

## Health Policy Research

## Updated Analysis of Declining Utilization Rate of 13% Epidural Procedures for Chronic Spinal Pain Management in the Traditional Medicare Population from 2019 to 2024

Laxmaiah Manchikanti, MD<sup>1</sup>, Mahendra R. Sanapati, MD<sup>2</sup>, Vidyasagar Pampati, MSc<sup>1</sup>, Alan D. Kaye, MD, PhD<sup>3</sup>, Nebojsa Nick Knezevic, MD, PhD<sup>4</sup>, Annu Navani, MD<sup>5</sup>, Devi Nampiaparampil, MD<sup>6</sup>, and Joshua A. Hirsch, MD<sup>7</sup>

From: <sup>1</sup>Pain Management Centers of America, Paducah, KY; <sup>2</sup>University of Louisville School of Medicine, Louisville, KY, and Indiana University School of Medicine, Evansville, IN;

<sup>3</sup>Louisiana State University Health Sciences Center at Shreveport, Shreveport, LA, Tulane School of Medicine, and LSU School of Medicine, New Orleans, LA; <sup>4</sup>Advocate Illinois Masonic Medical Center and College of Medicine, University of Illinois, Chicago, IL; <sup>5</sup>LeReve Regenerative Wellness, San Jose, CA, and Boomerang Health Care, Walnut Creek, CA; <sup>6</sup> Metropolis Pain Medicine, New York City, NY; <sup>7</sup>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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**Background:** Recent analysis of epidural procedure utilization has demonstrated significant shifts over the past 25 years. Utilization increased substantially until 2004, continued with modest growth through 2011, and then gradually declined through 2019 among the Medicare population. Influences from the COVID-19 pandemic, the Affordable Care Act (ACA), and economic pressures have continued to contribute to declining utilization patterns.

**Objective:** The present investigation provides an updated evaluation of epidural procedure utilization for chronic pain management in the U.S. Medicare population, focusing on the time periods of 2000 to 2010, 2010 to 2019, and 2019 to 2024.

**Study Design:** A retrospective cohort study evaluating utilization patterns and variables for epidural injections in the fee-for-service (FFS) traditional Medicare population in the U.S. from 2000 to 2024.

**Methods:** A retrospective longitudinal analysis of Medicare Part B data from 2000 through 2024 was completed. Epidural injection services included cervical/thoracic and lumbar/caudal interlaminar injections, and cervical/thoracic and lumbar/sacral transforaminal injections, identified using procedure codes in the study database. A procedure or service represented all interventions performed during a treatment episode, incorporating add-on codes and bilateral services. Episodes were defined as one unit regardless of bilateral or additional services, reflecting the number of times patients received treatment. Utilization was assessed through counts, rates per 100,000 beneficiaries, geometric mean changes, and percent changes across key intervals (2000–2010, 2010–2019, 2019–2024). Trends by provider's specialty and place of service were also evaluated.

**Results:** From 2000 to 2010, services, episodes, and rates per 100,000 beneficiaries increased 144.3%, 126.1%, and 103%. From 2010 to 2019, this pattern shifted to declining utilization, with reductions of 9.5% in services, 0.4% in episodes, and 9% in rates per 100,000. From 2019 to 2024, procedural rates declined 13%, episodes declined 22.6%, and episode rates declined 11.9%, corresponding to average annual reductions of 2.8%, 4.3%, and 2.6%.

Comparative analysis showed that from 2000 to 2010, interlaminar epidural rates increased 43.8%, whereas transforaminal epidural rates increased 579.1%. From 2010 to 2019, interlaminar rates declined 18.4%, while transforaminal rates increased 5%. From 2019 to 2024, interlaminar rates declined 14.6% compared to 8.7% for transforaminal procedures. By 2024, interventional pain specialists performed over 92% of all epidural injections, while other specialties showed decreasing participation. A continued shift toward office settings and ambulatory surgery centers (ASCs) was also observed.

**Limitations:** The study includes data only through 2024 and is limited to the FFS Medicare population, excluding Medicare Advantage beneficiaries who accounted for 54% of Medicare enrollment by 2024. Limitations inherent to retrospective claims data also apply.

equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted article.

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**Conclusion:** Epidural injection utilization has shifted substantially over the last 25 years, driven by changes in clinical practice, regulatory and economic influences, and pandemic-related disruptions. The increasing concentration of procedure utilization among interventional pain specialists, together with the continued expansion of transforaminal techniques, underscores the progressive specialization and refinement of interventional pain management within the Medicare population.

**Key words:** Chronic spinal pain, interventional techniques, interlaminar epidural injections, caudal epidural injections, transforaminal epidural injections, utilization patterns, COVID-19 pandemic, economic decline, Affordable Care Act (ACA)

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National healthcare expenditures are projected to grow substantially, with average annual increases of 5.6%, outpacing nominal GDP growth by 43% (1-4). This reflects broad price inflation, the effects of an aging population, and rising healthcare demand relative to income growth, potentially elevating healthcare's share of the economy to 19.7% of GDP by 2032 (1,2). In 2022, U.S. healthcare spending increased 4.1% to \$4.5 trillion, a faster rate than the 3.2% rise in 2021 but lower than the 10.6% increase in 2020 driven by pandemic-related surges. Estimated spending for 2023 is \$4.8 trillion, with per capita expenditures of \$14,423. This encompasses \$6,838 per capita for private health insurance, \$15,689 for Medicare, and \$9,336 for Medicaid, with projections indicating increases to \$10,576 for private insurance, \$24,921 for Medicare, and \$15,632 for Medicaid. Importantly, less than 20% of Part B spending is directed toward physician and clinical services, which increased 2.7% to \$884.9 billion in 2022, a slower growth rate than the overall 4.1% healthcare increase (4). Slower service utilization and lower physician reimbursement contributed to this trend, despite ongoing closures of independent practices driven by multiple economic and regulatory pressures (5-29).

Healthcare expenditure patterns continue to align with pre-existing trajectories, with pandemic-era impacts sustaining levels (1-4). Previously published U.S. data on public and private spending (10,11) indicated that back and neck pain accounted for the highest expenditures, increasing 53.5% from \$87.6 billion in 2013 to \$134.5 billion in 2016. These rising costs mirror ongoing shifts in healthcare delivery characterized by heightened regulation and oversight. While such changes have occasionally contributed to reduced procedure utilization and enhanced appropriateness criteria, they may also restrict access to essential treatments, including epidural procedures.

Numerous healthcare policies have changed since the passage of the ACA have significantly affected patients with treatable pain (17-20). These include the Inflation Reduction Act (IRA) of 2022 (5,20), the expansion of Medicare Advantage Plans (6-8), and regulatory acceleration under the 21st Century Cures Act (9) combined with rising costs and declining healthcare utilization (9,21-24). Patients have experienced increasing financial burdens through high deductibles, coinsurances, and escalating copays (9,21-24). Pain practices have simultaneously faced rising operational costs, including the need for additional staffing to navigate complex insurance requirements, manage patient financial concerns, and respond to increased scrutiny from audits along with a growing volume of audits (9,21-44). The COVID-19 pandemic further contributed to declining utilization, a rise in cannabis consumption, and persistent opioid-related mortality (12-16,45-58), while unemployment, inflation, workforce shortages, and supply chain disruptions have amplified these challenges (6-8,12-16).

Prior analyses of epidural procedure utilization demonstrated significant growth from 2000 to 2010, followed by marked declines from 2010 to 2022 (14). Reductions varied by procedure category, with the greatest decreases observed for lumbar interlaminar and caudal epidural injections, while lumbar transforaminal epidural injections showed comparatively smaller declines. Updated evaluations of interventional pain management utilization specific to traditional Medicare patients indicated an overall cumulative reduction in services of 16.8% from 2019 to 2024, corresponding to an average annual decline of 3.6%. In addition, epidural and adhesiolysis procedures decreased 13.1% per 100,000 Medicare beneficiaries over the same period (15). These declines, however, remain less pronounced than those observed for facet joint and sacroiliac joint interventions, which were reduced

23.1%, while disc procedures and other nerve blocks demonstrated overall increases of 5.4% total and 1% annually.

Under these circumstances, independent physicians are facing increasing difficulty maintaining financial viability (6-8,36,37,58-63). The Physicians Advocacy Institute's (PAI) most recent Avalere analysis shows that rural areas in the United States lost nearly 2,500 physicians, representing 5% of the rural workforce, and almost 3,300 medical practices, an 11% decline, from 2019 to 2024. During this period, the number of independent physicians fell by 43%, and more than 40% of independent practices either closed or were absorbed by corporate entities. Employment and ownership by hospitals, health systems, insurers, and private equity firms expanded sharply, resulting in 76% of rural physicians being employed by non-physician entities and 61% of practices being under non-physician ownership (64). Despite these transitions, Centers for Medicare & Medicaid Services (CMS) policies continue to negatively impact independent practices (6-8,35-37).

Clinical and economic evidence related to epidural procedures remains mixed. Although a substantial number of studies, including systematic reviews, randomized controlled trials (RCTs), cost-effectiveness evaluations, and guideline publications, have contributed to the evidence base (29,65-78), the overall strength of evidence is moderate, and longstanding debate continues over clinical effectiveness, indications, and appropriate use.

This investigation is therefore designed as a retrospective cohort study evaluating epidural injection utilization patterns from 2000 to 2024, offering updated insights on use within the U.S. fee-for-service (FFS) traditional Medicare population and building upon previously published research (14).

## **METHODS**

This study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational studies (79). Data was obtained from non-identifiable, public-use files provided by CMS (80), ensuring patient confidentiality and non-attributability.

### **Study Design**

Earlier analyses by our group and others did not accurately isolate the traditional FFS Medicare population (12-16,74,75). Therefore, this assessment focused solely on traditional FFS Medicare beneficiaries, exclud-

ing individuals enrolled in Medicare Advantage plans. As Medicare Advantage data was unavailable, the analysis was restricted to utilization patterns within the traditional FFS program. The study was structured to evaluate utilization trends and associated variables for epidural injections used in the treatment of chronic spinal pain from 2000 to 2024.

### **Objectives**

The primary objective was to assess epidural procedure utilization patterns within the FFS traditional Medicare population from 2000 to 2024, providing an updated analysis of trends spanning more than 25 years.

### **Setting**

Data was sourced from the CMS national database, specifically evaluating the FFS traditional Medicare population in the United States (80).

### **Participants**

The study included all traditional Medicare FFS recipients from 2000 to 2024, encompassing beneficiaries enrolled through Social Security disability, Social Security insurance, or retirement.

### **Variables**

A procedure or service was defined as all procedures performed during a treatment episode, including any add-on codes and bilateral procedures. Episodes were defined as a single unit, regardless of bilateral services or additional procedures, reflecting the number of times patients received treatment. Service (procedures) and episode (visits) rates were calculated annually based on the Medicare beneficiary population and are reported as procedures per 100,000 beneficiaries. Each episode was defined as one procedure per region using only primary procedure codes. Services included all procedure levels with any corresponding add-on codes.

Epidural procedures are performed by multiple specialties, including interventional pain management (-09), pain medicine (-72), anesthesiology (-05), physical medicine and rehabilitation (-25), neurology (-13), psychiatry (-26), orthopedic surgery (-20), general surgery (-17), neurosurgery (-14), diagnostic radiology (-30), interventional radiology (-94), and other physicians. Surgical providers were grouped separately, as were radiological providers, consistent with Medicare specialty classifications.

The CPT codes for epidural procedures evaluated from 2000 to 2020 included 62310, 62320 (new), 62321 (new), 62311, 62322 (new), 62323 (new), 64479, 64480, 64483, 64484.

Data was examined by place of service, distinguishing facility-based settings such as ambulatory surgery centers (ASCs) or hospital outpatient departments (HOPDs) from non-facility settings such as physician offices. Utilization was also compared across MAC jurisdictions. MACs are private insurers assigned to specific U.S. geographic regions to process Medicare Part A, Part B, or durable medical equipment claims for FFS beneficiaries, as authorized under the Medicare Prescription Drug Improvement and Modernization Act of 2003 (MMA).

### **Data Sources**

Data was extracted from CMS physician/supplier procedure summary master files from 2000 to 2024 (80), including traditional FFS Medicare participants both below and above 65 years of age, regardless of disability status.

### **Measures**

The CMS 100% dataset included primary and add-on procedure codes, bilateral services, specialty codes, place of service, total services, and allowed versus denied service counts. Analyses focused solely on allowed services, excluding denied claims and those with zero payment. Claims with type of service codes 8 or F were also excluded. Rates were calculated per 100,000 Medicare beneficiaries for each calendar year.

### **Bias**

Data used in this analysis was obtained from CMS by American Society of Interventional Pain Physicians (ASIPP). This study was supported internally by the authors' practice without external funding or industry involvement.

### **Study Size**

The study evaluated all traditional Medicare FFS patients receiving interventional procedures for chronic spinal pain across all U.S. regions and service settings from 2000 to 2024.

### **Data Compilation**

Data compilation and statistical tabulation were performed using Microsoft Access 2020 and Microsoft Excel 2020 (Microsoft Corporation, Redmond, WA).

## **RESULTS**

### **Patients**

This analysis includes patients enrolled in the FFS traditional Medicare program from 2000 to 2024.

### **Trends in Epidural Procedure Utilization, 2000–2024**

From 2000 to 2024, the Medicare FFS population increased by 20.5%, and the proportion of beneficiaries aged 65 and older rose from 12.4% to 18.0%. During the same time period, total epidural procedures, excluding adhesiolysis and continuous or neurolytic techniques, nearly doubled, increasing from 839,474 in 2000 to 1,668,552 in 2024, which represents a 98.8% increase. When adjusted for beneficiary population size, the rate of epidural procedures per 100,000 beneficiaries increased from 2,514 to 4,836, a growth of 92.4%. Episodes (visits) based solely on primary procedure codes increased 68.6%. Although the overall geometric annual growth rate was moderate at 2.2%, substantial variation occurred across specific time intervals, as shown in Table 1.

From 2000 to 2010, utilization of epidural services showed substantial expansion, increasing by 144.3%, with a geometric mean annual growth rate of 9.3%. From 2010 to 2019, this trajectory stabilized and then reversed, resulting in a 9.5% decline and an overall annual decrease of 1.1%. The most pronounced decline occurred during the COVID-19 pandemic, when total epidural services decreased 15.6% from 2019 to 2020, and episodes declined 17.1%. Although utilization demonstrated partial recovery in subsequent years, it remained below pre-pandemic levels, with a 13% decrease in rates from 2019 to 2024. A modest rebound was noted between 2023 and 2024, as services and rates increased by 2.9% and 3.1%, respectively (Fig. 1).

Between 2000 and 2011, epidural procedure rates increased. However, beginning in 2011, the rates began to decline, ultimately returning to levels similar to those observed in 2006, decreasing from 4,836 per 100,000 beneficiaries in 2024 to approximately 5,061 per 100,000 in 2006 (Fig. 2).

### **Procedure-Specific Utilization Patterns**

#### ***Interlaminar Epidural Injections***

Interlaminar cervical and thoracic procedure rates increased at a geometric mean annual growth rate of 8.5% from 2000 to 2010, followed by more modest growth of 1.0% per year from 2010 to 2019, and

## Utilization Trends of Epidural Procedures, 2019–2024

Table 1. *Characteristics of Medicare beneficiaries and epidural procedures, excluding adhesiolysis and continuous/neurolytic epidurals, 2000–2024.*

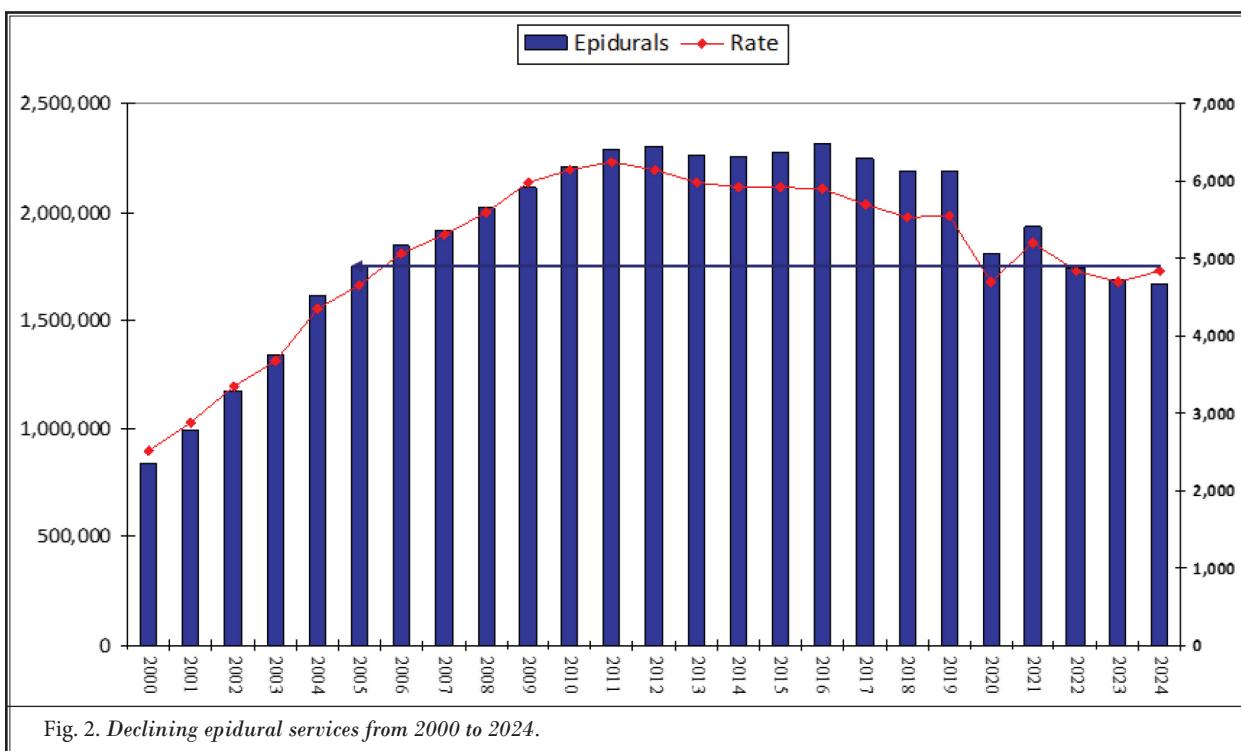
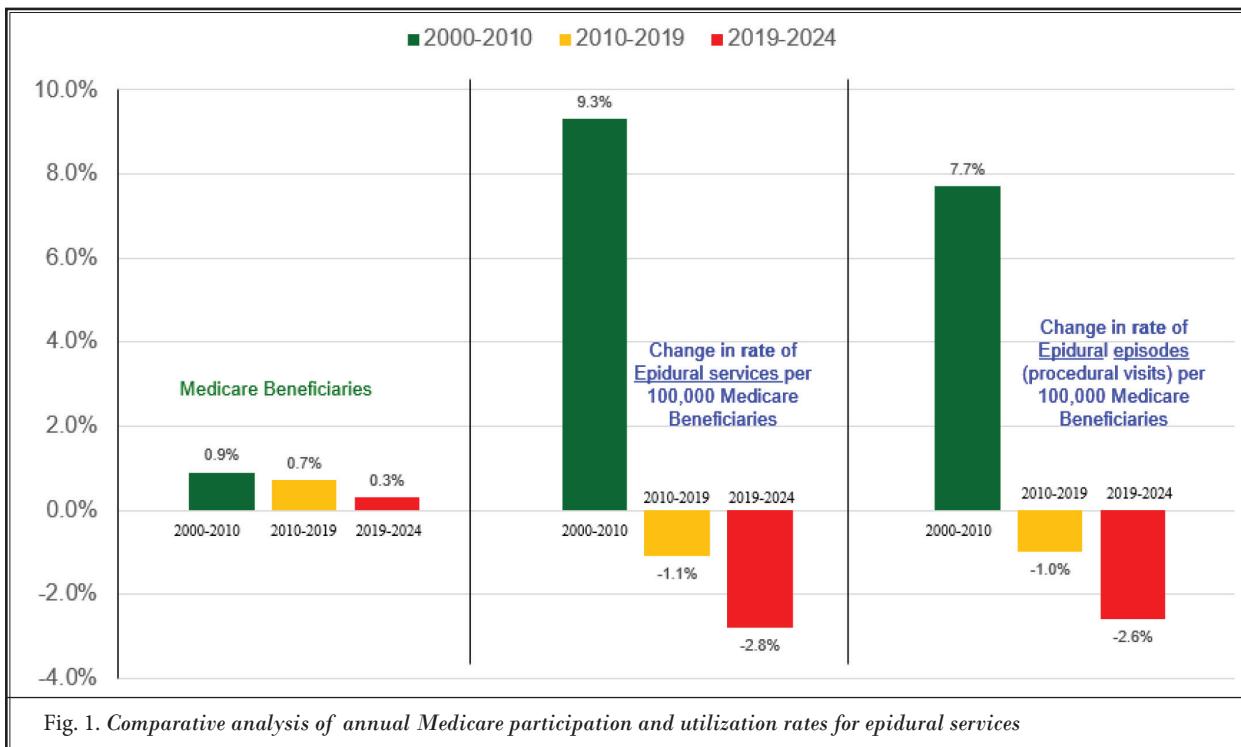
Year	U.S. Population		Traditional Medicare beneficiaries (in thousands)	Epidural Services*				
	In thousands	Percentage of >= 65 years old		Procedures or Services (all Codes)	Rate	PCPY	Episodes (Primary codes only)	Rate
Y2000	282,172	12.40%	33,392	839,474	2,514		792,563	2,374
Y2001	285,040	12.40%	34,445	989,034	2,871	14.2%	927,364	2,692
Y2002	288,369	12.30%	35,003	1,172,248	3,349	16.6%	1,082,298	3,092
Y2003	290,211	12.40%	36,526	1,342,829	3,676	9.8%	1,213,014	3,321
Y2004	292,892	12.40%	37,029	1,611,887	4,353	18.4%	1,397,749	3,775
Y2005	295,561	12.40%	37,596	1,747,771	4,649	6.8%	1,510,354	4,017
Y2006	299,395	12.40%	36,439	1,844,182	5,061	8.9%	1,575,656	4,324
Y2007	301,290	12.60%	36,163	1,915,227	5,296	4.6%	1,618,656	4,476
Y2008	304,056	12.80%	36,012	2,017,132	5,601	5.8%	1,675,681	4,653
Y2009	307,006	12.90%	35,301	2,112,511	5,984	6.8%	1,733,339	4,910
Y2010	308,746	13.00%	35,914	2,205,307	6,141	2.6%	1,792,291	4,991
Y2011	311,583	13.28%	36,600	2,289,213	6,255	1.9%	1,864,066	5,093
Y2012	313,874	13.75%	37,500	2,304,993	6,147	-1.7%	1,892,951	5,048
Y2013	316,129	14.14%	37,800	2,259,887	5,979	-2.7%	1,854,380	4,906
Y2014	318,892	14.48%	38,100	2,255,668	5,920	-1.0%	1,826,336	4,794
Y2015	320,897	14.88%	38,500	2,276,267	5,912	-0.1%	1,845,604	4,794
Y2016	323,127	15.24%	39,300	2,316,285	5,894	-0.3%	1,882,269	4,789
Y2017	326,625	15.63%	39,500	2,247,240	5,689	-3.5%	1,835,796	4,648
Y2018	327,167	16.00%	39,600	2,186,893	5,522	-2.9%	1,788,915	4,517
Y2019	328,293	16.47%	39,300	2,184,917	5,560	0.7%	1,784,870	4,542
Y2020	331,002	16.90%	38,600	1,810,884	4,691	-15.6%	1,473,789	3,818
Y2021	332,049	16.83%	37,000	1,928,978	5,213	11.1%	1,575,384	4,258
Y2022	333,272	17.24%	36,000	1,738,530	4,829	-7.4%	1,432,658	3,980
Y2023	334,915	17.71%	35,800	1,683,412	4,702	-2.6%	1,389,752	3,882
Y2024	340,100	17.99%	34,500	1,668,552	4,836	2.9%	1,380,782	4,002
Change								
2000-2024	20.5%		3.3%	98.8%	92.4%		74.2%	68.6%
GM	0.8%		0.1%	2.9%	2.8%		2.3%	2.2%
2000-2010	9.4%		7.6%	162.7%	144.3%		126.1%	110.3%
GM	0.9%		0.7%	10.1%	9.3%		8.5%	7.7%
2010-2019	6.3%		9.4%	-0.9%	-9.5%		-0.4%	-9.0%
GM	0.7%		1.0%	-0.1%	-1.1%		-0.05%	-1.0%
2019-2020	0.8%		-1.8%	-17.1%	-15.6%		-17.4%	-15.9%
2019-2024	3.6%		-12.2%	-23.6%	-13.0%		-22.6%	-11.9%
GM	0.3%		-1.7%	-4.5%	-2.8%		-4.3%	-2.6%
2020-2021	0.3%		-4.1%	6.5%	11.1%		6.9%	11.5%
2021-2022	0.4%		-2.7%	-9.9%	-7.4%		-9.1%	-6.5%
2022-2023	0.5%		-0.6%	-3.2%	-2.6%		-3.0%	-2.5%
2023-2024	1.5%		-3.6%	-0.9%	2.9%		-0.6%	3.1%

Rate – Rate per 100,000 Medicare beneficiaries, GM - Geometric average change

Epidural Services = 62310, 62320, 62321 C/T or interlaminar epidural injections; 62311, 62322, 62323-L/S interlaminar epidural injections; 64479-C/T transforaminal epidural injections; 64480- C/T transforaminal epidural injections add-on; 64483-L/S transforaminal epidural injections; 64484-L/S transforaminal epidural injections add-on

then declined at an annual rate of 1.9% from 2019 to 2024. Lumbar and caudal interlaminar injection rates

increased at a geometric mean annual growth rate of 2.9% from 2000 to 2010, followed by a decline of 3.0%



per year from 2010 to 2019, which continued with a further decrease of 3.5% annually from 2019 to 2024 (Table 2 and Fig. 3).

### **Transforaminal Epidural Injections**

Transforaminal procedures demonstrated the most substantial growth. Cervical and thoracic transforaminal epidural injection rates increased at a geometric mean annual growth rate of 11.0% from 2000 to 2010, then declined by 3.8% per year from 2010 to 2019, followed by a continued reduction of 3.0% annually from 2019 to 2024. Lumbar transforaminal epidural injection rates increased markedly, with a geometric mean annual growth rate of 23.2% from 2000 to 2010, followed by a slight rise of 0.1% per year from 2010 to 2019, before declining 2.5% annually from 2019 to 2024 (Table 2 and Fig. 3).

### **Aggregate Trends in Interlaminar vs. Transforaminal Approaches**

Total interlaminar procedures remained relatively stable over the 24-year period, showing an overall change of +0.3%, while transforaminal primary procedures increased by more than 550.5%, as shown in Appendix Table 1. Interlaminar injection rates increased 3.7% per year from 2000 to 2010, whereas transforaminal injection rates increased 21.1% annually, representing a 5.7-fold higher growth rate during that period. From 2010 to 2019, these trends shifted, with interlaminar rates declining 2.2% annually and transforaminal rates showing a slight increase of 0.5% per year. From 2019 to 2024, both procedure types demonstrated declines, with interlaminar and transforaminal rates decreasing 3.1% and 1.8% annually, respectively. This sustained pattern of divergence resulted in a procedural mix progressively favoring transforaminal approaches. Interlaminar injections were seven times more common than transforaminal injections in 2000, compared to a ratio of approximately 1.1 to 1 by 2024, indicating almost equivalent utilization (Appendix Table 1).

Utilization rates of epidural injections as a proportion of all interventional pain management procedures decreased from 57% in 2000 to 40% in 2024, as shown in Appendix Fig. 1.

### **Specialty-Level Utilization Patterns**

Interventional pain physicians consistently performed the majority of epidural procedures, with their share increasing from 83.7% in 2000 to 92.1% in 2024 (Appendix Table 2). Over the same period, surgical

specialties demonstrated a reduction in their share of services from 5.6% to 3.4%. Radiological specialties also showed a slight proportional decline from 2.7% to 2.6%, despite increases in absolute volume. General physicians, including family medicine, internal medicine, and general practice, experienced a marked decline from 6.2% to 1.3%, reflecting a continued shift of services toward procedural specialists. Other providers, including CRNAs, NPs, and PAs, consistently accounted for less than 1% of procedures performed.

### **Place of Service Trends**

As shown in Fig. 4, site-of-service patterns shifted progressively over time. From 2010 to 2024, ASC utilization increased modestly, HOPD utilization declined, and office-based utilization exhibited a slight downward trend. These transitions indicate gradual migration toward ASCs, aligned with reimbursement structures and expanding interventional capability in outpatient surgical environments.

Overall, these findings reflect evolving practice patterns, shifting specialty involvement, and the significant influence of policy changes, reimbursement environments, and the COVID-19 pandemic on epidural procedure utilization within the Medicare population. It is also important to recognize that CMS has combined ASCs with hospitals in rate-setting, placing them in the same payment category and reducing reimbursement for independent physicians in ASCs by as much as 11% for certain procedures (6-8,36,37,81).

## **DISCUSSION**

In this comprehensive longitudinal analysis of Medicare FFS beneficiaries from 2000 through 2024, substantial changes were observed in utilization patterns of epidural injections for spinal pain, with varying trends based on procedure type, specialty involvement, and timeframe of assessment. Epidural services nearly doubled over the 24-year period, reflecting expanded access to interventional pain care and the growing prevalence of degenerative and chronic pain conditions in an aging population. The most notable growth occurred between 2000 and 2010, a period marked by rapid adoption of interventional pain techniques, increasing training opportunities, and early guideline development supporting epidural steroid injections for radicular pain. During this decade, overall utilization increased by more than 160%, with geometric annual growth rates exceeding 9%.

Following 2010, a different trend emerged (17-44).

Table 2. Utilizations of epidural injections in the fee-for-service Medicare population from 2000-2024

HCPCS	Cervical/Thoracic Interlaminar Epidurals (CPT 62310, 62320, 62321)			Lumbar Interlaminar and Caudal Epidurals (CPT 62311, 62322, 62323)			Cervical/Thoracic Transformaminal Epidurals (CPT 64479, 64480)			Lumbar/Sacral Transformaminal Epidurals (CPT 64483, 64484)		
	Services	Rate	Services	Rate	CPT 64479	CPT 64480	Services	Rate	CPT 64483	CPT 64484	Services	Rate
2000	75,741	227	618,362	1,852	13,454	9,434	22,888	69	85,006	37,477	122,483	367
2001	84,385	245	702,713	2,040	14,732	8,537	23,269	68	125,534	53,133	178,667	519
2002	99,117	283	786,919	2,248	18,583	10,835	29,418	84	177,679	79,115	256,794	734
2003	109,783	301	838,858	2,297	21,882	15,769	37,651	103	242,491	114,046	356,537	976
2004	130,649	353	878,174	2,372	25,182	18,094	43,276	117	363,744	196,044	559,788	1,512
2005	141,652	377	945,350	2,514	27,844	20,525	48,369	129	395,508	216,892	612,400	1,629
2006	146,748	403	946,961	2,599	29,822	23,073	52,895	145	452,125	245,453	697,578	1,914
2007	156,415	433	926,029	2,561	29,938	22,266	52,204	144	506,274	274,305	780,579	2,159
2008	165,636	460	905,419	2,514	32,286	24,003	56,289	156	572,340	317,448	889,788	2,471
2009	175,503	497	888,166	2,516	37,012	27,487	64,499	183	632,658	351,685	984,343	2,788
2010	184,750	514	888,421	2,474	40,003	29,888	69,891	195	679,117	383,128	1,062,245	2,958
2011	200,134	547	914,324	2,498	38,970	26,628	65,598	179	710,638	398,519	1,109,157	3,030
2012	213,390	569	925,179	2,467	35,945	21,293	57,238	153	718,437	390,749	1,109,186	2,958
2013	217,393	575	901,468	2,385	34,699	20,409	55,108	146	700,820	385,098	1,085,918	2,873
2014	208,741	548	815,858	2,141	37,944	21,587	59,531	156	763,793	407,745	1,171,538	3,075
2015	215,897	561	820,227	2,130	37,855	21,115	58,970	153	771,625	409,548	1,181,173	3,068
2016	224,118	570	824,822	2,099	38,741	20,467	59,208	151	794,588	413,549	1,208,137	3,074
2017	223,060	565	788,456	1,996	37,648	18,915	56,563	143	786,632	392,529	1,179,161	2,985
2018	220,470	557	751,846	1,899	37,184	17,251	54,335	137	779,415	380,727	1,160,142	2,930
2019	221,462	564	737,394	1,876	37,129	16,919	54,048	138	788,885	383,128	1,172,013	2,982
2020	183,699	476	596,369	1,545	30,948	14,201	45,149	117	662,773	322,894	985,667	2,554
2021	195,792	529	631,676	1,707	33,041	14,667	47,708	129	714,875	338,927	1,053,802	2,848
2022	177,504	493	569,962	1,583	29,398	11,599	40,997	114	655,794	294,273	950,067	2,639
2023	173,650	485	549,147	1,534	29,356	11,014	40,370	113	637,599	282,646	920,245	2,571
2024	176,858	513	542,179	1,572	29,802	11,011	40,813	118	631,943	276,759	908,702	2,634

Table 2 cont. Utilizations of epidural injections in the fee-for-service Medicare population from 2000-2024

HCPCS	Cervical/Thoracic Interlaminar Epidurals (CPT 62310, 62320, 62321)			Lumbar Interlaminar and Caudal Epidurals (CPT 62311, 62322, 62323)			Cervical/Thoracic Transforaminal Epidurals (CPT 64479, 64480)			Lumbar/Sacral Transforaminal Epidurals (CPT 64483, 64484)		
	Services	Rate	Services	Rate	CPT 64479	CPT 64480	Total Services	Rate	CPT 64483	CPT 64484	Total Services	Rate
Change												
2000-2024	133.5%	126.0%	-12.3%	-15.1%	121.5%	16.7%	78.3%	72.6%	643.4%	638.5%	641.9%	618.1%
GM	3.6%	3.5%	-0.5%	-0.7%	3.4%	0.6%	2.4%	2.3%	8.7%	8.7%	8.7%	8.6%
2000-2010	143.9%	126.8%	43.7%	33.6%	197.3%	216.8%	205.4%	183.9%	698.9%	922.3%	767.3%	706.4%
GM	9.3%	8.5%	3.7%	2.9%	11.5%	12.2%	11.8%	11.0%	23.1%	26.2%	24.1%	23.2%
2010-2019	19.9%	9.5%	-17.0%	-24.2%	7.2%	-43.4%	-22.7%	-29.3%	16.2%	0.0%	10.3%	0.8%
Change	2.0%	1.0%	-2.0%	-3.0%	-0.8%	-6.1%	-2.8%	-3.8%	1.7%	0.0%	1.1%	0.1%
2019-2020	-17.1%	-15.5%	-19.1%	-17.7%	-16.6%	-16.1%	-16.5%	-15.0%	-16.0%	-15.7%	-15.9%	-14.4%
2019-2024	-20.1%	-9.0%	-26.5%	-16.2%	-19.7%	-34.9%	-24.5%	-14.0%	-19.9%	-27.8%	-22.5%	-11.7%
GM	-4.4%	-1.9%	-6.0%	-3.5%	-4.3%	-8.2%	-5.5%	-3.0%	-4.3%	-6.3%	-5.0%	-2.5%
2020-2021	6.6%	11.2%	5.9%	10.5%	6.8%	3.3%	5.7%	10.2%	7.9%	5.0%	6.9%	11.5%
2021-2022	-9.3%	-6.8%	-9.8%	-7.3%	-11.0%	-20.9%	-14.1%	-11.7%	-8.3%	-13.2%	-9.8%	-7.3%
2021-2023	-2.2%	-1.6%	-3.7%	-3.1%	-0.1%	-5.0%	-1.5%	-1.0%	-2.8%	-4.0%	-3.1%	-2.6%
2023-2024	1.8%	5.7%	-1.3%	2.5%	1.5%	0.0%	1.1%	4.9%	-0.9%	-2.1%	-1.3%	2.5%

As implementation of the Affordable Care Act (ACA) progressed, enhanced scrutiny of coding, preauthorization, and clinical appropriateness led to stabilization followed by gradual decline. From 2010 to 2019, overall epidural utilization decreased by approximately 1% despite continued expansion of the Medicare population. Multiple factors likely contributed, including more restrictive MAC policies and expanded emphasis on multimodal and non-interventional pain management.

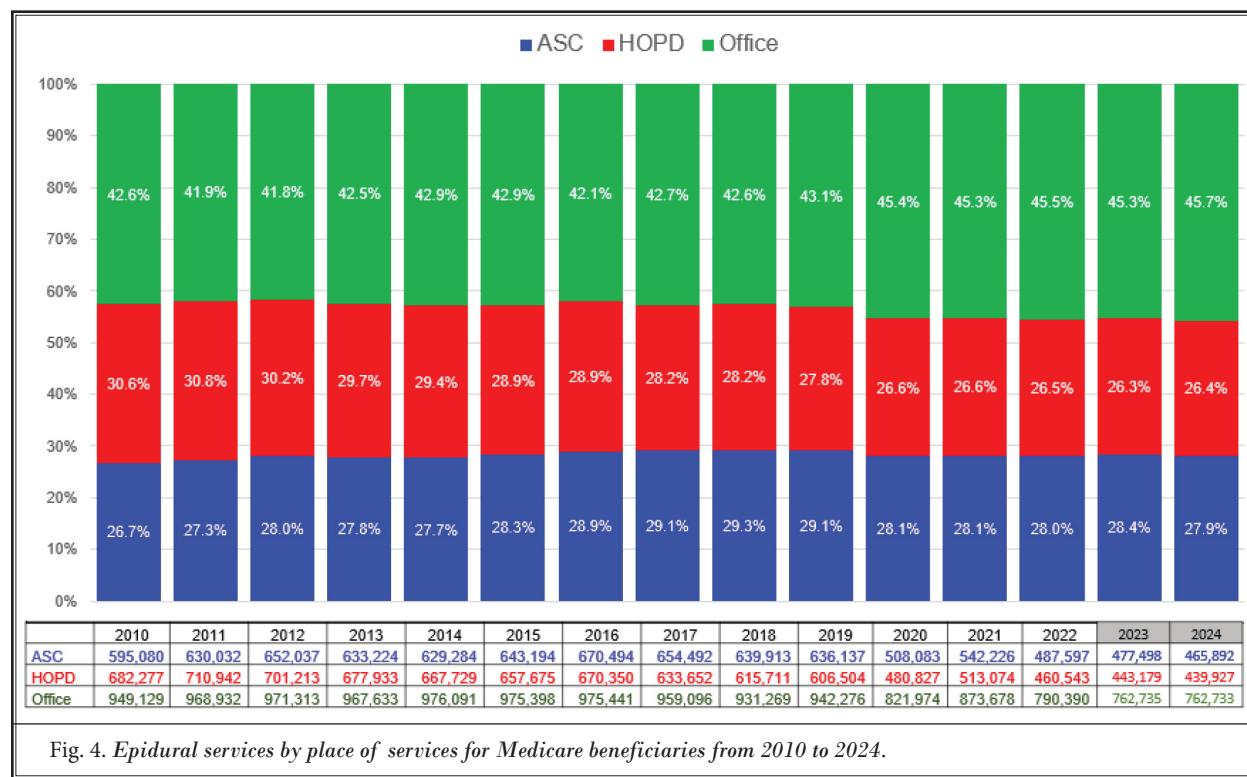
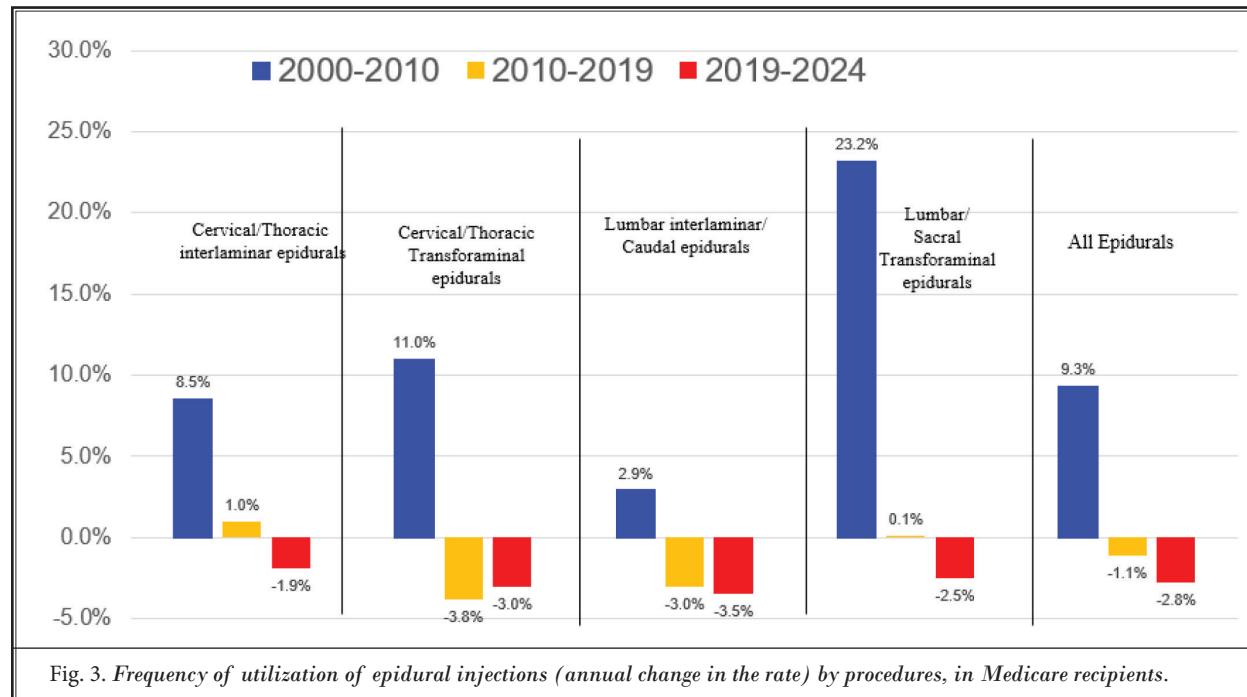
The most dramatic impact occurred during the COVID-19 pandemic from 2019 to 2020, when epidural volumes declined by 15–17% across procedure categories. These reductions were driven by widespread shutdowns, reduced facility access, fluoroscopy limitations, patient hesitancy, and staffing shortages. Although partial recovery followed, utilization remained below pre-pandemic levels through 2024. A modest rebound was noted between 2023 and 2024; however, this was insufficient to return to 2019 baseline levels.

One of the most prominent long-term findings was the shift from interlaminar to transforaminal approaches. Over the 24-year period, transforaminal procedures increased more than 550% when considering primary procedure codes and over 600% when including add-on codes. Interlaminar injections increased only 3.6% overall, despite substantial gains early in the period. These shifts reflect evolving preferences for selective nerve root targeting, increased use of advanced imaging guidance, and clinical belief in greater diagnostic precision. However, the post-2019 declines suggest that transforaminal procedures remain similarly vulnerable to reimbursement and regulatory pressures affecting interventional spine care.

Specialty-specific trends also demonstrated increasing concentration

among interventional pain specialists. By 2024, more than 92% of all epidural injections were performed by interventional pain management, pain medicine,

anesthesiology, PM&R, neurology, and psychiatry specialists. Radiology and surgical specialties continued to see reductions in procedural share, while primary



care physicians contributed fewer than 2% of services. These patterns illustrate ongoing sub specialization, increased credentialing requirements for fluoroscopically guided procedures, and practice consolidation.

Shifts in place of service further emphasized changing delivery structures. From 2000 to 2024, office-based settings increased from 42.6% to 45.7%, ASC utilization rose by 1.2%, and HOPD utilization declined from 30.6% to 26.4%, reflecting patient cost considerations, workflow efficiency, and evolving reimbursement incentives favoring non-hospital sites of service.

Collectively, these findings underscore the dynamic nature of interventional pain practice within Medicare and the influence of clinical, regulatory, epidemiologic, and economic factors shaping epidural injection utilization. Future utilization patterns will require close observation, particularly as reimbursement reductions for ASC procedures take effect beginning in 2026, when CMS payment policy will continue treating ASCs similarly to HOPDs (6-8,36,37,81).

Overall, this study presents an updated evaluation of epidural procedure utilization in traditional Medicare from 2000 to 2024, with focused analysis over three intervals: 2000 to 2010, 2010 to 2019, and 2019 to 2024. The full impact of current policy changes may not be evident until Medicare data from 2026 and subsequent years becomes available.

The strengths of this study include the separation of Medicare Advantage beneficiaries and precise assessment of utilization patterns exclusively among traditional Medicare patients, along with reporting of utilization rates per 100,000 population. This analysis also incorporates the most recent available national CMS data through 2024, addressing a previous limitation where Medicare Advantage data was unavailable and sometimes inappropriately combined with FFS population figures.

## **CONCLUSION**

This analysis of FFS traditional Medicare data from 2000 to 2024 demonstrates substantial changes in utilization patterns, patient demographics, and procedural trends for epidural injections. From 2000 to 2010, a strong upward trend was observed in epidural procedure episodes. However, this growth transitioned to a decline between 2010 and 2019. The COVID-19 pandemic intensified these reductions in 2019–2020, followed by partial recovery during 2021 and a subsequent decrease in 2022. Overall, from 2019 to 2024, all categories of epidural procedures showed notable

declines, with the most significant reductions observed among interlaminar injections. These findings highlight the continuously evolving environment of epidural interventions, influenced by policy changes, economic pressures, and pandemic-related challenges, emphasizing the ongoing need to monitor utilization in chronic pain management.

## **Author Contributions**

The study was designed by LM, VP, and JH.

Statistical analysis was performed by VP.

All authors contributed to the preparation of this study, reviewed, and approved the content with final version.

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## **Author Affiliations**

Dr. Manchikanti is Director, Pain Management Centers of America, Paducah, KY, Clinical Professor, Anesthesiology and Perioperative Medicine, University of Louisville, Louisville, KY, and Professor of Anesthesiology-Research, Department of Anesthesiology, School of Medicine, LSU Health Sciences Center, Shreveport, LA, USA  
drlm@thepainmd.com

Dr. Sanapati is Assistant Professor (Gratis) of Anesthesiology and Research, Department of Anesthesiology and Perioperative Medicine, University of Louisville School of Medicine, Louisville, KY, and Voluntary Faculty, Indiana University School of Medicine, Evansville, IN, USA  
msanapati@gmail.com

Vidyasagar Pampati is a Statistician, Pain Management Centers of America, Paducah, KY, USA  
sagar@thepainmd.com

Dr. Kaye is Professor, Interventional Pain Fellowship Director, Vice Chair of Research, Department of Anesthesiology; Professor, Department of Pharmacology, Toxicology, and Neurosciences, Louisiana State University Health Sciences Center at Shreveport, Shreveport, LA; Professor, Department of Anesthe-

siology, Tulane School of Medicine, and Professor, Department of Anesthesiology and Pharmacology, LSU School of Medicine, New Orleans, LA, USA  
alan.kaye@lsuhs.edu

Dr. Knezevic is Vice Chair for Research, Department of Anesthesiology, Advocate Illinois Masonic Medical Center, Chicago, IL, and Clinical Professor, Department of Anesthesiology and Department of Surgery, College of Medicine, University of Illinois, Chicago, IL, USA  
nick.knezevic@gmail.com

Dr. Navani is Founder and Chief Medical Officer, LeReve Wellness, San Jose, CA and Chief Medical Officer, Boomerang Healthcare, Walnut Creek, CA, USA  
annu@navani.net

Dr. Hirsch is the Director of Interventional Neuroradiology, Chief Interventional Spine at the Massachusetts General Hospital and Professor at Harvard Medical School, Boston, MA, USA  
jahirsch@mgh.harvard.edu

**Supplemental material is available at [www.painphysicianjournal.com](http://www.painphysicianjournal.com)**

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Appendix Table 1. *Utilizations of epidural injections in the fee-for-service Medicare population from 2000-2024.*

	Interlaminar (Cervical/ Thoracic, Lumbar and Caudal Epidurals episodes (CPT 62310, 62311)		Total Transforaminal episodes (64479 & 64483) (Primary codes only)		Ratio (Interlaminar/ transforaminal)	Total Transforaminal with addon codes (64479,64480 & 64483, 64484)	
	HCPCS	Services	Rate	Services	Rate	Services	Rate
2000	694,103	2,079	98,460	295	7.0	145,371	435
2001	787,098	2,285	140,266	407	5.6	201,936	586
2002	886,036	2,531	196,262	561	4.5	286,212	818
2003	948,641	2,597	264,373	724	3.6	394,188	1,079
2004	1,008,823	2,724	388,926	1,050	2.6	603,064	1,629
2005	1,087,002	2,891	423,352	1,126	2.6	660,769	1,758
2006	1,093,709	3,001	481,947	1,323	2.3	750,473	2,060
2007	1,082,444	2,993	536,212	1,483	2.0	832,783	2,303
2008	1,071,055	2,974	604,626	1,679	1.8	946,077	2,627
2009	1,063,669	3,013	669,670	1,897	1.6	1,048,842	2,971
2010	1,073,171	2,988	719,120	2,002	1.5	1,132,136	3,152
2011	1,114,458	3,045	749,608	2,048	1.5	1,174,755	3,210
2012	1,138,569	3,036	754,382	2,012	1.5	1,166,424	3,110
2013	1,118,861	2,960	735,519	1,946	1.5	1,141,026	3,019
2014	1,024,599	2,689	801,737	2,104	1.3	1,231,069	3,231
2015	1,036,124	2,691	809,480	2,103	1.3	1,240,143	3,221
2016	1,048,940	2,669	833,329	2,120	1.3	1,267,345	3,225
2017	1,011,516	2,561	824,280	2,087	1.2	1,235,724	3,128
2018	972,316	2,455	816,599	2,062	1.2	1,214,577	3,067
2019	958,856	2,440	826,014	2,102	1.2	1,226,061	3,120
2020	780,068	2,021	693,721	1,797	1.1	1,030,816	2,671
2021	827,468	2,236	747,916	2,021	1.1	1,101,510	2,977
2022	747,466	2,076	685,192	1,903	1.1	991,064	2,753
2023	722,797	2,019	666,955	1,863	1.1	960,615	2,683
2024	719,037	2,084	661,745	1,918	1.1	949,515	2,752
Change							
2000-2024	3.6%	0.3%	572.1%	550.5%		553.2%	6221.9%
GM	0.1%	0.0%	8.3%	8.1%		8.1%	18.9%
2000-2010	54.6%	43.8%	630.4%	579.1%		678.8%	7141.0%
GM	4.5%	3.7%	22.0%	21.1%		22.8%	53.5%
2010-2019	-10.7%	-18.4%	14.9%	5.0%		8.3%	-1.0%
Change	-1.2%	-2.2%	1.6%	0.5%		0.9%	-0.1%
2019-2020	-18.6%	-17.2%	-16.0%	-14.5%		-15.9%	-14.4%
2019-2024	-25.0%	-14.6%	-19.9%	-8.7%		-22.6%	-11.8%
GM	-5.6%	-3.1%	-4.3%	-1.8%		-5.0%	-2.5%
2020-2021	6.1%	10.7%	7.8%	12.5%		6.9%	11.5%
2021-2022	-9.7%	-7.2%	-8.4%	-5.8%		-10.0%	-7.5%
20212-2023	-3.3%	-2.8%	-2.7%	-2.1%		-3.1%	-2.5%
2023-2024	-0.5%	3.2%	-0.8%	3.0%		-1.2%	2.6%

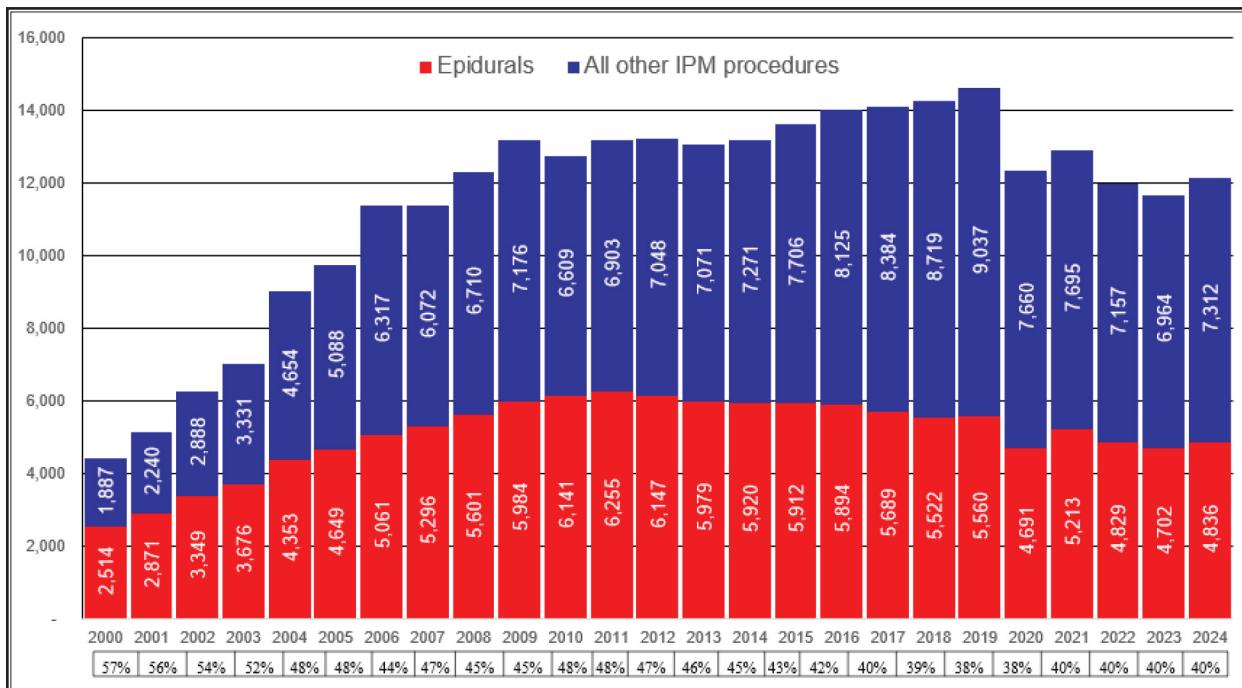
Appendix Table 2. *Utilization patterns of epidural injections by various specialty groups from 2000 to 2024 in Medicare recipients.*

Specialty	Interventional Pain Management <sup>#</sup>		Surgical (neuro, general, & orthopedic)		Radiology		General Physicians		Other Providers (CRNA, NP & PA)		Total	
	Services	Rate	Services	Rate	Services	Rate	Services	Rate	Services	Rate	Services	Rate
2000	702,731 (83.7%)	2,104	47,213 (5.6%)	141	22,794 (2.7%)	68	52,429 (6.2%)	157	14,307 (1.7%)	43	839,474	2,514
2010	1,911,762 (86.7%)	5,323	126,119 (5.7%)	351	83,670 (3.8%)	233	65,610 (3.0%)	183	18,146 (0.8%)	51	2,205,307	6,141
2011	2,008,135 (87.7%)	5,487	117,001 (5.1%)	320	87,447 (3.8%)	239	58,974 (2.6%)	161	17,656 (0.8%)	48	2,289,213	6,255
2012	2,038,618 (88.4%)	5,436	111,135 (4.8%)	296	88,123 (3.8%)	235	50,243 (2.2%)	134	16,874 (0.7%)	45	2,304,993	6,147
2013	2,008,620 (88.9%)	5,314	103,000 (4.6%)	272	82,766 (3.7%)	219	49,848 (2.2%)	132	15,653 (0.7%)	41	2,259,887	5,979
2014	2,019,328 (89.5%)	5,300	100,658 (4.5%)	264	82,257 (3.6%)	216	39,876 (1.8%)	105	13,549 (0.6%)	36	2,255,668	5,920
2015	2,045,138 (89.8%)	5,312	100,262 (4.4%)	260	81,034 (3.6%)	210	36,088 (1.6%)	94	13,745 (0.6%)	36	2,276,267	5,912
2016	2,086,614 (90.1%)	5,309	97,656 (4.2%)	248	82,397 (3.6%)	210	34,722 (1.5%)	88	14,896 (0.6%)	38	2,316,285	5,894
2017	2,028,083 (90.2%)	5,134	92,546 (4.1%)	234	81,559 (3.6%)	206	31,275 (1.4%)	79	13,777 (0.6%)	35	2,247,240	5,689
2018	1,980,578 (90.6%)	5,001	88,170 (4.0%)	223	76,959 (3.5%)	194	27,527 (1.3%)	70	13,659 (0.6%)	34	2,186,893	5,522
2019	1,976,335 (90.5%)	5,029	87,605 (4.0%)	223	78,160 (3.6%)	199	28,176 (1.3%)	72	14,641 (0.7%)	37	2,184,917	5,560
2020	1,643,271 (90.7%)	4,257	73,261 (4.0%)	190	58,491 (3.2%)	152	24,314 (1.3%)	63	11,547 (0.6%)	30	1,810,884	4,691
2021	1,751,965 (90.8%)	4,735	77,119 (4.0%)	208	61,745 (3.2%)	167	25,256 (1.3%)	68	12,893 (0.7%)	35	1,928,978	5,213
2022	1,587,918 (91.3%)	4,411	64,644 (3.7%)	180	51,250 (2.9%)	142	22,905 (1.3%)	64	11,813 (0.7%)	33	1,738,530	4,829
2023	1,543,682 (91.7%)	4,312	59,344 (3.5%)	166	46,533 (2.8%)	130	21,710 (1.3%)	61	12,143 (0.7%)	34	1,683,412	4,702
2024	1,535,934 (92.1%)	4,452	56,393 (3.4%)	163	42,550 (2.6%)	123	20,980 (1.3%)	61	12,695 (0.8%)	37	1,668,552	4,836
2000-2024	118.6%	111.5%	19.4%	15.6%	86.7%	80.7%	-60.0%	-61.3%	-11.3%	-14.1%	98.8%	92.4%
GM	3.3%	3.2%	0.7%	0.6%	2.6%	2.5%	-3.7%	-3.9%	-0.5%	-0.6%	2.9%	2.8%
2000-2010	172.0%	152.9%	167.1%	148.4%	267.1%	241.3%	25.1%	16.4%	26.8%	17.9%	162.7%	144.3%
GM	10.5%	9.7%	10.3%	9.5%	13.9%	13.1%	2.3%	1.5%	2.4%	1.7%	10.1%	9.3%
2010-2019	3.4%	-5.5%	-30.5%	-36.5%	-6.6%	-14.6%	-57.1%	-60.8%	-19.3%	-26.3%	-0.9%	-9.5%
GM	0.4%	-0.6%	-4.0%	-4.9%	-0.8%	-1.7%	-9.0%	-9.9%	-2.4%	-3.3%	-0.1%	-1.1%
2019-2020	-16.9%	-15.3%	-16.4%	-14.9%	-25.2%	-23.8%	-13.7%	-12.1%	-21.1%	-19.7%	-17.1%	-15.6%
2019-2024	-22.3%	-11.5%	-35.6%	-26.7%	-45.6%	-38.0%	-25.5%	-15.2%	-13.3%	-1.2%	-23.6%	-13.0%
GM	-4.9%	-2.4%	-8.4%	-6.0%	-11.5%	-9.1%	-5.7%	-3.2%	-2.8%	-0.2%	-5.2%	-2.7%
2023-2024	-0.5%	3.2%	-5.0%	-1.4%	-8.6%	-5.1%	-3.4%	0.3%	4.5%	8.5%	-0.9%	2.9%

Rate - Per 100,000 Medicare Beneficiaries; GM: Geometric change (Annual change)

IPM (Interventional Pain Management): Anesthesiology, Pain Management, PM&R, Neurology, Psychiatry, General Physicians: Family Practice, General Practice & Internal Medicine

(%) - percentage to row total



Appendix Fig. 1. Utilization rates of epidural injections and all other IPM procedures from 2000 to 2024, in Medicare recipients.