved the content with the final version.

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