Health Policy Research

Exponential Decline of 28.9% in Utilization of Interventional Pain Management Techniques Among Medicare Beneficiaries From 2019 to 2022: Updated Analysis on the Ongoing Effects of COVID-19, Economic Decline, the Affordable Care Act (ACA), and Medical Policies

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Background: Numerous studies have highlighted the escalating costs associated with managing low back and neck pain, as well as other musculoskeletal disorders. In the past, there was a notable increase in the use of interventional techniques to address these disorders. However, the COVID-19 pandemic disrupted various chronic pain treatment approaches, including interventional procedures and opioid use, following a broader trend of reduced healthcare services. Consequently, there was an 18.7% decline in the use of interventional techniques per 100,000 Medicare beneficiaries between 2019 and 2020, a stark contrast to the previous growth patterns, despite some initial declines observed starting in 2017.

Objectives: This analysis aims to provide an updated evaluation of the utilization of interventional techniques for chronic pain management in the U.S. Medicare population.

Study Design: A retrospective cohort study examining utilization patterns and factors affecting interventional techniques for chronic pain management in the FFS Medicare population in the United States from 2000 to 2022.

Methods: Data for this analysis was obtained from the Centers for Medicare & Medicaid Services (CMS) master database, specifically the physician/supplier procedure summary, spanning the years 2000 to 2022.

Results: This retrospective cohort study found that the rate of interventional pain management services per 100,000 Medicare beneficiaries showed a cumulative decline between 2019 and 2022 of 28.9%, with an annual decrease of 10.7%. This contrasts sharply with the 2010-2019 period, which saw a small annual decline of 0.4%. Particularly significant was the sharp reduction of 18.7% from 2019 to 2020, coinciding with the pandemic. From 2020 to 2021, the decline slowed to 1.1%, before accelerating again with an 11.5% drop between 2021 and 2022.

Limitations: Data were available only through 2022 and were limited to the FFS Medicare population; utilization patterns for Medicare Advantage Plans, which accounted for nearly 50% of Medicare enrollment in 2022, were not included. Additionally, this analysis shares the inherent limitations of all retrospective reviews based on claims data.

Conclusion: This retrospective analysis demonstrates a significant reduction in the use of interventional pain management techniques from 2019 to 2022. Contributing factors to this decline likely include the lasting effects of COVID-19, economic challenges, the Affordable Care Act (ACA), and evolving local coverage determination 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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Since the introduction of the Affordable Care Act, health care utilization has decreased (1-10). Patients have been plagued by high deductibles, coinsurances, and rising copays. Pain practices have faced rising costs: hiring staff to explain insurance plans to patients, managing patient complaints about their rising costs, and fending off increased scrutiny from audits and a greater number of audits (11-30). The COVID-19 pandemic accelerated the decrease in utilization (31-44). There were major disruptions as patients and employees quarantined themselves. Fluctuating requirements about screening, formal testing, mandatory vaccination, and treatment led to further disruptions, obstacles to access, and uncertainty about how to proceed. The lockdowns and intermittent bans on elective procedures further exacerbated this situation. Now with unemployment, inflation, changes in the workforce, and disruptions in the supply chain, the economic challenges have worsened (11-22). Moreover, patients present in worse health because many have foregone screening and necessary medical care over the past few years, either preferring to stay "safe" at home, or because of decreased access to primary and secondary preventive medical care for the reasons listed above.

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%, and resulting in an increase in the share of the nation's economy devoted to healthcare spending, reaching 7.6% (45,46). Experts forecast continued growth in national health expenditures, averaging 5.6%, which is expected to surpass the nominal GDP growth rate of 4.3%. This rapid increase in healthcare costs, driven by an aging population and rising healthcare demand that outpace 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%, reaching $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 have 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, which includes physician services, comprises 20% of the spend in Medicare FFS patients. In 2022, spending on these services increased by 2.7%, totaling $884.9 billion, a deceleration from the 5.3% increase in 2021 (47). This slowdown affected Medicare, Medicaid, private health insurance, and out-of-pocket costs largely due to reduced service utilization and moderated physician price increases.

The COVID-19 pandemic had a lasting impact on interventional pain management practices (31-34). Multiple analyses show an 18.7% reduction in the use of interventional techniques for managing chronic pain in the Medicare population in 2020 (35). Further assessments of evaluations of specific service types revealed similar declines (4,36-38), with numerous negative consequences reported (5-10,39-44,48,49). Even prior to the pandemic, growth patterns for interventional techniques were changing and at times declining in the Medicare population following the implementation of the Affordable Care Act (ACA) (4-10,48).

Consistent with rising national healthcare expenditures, U.S. spending on personal and public healthcare from 1996 to 2016 reached a peak of $134.5 billion for back and neck pain in 2016, representing a 53.5% increase from 2013, when spending was $87.6 billion (50).

The ACA, also known as Obamacare, represents one of the most significant changes in the U.S. healthcare policy since the introduction of Medicaid and Medicare in 1965 (1-3). The ACA was designed with three primary goals: to increase insurance coverage, improve care quality, and control healthcare costs (1-3). Despite real successes, the ACA has faced criticism, particularly regarding its failure to fully distinguish between affordability and access (1). While health insurance provides a financial mechanism for covering healthcare costs, access refers to the actual ability to receive care. Some critics argue that the ACA widened the gap between the ability to pay for healthcare and access to necessary services. Increasing regulations and oversight have also affected healthcare delivery, leading to reduced utilization and access to medically necessary treatments, including interventional pain techniques (11-21,24-30).

Another major issue impacting healthcare is the economic slowdown, initially triggered by the COVID-19 pandemic and exacerbated by inflation, supply chain issues, rising energy costs, global conflicts, and external economic pressures. Inflation rose by 19% between 2021 and 2024, while physician payments have declined by 21% since 2001 ostensibly to balance the budget amid growing service demands and managed

care expansion (14,16,17). Since 2000, medical inflation has outpaced general inflation, with healthcare costs increasing by 121.3%, compared to an 86.1% rise in consumer goods and services. In June 2024, medical costs rose by 3.3%, slightly higher than the 3% increase for overall consumer prices (17).

Independent medical practices are struggling to survive, with over 108,700 physicians leaving private practice for other employment opportunities between 2019 and 2021 (18,19). By 2023, 77% of physicians were employed by hospital health systems or corporate entities, and 58.5% of practices were owned by these organizations (14,15,18). The cost of medical and surgical supplies for full-time physicians increased by 82% between 2022 and 2023 (19), and nearly 80% of physicians cited better leverage in payer negotiations as a key reason for selling their practices to hospital systems (20). Fraud investigations and regulatory scrutiny have also disproportionately impacted physicians (11-13), contributing to rising burnout, bankruptcies, and exits from private practice.

The COVID-19 pandemic exacerbated these challenges. Studies show significant declines in the utilization of interventional techniques, with a 19% drop in epidural procedures (36), an 18.5% decrease in facet joint interventions (37), and a 19.2% reduction in sacroiliac joint injections (38) from 2019 to 2020.

Despite these trends, there is extensive literature supporting the clinical and cost-effectiveness of various interventional techniques through randomized controlled trials, systematic reviews, cost-utility analyses, and real-world evidence (39-42,49,22,23,51-91). However, 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 (22,23,54,55,58,59).

This retrospective cohort study updates previous publications on the utilization patterns of interventional techniques in the U.S. fee-for-service (FFS) Medicare population from 2000 to 2022.

Methods

This investigation adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure clarity and reliability in reporting the results (92). The study utilized publicly available, non-identifiable data from the Centers for Medicare & Medicaid Services (CMS) database, which includes non-attributable and non-confidential information (93).

Study Design

The study was designed to evaluate utilization patterns and variables associated with interventional techniques used in the management of chronic pain from 2000 to 2022. The majority of interventional techniques were included, with the exception of 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 2022 in the FFS Medicare population.

Setting

The analysis utilized the CMS national database of specialty usage data files, focusing on the FFS Medicare population in the United States (93).

Participants

Participants included all individuals in the FFS Medicare population from 2000 to 2022, 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 2022, analyzing trends across multiple time periods, including 2010 to 2019 and 2010 to 2020. 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, but 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).

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

Data Sources

The data for this study were extracted from the CMS Physician/Supplier Procedure Summary Master Data from 2000 to 2022 (93), which included FFS Medicare participants below and above 65 years of age who received interventional techniques, regardless of 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 denied and zero-payment services). Allowed service rates were calculated per 100,000 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 Medicare FFS patients who received interventional procedures for chronic spinal pain in all settings and regions of the United States from 2000 to 2022.

Data Compilation

Data were compiled using Microsoft Access 2020 and Microsoft Excel 2020 (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, this study provides an in-depth analysis of interventional pain management trends within the U.S. Medicare FFS population over a 22-year period.

Results

Participants

The participants in this study consisted of all FFS Medicare beneficiaries from 2000 to 2022.

Descriptive Data of Population Characteristics

As illustrated in Appendix Table 1, population growth patterns remained relatively stable until 2019, after which significant fluctuations were observed, primarily due to the impact of the COVID-19 pandemic and other contributing factors. Between 2000 and 2010, the U.S. population grew at an annual rate of 0.9%, while the Medicare population expanded at a rate of 1.7%. This trend continued with some variation between 2010 and 2019, during which time the U.S. population growth slowed to 0.7% annually, while the Medicare population growth accelerated to 3% per year—substantially higher than the 1.7% annual growth rate recorded in the previous decade.

From 2019 to 2020, the total U.S. population grew by 0.8%, but Medicare enrollment saw a decline in growth rate from 3% (2010–2019) to 2.3%. Subsequently, between 2019 and 2022, annual population growth further decelerated to 0.5%, with Medicare participation growing at a slower pace of 1.9%.

As presented in Table 1 and Fig. 1, the rate of interventional pain management services per 100,000 Medicare beneficiaries experienced a notable decline between 2019 and 2022 of 28.9%, with an average annual decrease of 10.7%. This contrasts sharply with the earlier period from 2010 to 2019, which saw a more moderate annual decline of 2.5%. Particularly significant was the sharp reduction of 18.7% from 2019 to 2020, coinciding with the pandemic. From 2020 to

Table 1. *Percentage change and geometric average of utilization across various categories of interventional procedures in the fee-for-service Medicare population from 2000 to 2022.*

	U.S. Population		Fee-for-service Medicare Beneficiaries			Change of Utilization of all Interventional Techniques#	
Year	**Total Population**	**≥ 65 Years**	**Number of individuals participating in Medicare**	**≥ 65 years**	**< 65 years**	**Allowed Services**	**Rate per 100,000 Medicare Beneficiaries**
2000-2010							
Change	9.4%	14.8%	18.4%	13.8%	47.5%	211.6%	163.2%
GM	0.9%	1.4%	1.7%	1.3%	4.0%	12.0%	10.2%
2000-2022							
Change	18.1%	63.8%	63.3%	65.5%	47.1%	193.6%	79.9%
GM	0.8%	2.3%	2.3%	2.3%	1.8%	5.0%	2.7%
2010-2019							
Change	6.3%	34.3%	30.5%	34.9%	9.8%	25.3%	-4.0%
GM	0.7%	3.3%	3.0%	3.4%	1.0%	2.5%	-0.4%
2019-2022							
Change	1.5%	6.3%	5.7%	7.8%	-9.2%	-24.8%	-28.9%
GM	0.5%	2.0%	1.9%	2.5%	-3.2%	-9.0%	-10.7%
2019-2020	0.8%	3.4%	2.3%	2.9%	-2.3%	-16.4%	-18.7%
2020-2021	0.3%	-0.1%	1.3%	1.8%	-2.4%	0.2%	-1.1%
2021-2022	0.4%	2.8%	2.1%	2.9%	-4.8%	-9.7%	-11.5%

GM: Geometric average annual change
(excluding continuous epidurals, intraarticular injections, trigger point and ligament injections, peripheral nerve blocks, vertebral augmentation procedures, and implantables)

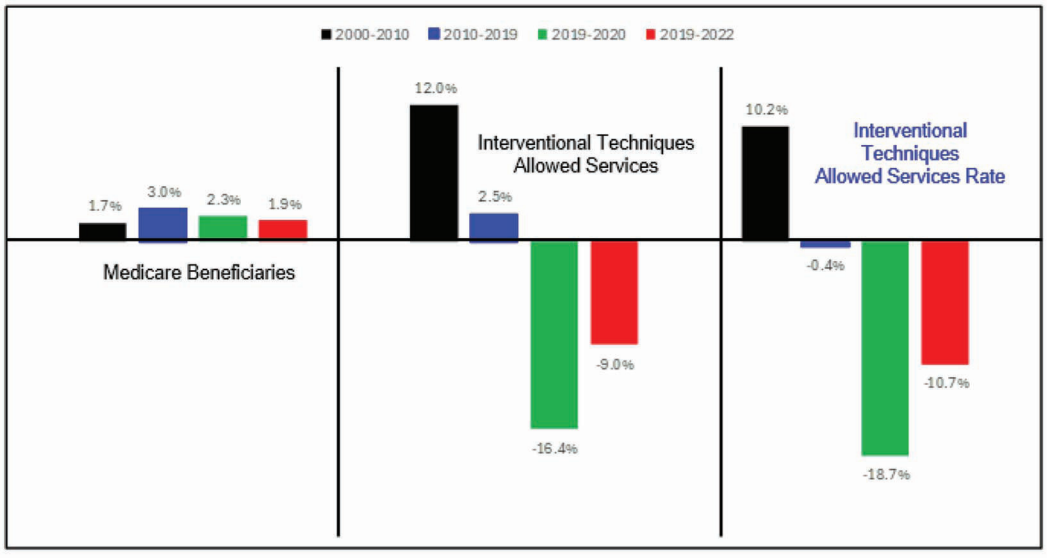

Fig. 1. *Comparative analysis of annual growth Medicare population, utilization of interventional pain management services rate (per 100,000 Medicare population) from 2000 to 2022 (geometric average annual change).*

2021, the decline slowed to 1.1%, before accelerating again with an 11.5% drop between 2021 and 2022.

In comparison, the period from 2000 to 2010 experienced robust annual growth in the utilization of interventional pain management services, with a 10.2% annual increase. However, beginning in 2010, growth rates began to flatten, with a minimal annual decrease of 0.4% in utilization observed between 2010 and 2019.

Figure 1 provides a visual comparison of the annual growth rate in the Medicare population alongside the utilization rates for interventional pain management services, expressed as the rate per 100,000 beneficiaries.

Utilization Characteristics

Table 2 and Figs. 2 and 3, along with Appendix Table 2, provide a detailed breakdown of the utilization frequencies of interventional techniques in the FFS Medicare population, categorized into three primary groups: epidural and adhesiolysis procedures, facet joint interventions and sacroiliac joint blocks, and disc procedures and other nerve blocks. These data highlight notable changes in utilization patterns after 2019.

From 2019 to 2020, the utilization of epidural and adhesiolysis procedures declined significantly by 19.0% per 100,000 Medicare beneficiaries. This sharp decrease was followed by a temporary rebound in 2020–2021, with a 5.2% increase in utilization. However, the trend reversed again, with a decline of 11.7% from 2021 to 2022. Overall, between 2019 and 2022, these procedures saw a cumulative decline of 24.7%.

In the case of facet joint interventions and sacroiliac joint blocks, the decrease in utilization from 2019 to 2020 was 17.5%. This decline continued through 2021, with an additional 6.6% reduction, followed by a further 13.3% drop from 2021 to 2022. The cumulative decline in these interventions from 2019 to 2022 amounted to 33.2%, indicating a substantial reduction in their use over this period.

For disc procedures and other types of nerve blocks, there was a more pronounced decrease of 25.4% from 2019 to 2020. However, unlike other categories, these procedures saw a slight recovery, with a 6.2% increase in utilization from 2020 to 2021 and

Table 2. *Frequency of utilization interventional techniques in the fee-for-service Medicare population from 2000 to 2022.*

	Epidural and adhesiolysis procedures		Facet joint interventions and Sacroiliac joint blocks		Disc Procedures and other types of nerve blocks		Utilization of all interventional techniques#	
	Allowed Services	Rate	Allowed Services	Rate	Allowed Services	Rate	Allowed Services	Rate
2000-2022								
Change	102.6%	24.1%	405.5%	209.6%	130.2%	41.0%	193.6%	79.9%
GM	3.5%	1.3%	8.5%	6.3%	3.4%	1.3%	5.5%	3.3%
2000-2010								
Change	158.7%	118.5%	356.1%	285.3%	125.6%	90.6%	211.6%	163.2%
GM	10.0%	8.1%	16.4%	14.4%	8.5%	6.7%	12.0%	10.2%
2010-2019								
Change	-1.5%	-24.5%	56.9%	20.3%	21.4%	-6.9%	25.3%	-4.0%
GM	-0.2%	-3.1%	5.1%	2.1%	2.2%	-0.8%	2.5%	-0.4%
2019-2022								
Change	-20.4%	-24.7%	-29.4%	-33.2%	-16.0%	-20.5%	-24.8%	-28.9%
GM	-7.3%	-9.0%	-10.9%	-12.6%	-5.6%	-7.4%	-9.1%	-10.7%
2019-2020	-17.1%	-19.0%	-15.6%	-17.5%	-23.7%	-25.4%	-16.9%	-18.7%
2020-2021	6.5%	5.2%	-5.4%	-6.6%	7.5%	6.2%	0.2%	-1.1%
2021-2022	-9.9%	-11.7%	-11.5%	-13.3%	2.4%	0.3%	-9.7%	-11.5%

GM: Geometric average annual change

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

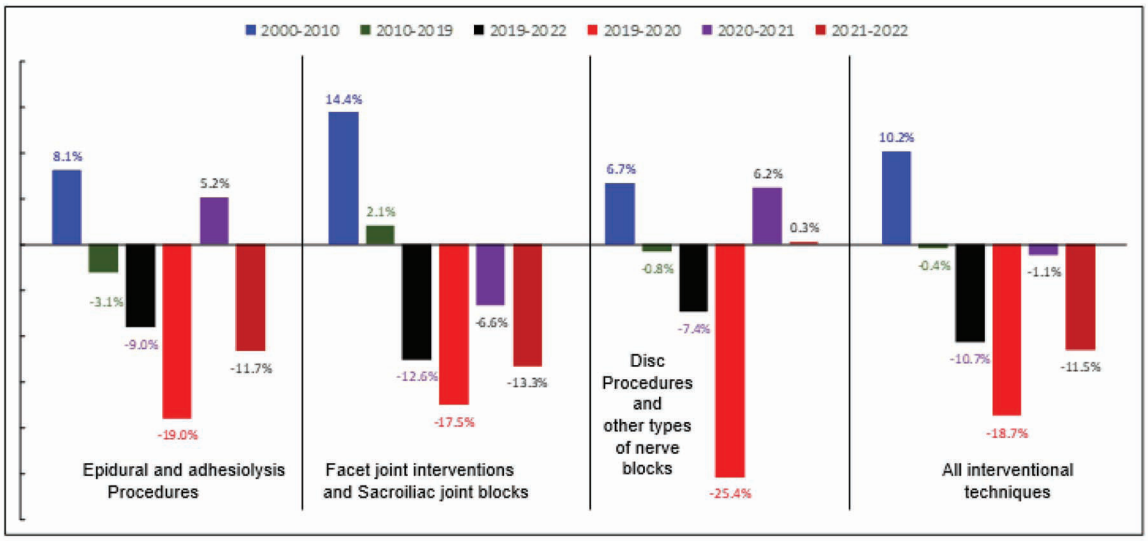

Fig. 2. *Comparative analysis of rate (per 100,000 Medicare recipients) of usage patterns for epidural and adhesiolysis procedures, facet joint interventions and sacroiliac joint blocks, disc procedures and other types of nerve blocks, all interventional techniques (geometric average annual change in rates).*

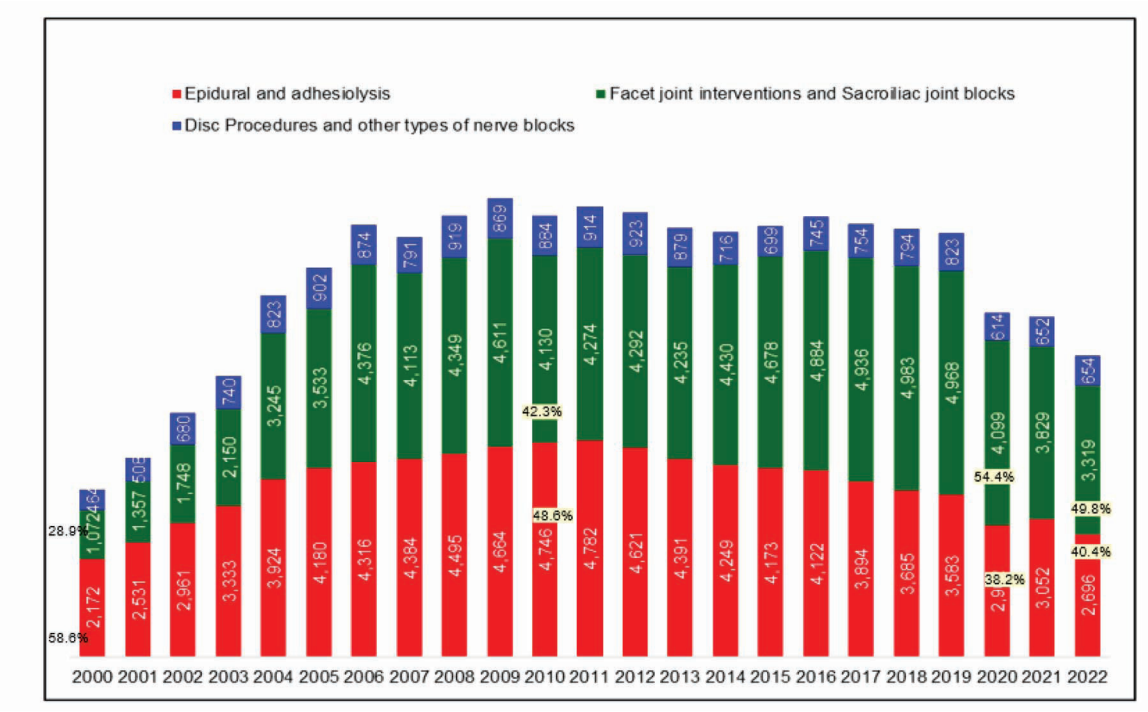

Fig. 3. *Distribution of procedural characteristics (rates) by type of procedures from 2000 to 2022.*

a marginal 0.3% rise from 2021 to 2022. Despite this modest recovery, the total decrease from 2019 to 2022 was 20.5%.

These results indicate that, while there was a temporary rebound in utilization of certain procedures in 2021, likely due to the easing of COVID-19 restrictions, the overall trend from 2021 to 2022 showed significant declines across all categories. This highlights the long-term impact of the pandemic and other factors on the utilization of interventional techniques in the Medicare population.

In contrast, the analysis revealed substantial increases in the utilization of interventional techniques from 2000 to 2010, with annual growth rates of 8.1% for epidural and adhesiolysis procedures, 14.4% for facet joint interventions and sacroiliac joint blocks, and 6.7% for disc procedures and other nerve blocks. Overall, this period saw an average increase of 10.2% in the utilization of these procedures.

However, from 2010 to 2019, the trend shifted, indicating a decline in utilization rates. Specifically, epidural and adhesiolysis procedures experienced an annual decrease of 3.1%, while facet joint interventions and sacroiliac joint blocks saw a modest increase of 2.1%. In contrast, disc procedures and other types of nerve blocks recorded an annual decline of 0.8%. Collectively, these changes resulted in an overall annual decrease of 0.4% in the utilization of interventional techniques during this period.

Figure 3 illustrates the distribution of procedural rates by type from 2000 to 2022, highlighting these evolving patterns. In 2000, epidural and adhesiolysis procedures accounted for 58.9% of all interventional procedures. This share significantly declined to 48.6% by 2010 and further reduced to 40.4% by 2022. Conversely, facet joint interventions and sacroiliac joint blocks exhibited an upward trend, increasing their share from 28.9% in 2000 to 49.8% in 2022.

Services Compared to Rate

This analysis provides a comprehensive overview of both the total number of services and the rate per 100,000 Medicare beneficiaries from 2000 to 2022, as depicted in Fig. 4. While the total number of services has continued to increase at a slow but steady pace, the rate of services per 100,000 Medicare population has shown slight decline since 2010. Notably, the overall rate for interventional techniques in 2022 (6,669) was comparable to the rate observed in 2003 (6,223), indicating a stagnation in growth despite the rising total number of services.

Discussion

This updated assessment of utilization data for

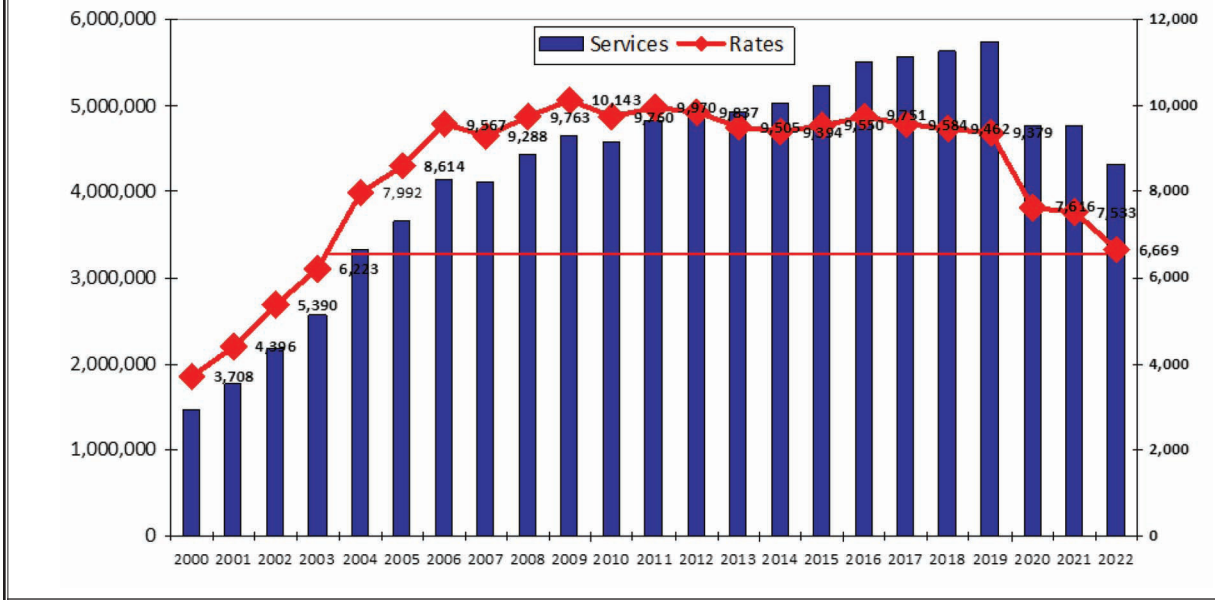

Fig. 4. *Growth of interventional pain management techniques services and rates from 2000 to 2022, in Medicare recipients.*

interventional techniques targeting chronic pain in the Medicare FFS population spanned from 2000 to 2022, with a focused analysis on the changes observed from 2019 to 2022. This article presents a comprehensive analysis of utilization trends across three time periods: 2000-2010, 2010-2019, and 2019-2022. The study includes most interventional techniques but excludes vertebral augmentation procedures and neuromodulation approaches, such as spinal cord stimulation and intrathecal infusion systems.

The overall U.S. population showed a slower growth rate of 0.5% from 2019 to 2022, compared to 0.7% from 2010 to 2019 and 0.8% from 2000 to 2010. Notably, individuals aged 65 and older experienced an annual increase of 3.3% from 2010 to 2019, which decreased to 2.0% from 2019 to 2022. This decline in the elderly population can be attributed to several factors, including the impact of COVID-19-related deaths. Medicare enrollment patterns mirrored these trends, with an annual growth rate of 3.0% from 2010 to 2019 but dropped to 1.9% from 2019 to 2022. This decrease in Medicare enrollment affects both those aged over 65 and those younger than 65. Specifically, the growth rate for individuals over 65 years was 3.4% annually from 2010 to 2019, which fell to 2.5% from 2019 to 2022. In contrast, the growth rate for those under 65 years shifted from 1.0% to -3.2% during the same periods.

This study found that the rate of interventional pain management services per 100,000 Medicare beneficiaries declined significantly between 2019 and 2022 of 28.9%, with a cumulative decrease of 10.7%. This contrasts sharply with the 2010-2019 period, which saw a small annual decline of 0.4%. Particularly significant was the sharp reduction of 18.7% from 2019 to 2020, coinciding with the pandemic. From 2020 to 2021, the decline slowed to 1.1%, before accelerating again with an 11.5% drop between 2021 and 2022. Specific utilization patterns of epidural and adhesiolysis procedures showed a decline of 19% from 2019 to 2020 with a temporary rebound in 2020 to 2021, with a 5% increase in utilization with a subsequent decline of 11.7% from 2021 to 2022. Overall, between 2019 and 2022, these procedures saw a cumulative decline of 24.7%. Facet joint interventions and sacroiliac joint blocks also followed a similar pattern with a cumulative decline from 2019 to 2022 of 33.2%. Further, for disc procedures and other types of nerves, there was a less pronounced decline of 20.5% from 2019 to 2022.

As discussed in the introduction, several factors likely contribute to these declines, including the prolonged economic impact of COVID-19, broader economic challenges, and the implementation of the ACA and related medical policies that took effect during and after 2021 (24-26).

Changes in the utilization of facet joint interventions may be attributed to several factors, including a shift from facet joint nerve blocks to radiofrequency neurotomy as mandated by local coverage determinations (LCDs). Additionally, there has been a reduction in the frequency of epidural injections, from a maximum of five times in the first year to a standard limit of four times, with few exceptions.

As with other retrospective studies, this analysis has certain limitations. It lacks differentiation among individual procedures within each category and does not include Medicare Advantage enrollees, who represent approximately 50% of the overall Medicare population. Furthermore, the analysis does not specify distinct approaches within each treatment modality, such as differentiating between facet joint nerve blocks and radiofrequency neurotomy, or interlaminar versus transforaminal epidural injections.

Conclusion

This analysis demonstrates a significant 28.9% drop in the use of interventional pain management techniques per 100,000 Medicare beneficiaries, with an annual decline of 10.7% between 2019 and 2022. Several factors likely contributed to this ongoing decrease, including the lasting effects of COVID-19, economic challenges, the ACA, and evolving local coverage determination policies.

Author Contributions

The study was designed by LM, JH, 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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Conflicts of Interest

Dr. Soin received support in the past from Neuros Medical and Avanos Medical, received consulting fees from Avanos Medical, owns several patents and is a co-inventor with Avanos Medical, and has stock options with Neuros Medical. Dr. Abd-Elsayed receives consulting fees from Medtronic and Curonix. Dr. Hirsch receives grants or contracts from Neiman Health Policy Institute, is a consultant for Medtronic, Relievant, and Sanofi, and is the Chair CSMB of neurovascular studies for Balt: Rapid Medical. All other authors certifies 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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Appendix Table 1. ***Summary of the frequency of utilization of various categories of interventional procedures in the fee-for-service Medicare population from 2000 to 2022.***

	U.S. Population		Fee-for-service Medicare Beneficiaries			Utilization of all interventional techniques#			
Year	Total Population (,000)	≥ 65 Years (,000) Percent*	Number of individuals participating in Medicare (,000) (Percent)*	≥ 65 years (,000) (Percent)*	< 65 years (,000) Percent*	Allowed Services#	PCFPY	Rate Per 100,000 Medicare Beneficiaries	PCFPY
Y2000	282,172	35,077 (12.40%)	39,632 (14.00%)	34,262 (86.50%)	5,370 (13.50%)	1,469,495		3,708	
Y2010	308,746	40,268 (13.00%)	46,914 (15.2%)	38,991 (83.11%)	7,923 (16.89%)	4,578,977	-1.4%	9,760	-3.8%
Y2011	311,583	41,370 (13.28%)	48,300 (15.5%)	40,000 (82.82%)	8,300 (17.18%)	4,815,673	5.2%	9,970	2.2%
Y2012	313,874	43,144 (13.75%)	50,300 (16.0%)	41,900 (83.30%)	8,500 (16.90%)	4,947,974	2.7%	9,837	-1.3%
Y2013	316,129	44,704 (14.14%)	51,900 (16.4%)	43,100 (83.04%)	8,800 (16.96%)	4,932,950	-0.3%	9,505	-3.4%
Y2014	318,892	46,179 (14.48%)	53,500 (16.8%)	44,600 (83.36%)	8,900 (16.64%)	5,025,904	1.9%	9,394	-1.2%
y2015	320,897	47,734 (14.88%)	54,900 (17.1%)	46,000 (83.79%)	9,000 (16.39%)	5,243,036	4.3%	9,550	1.7%
Y2016	323,127	49,244 (15.24%)	56,500 (17.5%)	47,500 (84.07%)	9,000 (15.93%)	5,509,306	5.1%	9,751	2.1%
Y2017	326,625	51,055 (15.63%)	58,000 (17.8%)	49,200 (84.83%)	8,900 (15.34%)	5,558,893	0.9%	9,584	-1.7%
Y2018	327,167	52,423 (16.02%)	59,600 (18.2%)	50,800 (85.23%)	8,800 (14.77%)	5,639,608	1.5%	9,462	-1.3%
Y2019	328,293	54,074 (16.47%)	61,200 (18.6%)	52,600 (85.95%)	8,700 (14.22%)	5,736,488	1.7%	9,373	-0.9%
Y2020	331,002	55,939 (16.90%)	62,600 (18.9%)	54,100 (86.42%)	8,500 (13.58%)	4,767,569	-16.9%	7616	-18.7%
Y2021	332,049	55,885 (16.8%)	63,400 (19.1%)	55,100 (86.9%)	8,300 (13.1)	4,776,040	0.2%	7,533	-1.1%
Y2022	333,272	57,470 (17.2)	64,700 (19.4%)	56,700 (87.7%)	7,900 (12.3%)	4,314,925	-9.7%	6,669	-11.5%
2000-2022									
Change	18.1%	63.8%	63.3%	65.5%	47.1%	193.6%		79.9%	
GM	0.8%	2.3%	2.3%	2.3%	1.8%	5.0%		2.7%	
2000-2010									
Change	9.4%	14.8%	18.4%	13.8%	47.5%	211.6%		163.2%	
GM	0.9%	1.4%	1.7%	1.3%	4.0%	12.0%		10.2%	
2010-2019									
Change	6.3%	34.3%	30.5%	34.9%	9.8%	25.3%		-4.0%	
GM	0.7%	3.3%	3.0%	3.4%	1.0%	2.5%		-0.4%	
2019-2022									
Change	1.5%	6.3%	5.7%	7.8%	-9.2%	-24.8%		-28.9%	
GM	0.5%	2.0%	1.9%	2.5%	-3.2%	-9.0%		-10.7%	
2019-2020	0.8%	3.4%	2.3%	2.9%	-2.3%	-16.4%		-18.7%	
2020-2021	0.3%	-0.1%	1.3%	1.8%	-2.4%	0.2%		-1.1%	
2021-2022	0.4%	2.8%	2.1%	2.9%	-4.8%	-9.7%		-11.5%	

GM: Geometric average annual change (*) - percentage to total population
PCFPY: percentage of change from previous year
(excluding continuous epidurals, intraarticular injections, trigger point and ligament injections, peripheral nerve blocks, vertebral augmentation procedures, and implantables)

Appendix Table 2. *Frequency of utilization interventional techniques in the fee-for-service Medicare population from 2000 to 2022.*

	Epidural and adhesiolysis procedures			Facet joint interventions and Sacroiliac joint blocks			Disc Procedures and other types of nerve blocks			Utilization of all interventional techniques#		
	Allowed Services (Facility)	PCFPY	Rate	Allowed Services (Facility)	PCFPY	Rate	Allowed Services (Facility)	PCFPY	Rate	Allowed Services (Facility)	PCFPY	Rate
2000	860,787 (79%)	7.2%	2,172	424,796 (67%)	39.5%	1,072	183,912 (87%)	14.3%	464	1,469,495 (72%)		3,708
2001	1,013,552 (78%)	17.7%	2,531	543,509 (62%)	27.9%	1,357	203,395 (87%)	10.6%	508	1,760,456 (69%)	19.8%	4,396
2002	1,199,324 (74%)	18.3%	2,961	708,186 (58%)	30.3%	1,748	275,542 (81%)	35.5%	680	2,183,052 (64%)	24.0%	5,390
2003	1,370,862 (71%)	14.3%	3,333	884,035 (53%)	24.8%	2,150	304,426 (80%)	10.5%	740	2,559,323 (60%)	17.2%	6,223
2004	1,637,494 (65%)	19.4%	3,924	1,354,242 (46%)	53.2%	3,245	343,311 (79%)	12.8%	823	3,335,047 (54%)	30.3%	7,992
2005	1,776,153 (65%)	8.5%	4,180	1,501,222 (47%)	10.9%	3,533	383,324 (78%)	11.7%	902	3,660,699 (54%)	9.8%	8,614
2006	1,870,440 (63%)	5.3%	4,316	1,896,688 (40%)	26.3%	4,376	378,996 (75%)	-1.1%	874	4,146,124 (49%)	13.3%	9,567
2007	1,940,454 (62%)	3.7%	4,384	1,820,695 (46%)	-4.0%	4,113	349,978 (73%)	-7.7%	791	4,111,127 (52%)	-0.8%	9,288
2008	2,041,155 (61%)	5.2%	4,495	1,974,999 (46%)	8.5%	4,349	417,257 (70%)	19.2%	919	4,433,411 (51%)	7.8%	9,763
2009	2,136,035 (59%)	4.6%	4,664	2,111,700 (46%)	6.9%	4,611	397,944 (69%)	-4.6%	869	4,645,679 (49%)	4.8%	10,143
2010	2,226,486 (57%)	4.2%	4,746	1,937,582 (48%)	-8.2%	4,130	414,909 (62%)	4.3%	884	4,578,977 (52%)	-1.4%	9,760
2011	2,309,906 (58%)	3.7%	4,782	2,064,227 (50%)	6.5%	4,274	441,540 (61%)	6.4%	914	4,815,673 (48%)	5.2%	9,970
2012	2,324,563 (58%)	0.6%	4,621	2,159,057 (50%)	4.6%	4,292	464,354 (57%)	5.2%	923	4,947,974 (53%)	2.7%	9,837
2013	2,278,790 (58%)	-2.0%	4,391	2,197,766 (51%)	1.8%	4,235	456,394 (51%)	-1.7%	879	4,932,950 (53%)	-0.3%	9,505
2014	2,273,104 (57%)	-0.2%	4,249	2,370,000 (50%)	7.8%	4,430	382,800 (47%)	-16.1%	716	5,025,904 (52%)	1.9%	9,394
2015	2,291,001 (57%)	0.8%	4,173	2,568,428 (50%)	8.4%	4,678	383,607 (44%)	0.2%	699	5,243,036 (53%)	4.3%	9,550
2016	2,329,062 (58%)	1.7%	4,122	2,759,559 (52%)	7.4%	4,884	420,685 (45%)	9.7%	745	5,509,306 (54%)	5.1%	9,751
2017	2,258,726 (54%)	-3.0%	3,894	2,862,876 (49%)	3.7%	4,936	437,289 (43%)	3.9%	754	5,558,893 (51%)	0.9%	9,584
2018	2,196,060 (54%)	-2.8%	3,685	2,970,100 (50%)	3.7%	4,983	473,448 (44%)	8.3%	794	5,639,608 (51%)	1.5%	9,462
2019	2,192,562 (57%)	-0.2%	3,583	3,040,164 (53%)	2.4%	4,968	503,762 (49%)	6.4%	823	5,736,488 (54%)	1.7%	9,373
2020	1,816,786 (55%)	-17.1%	2,902	2,566,014 (52%)	-15.6%	4,099	384,569 (45%)	-23.7%	614	4,767,369 (52%)	-16.9%	7,616
2021	1,935,150 (55%)	6.5%	3,052	2,427,429 (53%)	-5.4%	3,829	413,461 (47%)	7.5%	652	4,776,040 (52%)	0.2%	7,533
2022	1,744,281 (55%)	-9.9%	2,696	2,147,265 (53%)	-11.5%	3,319	423,379 (47%)	2.4%	654	4,314,925 (52%)	-9.7%	6,669
2000-2022												

Appendix Table 2 cont. ***Frequency of utilization interventional techniques in the fee-for-service Medicare population from 2000 to 2022.***

Change	102.6%		24.1%	405.5%		209.6%	130.2%		41.0%	193.6%		79.9%
GM	3.5%		1.3%	8.5%		6.3%	3.4%		1.3%	5.5%		3.3%
2000-2010												
Change	158.7%		118.5%	356.1%		285.3%	125.6%		90.6%	211.6%		163.2%
GM	10.0%		8.1%	16.4%		14.4%	8.5%		6.7%	12.0%		10.2%
2010-2019												
Change	-1.5%		-24.5%	56.9%		20.3%	21.4%		-6.9%	25.3%		-4.0%
GM	-0.2%		-3.1%	5.1%		2.1%	2.2%		-0.8%	2.5%		-0.4%
2019-2022												
Change	-20.4%		-24.7%	-29.4%		-33.2%	-16.0%		-20.5%	-24.8%		-28.9%
GM	-7.3%		-9.0%	-10.9%		-12.6%	-5.6%		-7.4%	-9.1%		-10.7%
2019-2020	-17.1%		-19.0%	-15.6%		-17.5%	-23.7%		-25.4%	-16.9%		-18.7%
2020-2021	6.5%		5.2%	-5.4%		-6.6%	7.5%		6.2%	0.2%		-1.1%
2021-2022	-9.9%		-11.7%	-11.5%		-13.3%	2.4%		0.3%	-9.7%		-11.5%

GM: Geometric average annual change
PCFPY: Percentage of change from previous year
(excluding continuous epidurals, intraarticular injections, trigger point and ligament injections, peripheral nerve blocks, vertebral augmentation procedures, and implantables)