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# Impact of the COVID-19 Pandemic on Utilization Patterns of Facet Joint Interventions in Managing Spinal Pain in a Medicare Population

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## ABSTRACT

**Introduction:** The COVID-19 pandemic resulted in major disruptions in all aspects of human life including a decline of medical services utilized during 2020. An analysis of the impact of COVID-19 pandemic showed an 18.7% reduction in utilization patterns of interventional techniques in managing chronic pain in the Medicare population from

2019 to 2020. However, specific changes in utilization patterns of facet joint interventions have not been studied. Thus, we sought to assess the utilization patterns including an update of facet joint interventions from 2018 to 2020, with analysis of the impact of COVID-19 pandemic in managing chronic spinal pain utilizing facet joint interventions in the fee-for-service Medicare population of the United States.

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**Methods:** The present investigation was designed to assess utilization patterns and variables of facet joint interventions, in managing chronic spinal pain from 2010 to 2020 in the fee-for-service (FFS) Medicare population in the United States (US), and how the COVID-19 pandemic impacted these utilization patterns. Data for the analysis were obtained from the master database from the Centers for Medicare & Medicaid Services (CMS) physician/supplier procedure summary from 2000 to 2020.

**Results:** Results of this analysis showed significant impact of COVID-19 with overall decrease of 18.5% of all facet joint interventions per 100,000 Medicare population compared to 20.2 and 20.5% decrease for lumbar and cervical facet joint injections, 15 and 13.1% decrease per 100,000 Medicare population of lumbosacral and cervicothoracic facet joint neurolysis procedures. The results are significant in that comparative analysis from 2000 to 2010 and 2010 to 2019 showing an annual increase of 14.4 vs. 2.2%, illustrating a decelerating pattern. There were also significant growth patterns noted with decreases in facet joint injections and nerve blocks compared to facet joint neurolytic procedures.

**Conclusions:** This analysis shows a significant effect of COVID-19 producing an overall decrease in utilization of facet joint interventions relative to pre-COVID data. Further, the analysis demonstrates continued deceleration of utilization patterns of facet joint interventions compared to the periods of 2000–2010 and 2010–2019.

**Keywords:** Facet joint interventions; Facet joint nerve blocks; Facet joint neurolysis; Interventional techniques

### Key Summary Points

Facet joint interventions in managing spinal pain experienced explosive growth rates from 2000 to 2009, with a reversal of those growth patterns and in some settings a trend of decline after 2009–2018.

The COVID-19 pandemic reduced utilization of lumbar/sacral facet joint interventions, showing a decrease of 16.7% from 2019 to 2020, in contrast to overall reduction of utilization of interventional techniques of 18.5% per 100,000 Medicare fee-for-service population.

The study was undertaken to provide an update of pre-COVID utilization patterns through 2019 in the United States fee-for-service Medicare population, and to assess the impact of COVID-19 from 2019 to 2020.

The results of this study demonstrated an overall rate of decrease of 18.5% for facet joint interventions. The decrease was more significant for lumbar/sacral facet joint injections compared to radiofrequency neurotomy procedures.

## INTRODUCTION

The COVID-19 pandemic resulted in major disruptions to the overall economy and to healthcare [1–16]. The economic shutdowns, increased pandemic-related hospitalizations, increased disease surveillance, and social isolation contributed to major changes in healthcare. The situation resulted in a decline of services offered during 2020 and extending through and beyond 2021 [1–10]. In the United States, national healthcare expenditures increased to \$4.1 trillion in 2020. Personal and public healthcare in the U.S. from 1996 to 2016

showed an increase of 53.5% from \$86.7 billion in 2013, increasing to \$134.5 billion in 2016, the highest outlay for back and neck pain [12, 13]. In addition to numerous changes brought by the COVID-19 pandemic, there have been multiple changes resulting in declining utilization and perceived curtailed access to medically necessary treatments, including interventional techniques [14–23].

Facet joint interventions are one of the commonly utilized interventional techniques for managing chronic spinal pain. However, with treatment modalities being increasingly scrutinized, facet joint interventions have been criticized for their over-utilization and lack of proven clinical and cost utility. Over the past two decades, multiple modalities in pain management have shown significant escalation in utilization, including opioids, leading to an opioid epidemic and escalating deaths [1–6].

A recent analysis of the impact of the COVID-19 pandemic showed an 18.7% reduction in utilization patterns of interventional techniques in managing chronic pain in the Medicare population from 2019 to 2020 [3]. This study also showed a decrease of facet joint interventions and sacroiliac joint blocks of 17.5%, epidural and adhesiolysis procedures of 19%, and disc procedures and other types of nerve blocks of 25.6% per 100,000 Medicare recipients.

The utilization patterns of facet joint interventions have been well studied with overall increases until 2009, but declining utilization since 2009 [14, 16, 21]. Analysis of the utilization of interventional techniques in the FFS population from 2000 to 2018 showed an annual increase of 0.2% with an overall increase of 7.4% from 2009 to 2018 for lumbar facet injections and neurolytics per 100,000 Medicare population from 2009 to 2018 [16, 21]. Similarly, cervical and thoracic facet joint interventions demonstrated increases from 2009 to 2018 at an annual rate of 0.5% compared to cervicothoracic facet joint neurolytic procedures of 8.7% per 100,000 Medicare recipients [16, 21]. These studies also showed a reversal of the ratio of lumbosacral facet joint injections compared with facet joint neurolytic procedures, decreasing from 6.7% in 2009 to 2.2% in 2018 [16, 21].

Similarly, the ratio of cervicothoracic facet joint injections compared with neurolytic procedures decreased from 8.85% in 2000 to 2.8% in 2018 [16, 21]. Overall, based on the available literature, radiofrequency procedures have increased relative to facet joint nerve blocks and intra-articular injections in the Medicare and commercially insured population [16, 21, 24]. There was an increase of 2.5% of lumbar facet joint injection procedures annually from 2007 to 2016, compared to radiofrequency neurotomy procedures from 35 to 53 per 100,000 enrollees in the commercially insured population [24].

Even though positive literature continues to emerge showing the clinical and cost-effectiveness of facet joint interventions, along with other interventional techniques, there are persisting impressions of the lack of clinical efficacy and cost-effectiveness. The positive evidence is presented in guidelines, systematic reviews, randomized controlled trials (RCTs), observational studies, diagnostic accuracy studies, and, finally, cost utility studies [25–50]. The majority of the discordance regarding the effectiveness of interventional techniques appears to be due to lack of agreement between proponents and opponents of the methodological evaluation of the literature [24, 50].

Consequently, multiple attempts to control utilization patterns have been initiated, specifically following reports from the Office of Inspector General (OIG) on overutilization and increasing costs of facet joint interventions relative to epidural injections [50–52]. Multiple local coverage determinations (LCDs), as well as medical policies have been revised using stricter inclusion criteria with severe restrictions on performing therapeutic facet joint injections unless specific contraindications for radiofrequency neurotomy are documented [53–61].

The present investigation was undertaken as a retrospective cohort study of utilization of patterns of facet joint interventions including the impact of COVID-19 from 2019 to 2020, with an update of pre-COVID utilization patterns to 2019, from previous publications regarding the United States FFS Medicare population [16, 21].

## METHODS

The present retrospective cohort study of utilization patterns of facet joint interventions was undertaken using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) criteria and similar methods have previously been utilized by our team [62]. The non-identifiable data utilized in this evaluation was obtained from the public use files (PUF), which is non-attributable and non-confidential, available through the Centers for Medicare and Medicaid Services (CMS) [63].

### Ethics Compliance

This article is based on previously conducted studies and does not contain any studies with human participants or animals performed by any of the authors.

### Study Design

This retrospective cohort study was designed to assess utilization patterns and variables for using multiple facet joint interventions in managing chronic spinal pain from 2000 to 2020. This study focused on the impact of the COVID-19 pandemic on utilization in the Medicare FFS population in the United States.

### Objectives

The objectives of this assessment were the evaluation of the impact of the COVID-19 pandemic on utilization patterns of facet joint interventions from 2019 to 2020 in the FFS Medicare population.

### Setting

The national database of specialty usage data files from CMS in the FFS Medicare population in the United States [63].

## Participants

All the participants in the database included all FFS Medicare recipients from 2000 to 2020, whether they were on Medicare due to Social Security disability, Social Security insurance, or retirement.

## Variables

Multiple variables were assessed in the utilization patterns of facet joint interventions in the Medicare population from 2019 to 2020 in order to evaluate the impact of the COVID-19 pandemic, including an analysis of the usage patterns from 2010 to 2019 and 2010 to 2020. Additionally, multiple characteristics of the Medicare population and the growth of that population were also studied.

Historically, facet joint interventions have been performed by physicians of various specialties, including interventional pain management (–09 specialty code), pain medicine (–72), anesthesiology (–05), physical medicine and rehabilitation (–25), neurology (–13), radiology (–30, –94), and psychiatry (–26). A multitude of other specialties also perform interventional procedures less frequently. Based on Medicare designations, orthopedic surgery (–20), general surgery (–17), and neurosurgery (–14) are combined as a surgical group; diagnostic radiology (–30), and interventional radiology (–94) are combined as a radiological group. All other physicians constitute a separate group, and all other providers are considered as “other providers”.

The procedure codes for facet joint interventions in effect during 2000–2020 were as follows:

- Facet joint interventions (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)
- Multiple interventional procedures CPT codes as utilized in comparative evaluations

have been described in a recent manuscript [3].

The data were also assessed based on the place of service—facility (ambulatory surgery center or hospital outpatient department) or non-facility (office).

The data were compared based on Medicare Administrative Contractor jurisdictions. A Medicare Administrative Contractor or MAC is a private health insurer who has been granted certain geographical jurisdictions in the US by CMS to process Medicare Part A and Part B medical claims or durable medical equipment claims for Medicare fee-for-service beneficiaries, based on the Medicare Prescription Drug Improvement and Modernization Act (MMA) of 2003.

### Data Sources

All the analyzed data were obtained from the CMS Physician/Supplier Procedure Summary Master Data from 2000 to 2020 [63]. These data included all FFS Medicare participants receiving interventional techniques irrespective of the type of disability.

### Measures

The CMS 100% dataset consists of procedure codes (primary procedure, add-on, and bilateral), specialty codes, place of service, total services, and denied services. The usage pattern analysis included all allowed services configured by taking services submitted minus services denied, any services with zero payments, and those with a service code of 8 or F. Allowed services were assessed for each procedure. Rates were calculated based on Medicare beneficiaries for the corresponding year and are reported as procedures per 100,000 Medicare beneficiaries.

### Bias

The data was purchased from CMS by the American Society of Interventional Pain Physicians (ASIPP). The study was conducted using the internal resources of the primary author's

practice without external funding or grants, either from industry or elsewhere.

### Study Size

The study size is large with the inclusion of all patients under Medicare FFS undergoing facet joint interventions in all settings for all regions in the US for chronic spinal pain from 2000 to 2020.

### Data Compilation

The data were compiled using Microsoft Access 2020 and Microsoft Excel 2020 (Microsoft Corporation, Redmond, WA, USA).

### Funding

There was no external funding in the preparation of this manuscript.

## RESULTS

### Participants

Participants in this assessment included all FFS Medicare recipients from 2000, and 2010–2020.

### Descriptive Data of Population Characteristics

Table 1 shows various characteristics of Medicare beneficiaries and facet joint interventions from 2000–2010 and 2010–2019, and with special emphasis on 2019 to 2020. From 2000 to 2010, the overall US population increased 9.4% with those older than 65 years of age increasing by 14.8%. The proportion of the elderly population in the US constituted 12.4% in 2000, which increased to 13% in 2010 and 16.9% in 2020. Medicare beneficiaries also showed similar changes during 2010 to 2020, with the number of Medicare beneficiaries increasing 33% in contrast to a change in the total population of 7%, and the population above 65 years of age increasing to 39%. The ratio of Medicare

**Table 1** Characteristics of Medicare beneficiaries and facet joint interventions from 2000 to 2020

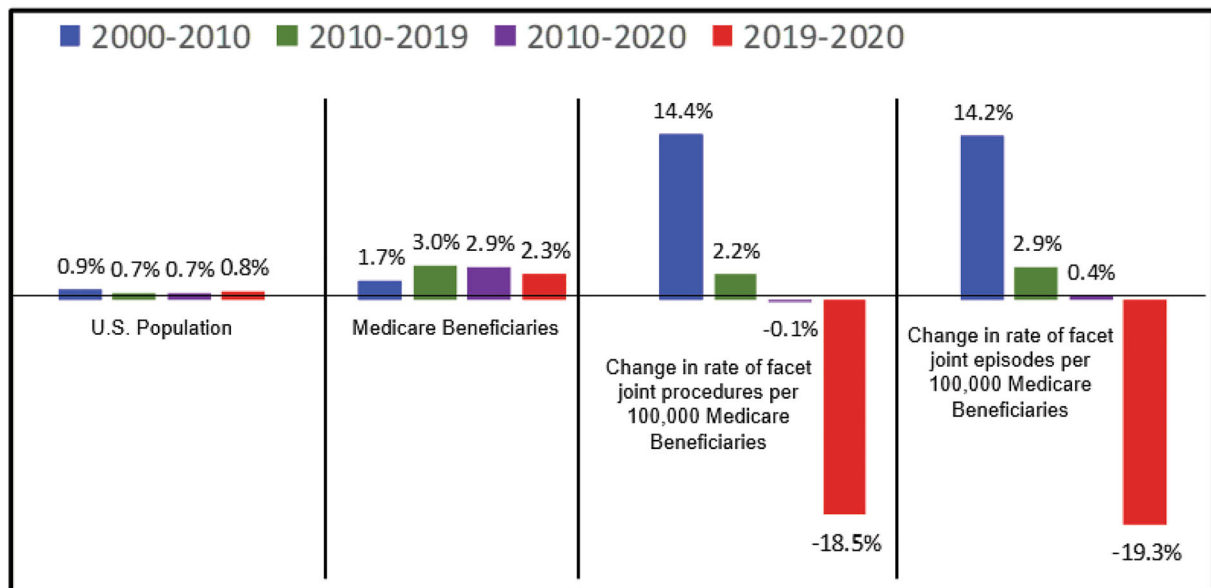
	U.S. Population		≥ 65 Years		Medicare beneficiaries			Facet joint interventions*				
	Total population (,000)	Percent	Number (,000)	Percent	% to U.S. population	≥ 65 years (,000) (Percent)	< 65 years (,000) Percent	Services* (Percent)	Rate Per 100,000	Only primary codes	Rate Per 100,000	
2000	282,172	12.4%	35,077	12.4%	14.0%	34,262 (86.5%)	5370 (13.5%)	375,242 (68%)	947	144,157	364	
2010	308,746	13.0%	40,268	13.0%	15.2%	38,991 (83.1%)	7923 (16.9%)	1,699,677 (49%)	3623	645,197	1375	
2011	311,583	13.3%	41,370	13.3%	15.5%	40,000 (82.8%)	8300 (17.2%)	1,811,573 (51%)	3751	682,472	1413	
2012	313,874	13.8%	43,144	13.8%	16.0%	41,900 (83.3%)	8500 (16.9%)	1,892,296 (51%)	3762	734,514	1460	
2013	316,129	14.1%	44,704	14.1%	16.4%	43,100 (83.0%)	8800 (17.0%)	1,931,123 (51%)	3721	753,922	1453	
2014	318,892	14.5%	46,179	14.5%	16.8%	44,600 (83.4%)	8900 (16.5%)	2,091,134 (50%)	3909	825,287	1543	
2015	320,897	14.88%	47,734	14.88%	17.1%	46,000 (83.8%)	9000 (16.4%)	2,271,431 (51%)	4137	897,742	1635	
2016	323,127	15.24%	49,244	15.24%	17.5%	47,500 (84.1%)	9000 (15.9%)	2,444,079 (52%)	4326	967,868	1713	
2017	326,625	15.63%	51,055	15.63%	17.8%	49,200 (84.8%)	8900 (15.2%)	2,537,254 (53%)	4375	1,011,287	1744	
2018	327,167	16.00%	52,347	16.00%	18.2%	50,800 (85.2%)	8800 (14.8%)	2,638,563 (53%)	4427	1,055,571	1771	
2019	328,293	16.47%	54,074	16.47%	18.6%	52,600 (85.8%)	8700 (14.2%)	2,702,551 (54%)	4416	1,085,479	1774	

**Table 1** continued

	U.S. Population		≥ 65 Years		Medicare beneficiaries		Facet joint interventions*			
	Total population (,000)	% to U.S. population	Number (,000)	Percent	Number (,000)	% to U.S. population	Services* (48%)	Rate Per 100,000	Only primary codes	Rate per 100,000
2020	331,002		55,939	16.90%	62,600	18.9%	8500 (13.6%)	2,253,781	896,308	1432
2000–2020										
Change	17.3%		59.5%	36.3%	58.0%	35.1%	58.3%	500.6%	521.8%	293.6%
GM	0.8%		2.4%	1.6%	2.3%	1.5%	2.3%	9.4%	9.6%	7.1%
2000–2010										
Change	9.4%		14.8%	4.8%	18.4%	8.5%	47.5%	353.0%	347.6%	278.1%
GM	0.9%		1.4%	0.5%	1.7%	0.8%	4.0%	16.3%	16.2%	14.2%
2010–2019										
Change	6.3%		34.3%	26.7%	30.5%	22.7%	9.8%	59.0%	68.2%	29.0%
GM	0.7%		3.3%	2.7%	3.0%	2.3%	1.0%	5.3%	5.9%	2.9%
2010–2020										
Change	7%		39%	30%	33%	24%	7%	33%	38.9%	4.1%
GM	0.7%		3.3%	2.7%	2.9%	2.2%	0.7%	2.9%	3.3%	0.4%
2019–2020	0.8%		3.4%	2.6%	2.3%	1.5%	– 2.3%	– 16.6%	– 17.4%	– 19.3%

\*Facet joint blocks: 64,470 or 64,490, 64,472 64,491 or 64,492; L/S facet Joint blocks 64,475 or 64,493, 64,476 or 64,494 or 64,495; C/T Facet Neurolysis: 64,626 or 64,633, 64,627 or 64,634; L/S facet neurolysis: 64,622 or 64,635, 64,623 or 64,636  
 GM—Geometric average annual change ( ) in facility percentage of procedures





**Fig. 1** Analysis of the annual growth the utilization rate of facet joint services in the Medicare beneficiaries, and the rate of episodes per 100,000 Medicare beneficiaries (data presented in Table 1)

beneficiaries was 14% in 2000, which increased to 18.9% in 2020 with an increase of 24% from 2010 to 2020.

Facet joint interventions from 2000 to 2010 showed a progressive increase in annual services of 16.3% with an average annual change per 100,000 Medicare recipients of 14.4%. However, from 2010 to 2019, there was a deceleration in growth with services increasing at an annual rate of only 5.3%, whereas the average annual change per 100,000 Medicare recipients increased by only 2.2%. From 2019 to 2020, facet joint interventions services decreased 16.6%, with the average annual change per 100,000 Medicare recipients decreasing by 18.5%. Utilizing the number of episodes or patient encounters per region, changes were similar. However, significant negative effects were seen from 2019 to 2020 with services decreasing to 3600 from 4416 per 100,000 Medicare recipients and episodes decreasing from 1774 in 2019 to 1432 in 2020.

Figure 1 shows changes in the Medicare population and utilization of facet joint procedures in Medicare beneficiaries, as well as the rate of facet joint procedures per 100,000 beneficiaries. It also shows the change in the rate of facet joint episodes.

### Utilization Characteristics

Table 2 shows the frequency of utilization of facet joint interventional services, which also includes add-on codes in the FFS Medicare population from 2000 to 2020. This table shows data of facet joint nerve blocks and radiofrequency neurotomy, both in the cervical/thoracic spine and the lumbar/sacral spine. From 2000 to 2010, services increased 17.4% for cervical facet joint nerve blocks at a rate of 15.5% annually compared to lumbar facet joint nerve blocks, which increased 15.7% at an annual rate of 13.8%. During the same period, radiofrequency neurolytic procedures increased in cervical spine total services by 25.6% at an annual rate of 23.5%, compared to those in the lumbar spine of 21.7 and 19.6%. From 2000 to 2010, all cervical facet joint interventions increased by 18.8%, services per year at an average annual rate of 16.8%, whereas all lumbar facet joint interventions increased by 15% at an average annual rate of 13.8%. There was an increase in all facet joint interventions by 16.3% at an annual rate of 14.4%. From 2010 to 2019, there were substantial changes with an increase in cervical facet joint nerve blocks of 4.9% at an

**Table 2** Frequency of utilizations of facet joint interventional services (including add-on codes) in the FFS Medicare population from 2000–2020

Year	C/T facet joint injections (64,470,64,471 or 64,490, 64,491, 64,493)		C/T facet neurolysis 64,626, 64,627 or 64,633, 64,634		C/T facet joint interventions (64,470,64,471 or 64,490, 64,491, 64,493, 64,626, 64,627 or 64,633, 64,634)		L/S facet joint injections (64,475, 64,476 or 64,494, 64,495)		L/S facet neurolysis 64,622, 64,623 or 64,635,64,636		L/S facet joint interventions (64,475, 64,476 or 64,493, 64,494, 64,495, 64,622, 64,623 or 64,635,64,636)		All (C/T/L/S) facet joint interventions	
	Services	Rate	Services	Rate	Services	Rate	Services	Rate	Services	Rate	Services	Rate	Services	Rate
F2000	58,324	147.16	8804	22	67,128	169	254,791	643	53,323	135	308,114	777	375,242	947
F2010	290,640	620	85,807	183	376,447	802	944,469	2013	378,761	807	1,323,230	2821	1,699,677	3623
F2011	317,220	657	97,526	202	414,746	859	990,449	2,051	406,378	841	1,396,827	2892	1,811,573	3751
F2012	334,751	666	101,717	202	436,468	868	1,049,496	2086	406,332	808	1,455,828	2894	1,892,296	3762
F2013	343,919	663	108,957	210	452,876	873	1,043,861	2011	434,386	837	1,478,247	2848	1,931,123	3721
F2014	364,436	681	120,218	225	484,654	906	1,125,757	2104	480,723	899	1,606,480	3003	2,091,134	3909
F2015	387,042	705	136,733	249	523,775	954	1,205,502	2196	542,154	988	1,747,656	3183	2,271,431	4137
F2016	412,873	731	156,916	278	569,789	1008	1,256,525	2224	617,765	1093	1,874,290	3317	2,444,079	4326
F2017	420,046	724	171,321	295	591,367	1020	1,273,415	2196	672,472	1159	1,945,887	3355	2,537,254	4375
F2018	434,054	728	186,718	313	620,772	1042	1,297,863	2178	719,928	1208	2,017,791	3386	2,638,563	4427
F2019	446,104	729	197,156	322	643,260	1051	1,314,398	2148	744,893	1217	2,059,291	3365	2,702,551	4416
F2020	362,572	579	175,343	280	537,915	859	1,068,062	1706	647,804	1035	1,715,866	2741	2,253,781	3600
2000–2020	521.7%	293.6%	1891.6%	1160.9%	701.3%	407.3%	319.2%	165.4%	1114.9%	669.1%	456.9%	252.6%	500.6%	280.3%
GM	9.6%	7.1%	16.1%	13.5%	11.0%	8.5%	7.4%	5.0%	13.3%	10.7%	9.0%	6.5%	9.4%	6.9%
2000–2010	398.3%	321.0%	874.6%	723.4%	460.8%	373.7%	270.7%	213.1%	610.3%	500.1%	329.5%	262.8%	353.0%	282.6%
GM	17.4%	15.5%	25.6%	23.5%	18.8%	16.8%	14.0%	12.1%	21.7%	19.6%	15.7%	13.8%	16.3%	14.4%
2010–2019	53.5%	17.7%	129.8%	76.1%	70.9%	31.0%	39.2%	6.7%	96.7%	50.8%	55.6%	19.3%	59.0%	21.9%
Change	4.9%	1.8%	9.7%	6.5%	6.1%	3.0%	3.7%	0.7%	7.8%	4.7%	5.0%	2.0%	5.3%	2.2%

Table 2 continued

Year	C/T facet joint injections	C/T facet neurolysis	C/T facet joint interventions	L/S facet joint injections	L/S facet neurolysis	L/S facet joint interventions	L/S facet joint interventions	All (C/T/L/S) facet joint interventions						
	(64,470,64,471, 64,490, 64,491, 64,493)	64,626, 64,633, 64,634	(64,470,64,471 or 64,490, 64,491, 64,493, 64,626, 64,627 or 64,633, 64,634)	(64,475, 64,476 or 64,493, 64,494, 64,495)	64,622, 64,623 or 64,635,64,636	(64,475, 64,476 or 64,493, 64,494, 64,495, 64,622, 64,623 or 64,635,64,636)								
	Services	Rate	Services	Rate	Services	Rate	Services	Rate						
2010–2020	24.7%	- 6.5%	104.3%	53.1%	42.9%	7.1%	13.1%	- 15.3%	71.0%	28.2%	29.7%	- 2.8%	33%	- 1%
GM	2.2%	- 0.7%	7.4%	4.4%	3.6%	0.7%	1.2%	- 1.6%	5.5%	2.5%	2.6%	- 0.3%	2.9%	- 0.1%
2019–2020	- 18.7%	- 20.5%	- 11.1%	- 13.1%	- 16.4%	- 18.2%	- 18.7%	- 20.6%	- 13.0%	- 15.0%	- 16.7%	18.5%	- 16.6%	- 18.5%

average annual rate of 1.8%, compared to lumbar facet joint nerve blocks with an increase of 3.7% services at an average annual 0.7% rate of change. In contrast, during the same period from 2010 to 2019, cervical facet neurolysis procedures increased 9.7% at an average annual rate of 6.5%, and lumbar facet neurolysis procedures increased 7.8% at an average annual rate of 4.7%. All cervical facet joint interventions increased 6.1% at an average annual rate of 3%, and lumbar facet joint interventions increased 5% and 2%. There was an overall increase of all facet interventions by 5.3%, at an average rate of 2.2% per annum. There was a complete reversal from 2019 to 2020 with cervical facet joint nerve blocks decreasing 18.7% at an average annual rate of decrease of 20.5% compared to lumbar facet joint nerve blocks which decreased 15% at an average annual rate of 16.7%. Radiofrequency neurotomy procedures in the cervical spine decreased 11.1% at an average annual rate of 13.1% compared to the decreases in lumbar facet joint radiofrequency neurotomies of 15% at an average annual rate of 16.7%, with an overall decrease of all services by 16.6% at an average annual rate of 18.5%.

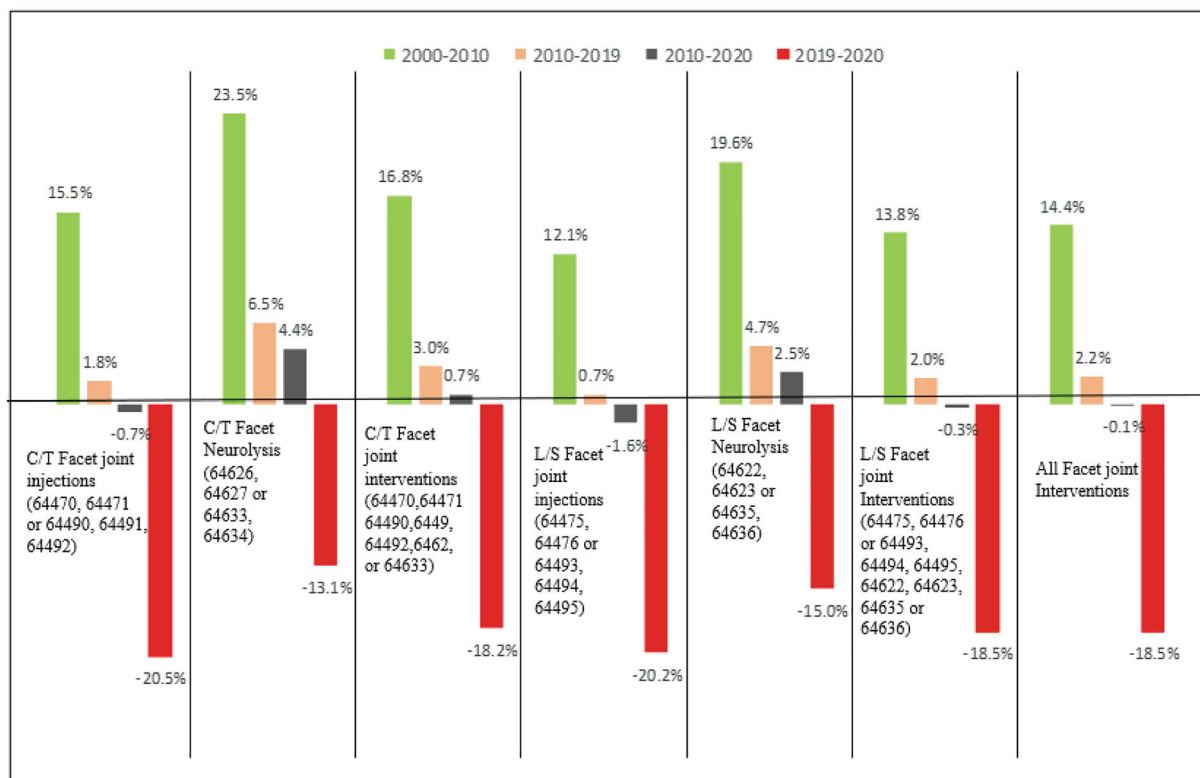
Figure 2 shows the same data in a graphic presentation.

Table 3 shows the frequency of facet joint interventional episodes utilizing primary codes only without add-on codes. While the total number of episodes compared to services was lower, the rate of change showed similar patterns with increases similar to those presented above with slightly different percentages.

Figure 3 shows the data in a graphic display.

The data also show the number of procedures per episode was 2.6 in 2000 and 2010, with 2.5 procedures per episode in 2019 and 2020.

As shown in Tables 2 and 3, the declines were steeper for lumbar facet joint interventions compared to cervical facet joint interventions. The comparison in decline of services is also based on the number of services provided. Lumbar facet joint services were 777 in the year 2000 per 100,000 Medicare beneficiaries, which increased to 3365 in 2019 and decreased to 2741 in 2020 compared to cervical total rate of



**Fig. 2** Annual change in frequency of utilization of facet joint interventional services from 2000 to 2020 per 100,000 Medicare recipients. Data derived from Table 2

services of 69 vs. 777 in 2000 and 414 vs. 3365 in 2019 and 2741 vs. 338 in 2020. Thus, for each cervical procedure, over 8.5 lumbar procedures are performed. Similarly, cervical facet joint episodes also show similar ratios with 22 in 2000 compared to 294 for lumbar facet joint interventions, changing to 322 for cervical facet joint episodes compared to 1360 for lumbar facet joint episodes in 2019, whereas in 2020, the numbers were 280 vs. 1094 for cervical and lumbar, respectively, with a ratio of 3.9 episodes of lumbar interventions compared to one intervention of cervical episode.

**Specialty Characteristics**

Table 4 and Fig. 4 show the frequency of utilization of facet joint interventions on specialty designation. Interventional pain management specialties gradually increased their share from

71.1% in 2000 to over 94% in 2018, continuing through 2020.

**Site of Service Characteristics**

Facet joint interventions are performed in multiple settings including hospital outpatient departments, ambulatory surgical centers, and in physician offices with resultant implications for payment. There has been a significant shift over the years in the performance of interventional techniques based on the location of the procedures performed, as shown in Table 5.

**DISCUSSION**

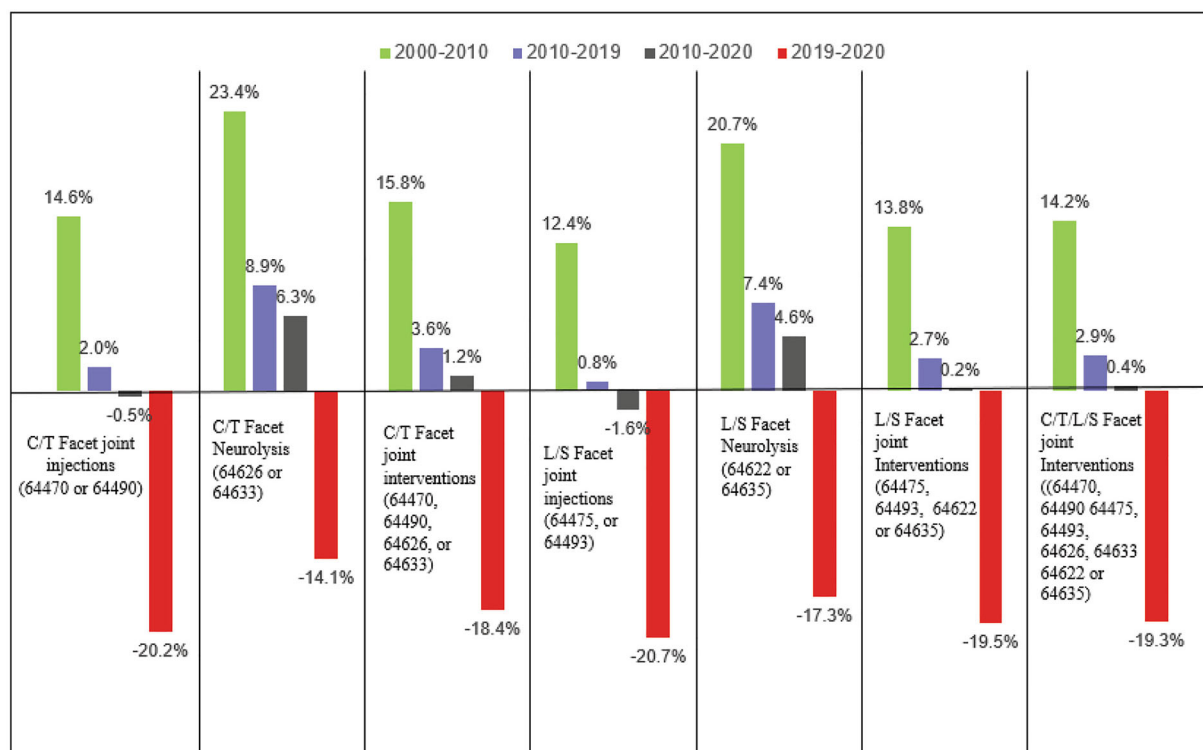
The present analysis of utilization patterns of facet joint interventions in managing spinal pain through 2020 provides an update from previous publications up to 2018 [16, 18], and assesses the impact of the COVID-19 pandemic

**Table 3** Frequency of utilizations of facet joint interventions episodes (primary codes only) in the FFS Medicare population from 2000–2020

	U.S. Population		≥ 65 Years		Medicare beneficiaries		Facet joint interventions*							
	Total population (,000)	U.S. population (,000)	Number (,000)	Percent	Number (,000)	% to U.S. population (Percent)	≥ 65 years (,000)	Percent	< 65 years (,000)	Percent	Services* (Percent)	Rate Per 100,000	Only primary codes	Rate per 100,000
2000	282,172	35,077	39,632	12.4%	39,632	14.0%	34,262 (86.5%)	5370 (13.5%)	375,242 (68%)	947	144,157	364		
2010	308,746	40,268	46,914	13.0%	46,914	15.2%	38,991 (83.1%)	7923 (16.9%)	1,699,677 (49%)	3623	645,197	1375		
2011	311,583	41,370	48,300	13.3%	48,300	15.5%	40,000 (82.8%)	8300 (17.2%)	1,811,573 (51%)	3751	682,472	1413		
2012	313,874	43,144	50,300	13.8%	50,300	16.0%	41,900 (83.3%)	8500 (16.9%)	1,892,296 (51%)	3762	734,514	1460		
2013	316,129	44,704	51,900	14.1%	51,900	16.4%	43,100 (83.0%)	8800 (17.0%)	1,931,123 (51%)	3721	753,922	1453		
2014	318,892	46,179	53,500	14.5%	53,500	16.8%	44,600 (83.4%)	8900 (16.5%)	2,091,134 (50%)	3909	825,287	1543		
2015	320,897	47,734	54,900	14.88%	54,900	17.1%	46,000 (83.8%)	9000 (16.4%)	2,271,431 (51%)	4137	897,742	1635		
2016	323,127	49,244	56,500	15.24%	56,500	17.5%	47,500 (84.1%)	9000 (15.9%)	2,444,079 (52%)	4326	967,868	1713		
2017	326,625	51,055	58,000	15.63%	58,000	17.8%	49,200 (84.8%)	8900 (15.2%)	2,537,254 (53%)	4375	1,011,287	1744		
2018	327,167	52,347	59,600	16.00%	59,600	18.2%	50,800 (85.2%)	8800 (14.8%)	2,638,563 (53%)	4427	1,055,571	1771		
2019	328,293	54,074	61,200	16.47%	61,200	18.6%	52,600 (85.8%)	8700 (14.2%)	2,702,551 (54%)	4416	1,085,479	1774		

**Table 3** continued

	U.S. Population		Medicare beneficiaries				Facet joint interventions*				
	≥ 65 Years (,000)		Number (,000)	Percent	% to U.S. population	≥ 65 years (,000) (Percent)	< 65 years (,000) Percent	Services*	Rate Per 100,000	Only primary codes	Rate per 100,000
	Number (,000)	Percent									
2020	331,002	55,939	62,600	16.90%	18.9%	54,100 (86.4%)	8500 (13.6%)	2,253,781 (48%)	3600	896,308	1432
2000–2020											
Change	17.3%	59.5%	58.0%	36.3%	35.1%	57.9%	58.3%	500.6%	280.3%	521.8%	293.6%
GM	0.8%	2.4%	2.3%	1.6%	1.5%	2.3%	2.3%	9.4%	6.9%	9.6%	7.1%
2000–2010											
Change	9.4%	14.8%	18.4%	4.8%	8.5%	13.8%	47.5%	353.0%	282.6%	347.6%	278.1%
GM	0.9%	1.4%	1.7%	0.5%	0.8%	1.3%	4.0%	16.3%	14.4%	16.2%	14.2%
2010–2019											
Change	6.3%	34.3%	30.5%	26.7%	22.7%	34.9%	9.8%	59.0%	21.9%	68.2%	29.0%
GM	0.7%	3.3%	3.0%	2.7%	2.3%	3.4%	1.0%	5.3%	2.2%	5.9%	2.9%
2010–2020											
Change	7%	39%	33%	30%	24%	39%	7%	33%	– 1%	38.9%	4.1%
GM	0.7%	3.3%	2.9%	2.7%	2.2%	3.3%	0.7%	2.9%	– 0.1%	3.3%	0.4%
2019–2020	0.8%	3.4%	2.3%	2.6%	1.5%	2.9%	– 2.3%	– 16.6%	– 18.5%	– 17.4%	– 19.3%



**Fig. 3** Annual change in frequency of utilization of facet joint interventions episodes (primary codes only) from 2000 to 2020, in Medicare recipients

in the Medicare FFS population. Overall results showed a continued increase, albeit at a slower rate, of facet joint interventional services of 5.3% at an average annual rate of 2.2% from 2010 to 2019, compared to the data from 2000 to 2010, which demonstrated a significant progressive increase in annual services of 16.3% with an average annual change per 100,000 Medicare recipients of 14.4%. The reduction in growth and decline of some procedures with an increase of others has been observed from 2010 onwards as in previous evaluations [16]. In addition, from 2000 to 2010, lumbar facet joint injections sessions or episodes grew by 14% at an average annual rate of 12.1%, but declined from 2010 to 2019 to a growth rate of 3.7% with an average annual rate of 0.7%. From 2000 to 2010, cervical/thoracic facet joint injection episodes increased by 17.4% at an average annual rate of 15.5%. Although those procedures increased during 2010 to 2019, they did so at a slower pace of 4.9% at an average annual rate of 1.8%. Cervical/thoracic facet neurolysis

procedures grew during 2000–2010 by 25.6% at an annual rate of 23.5%. Those procedures had a slower increase during 2010 to 2019 of 9.7% at an average annual rate of 6.5%.

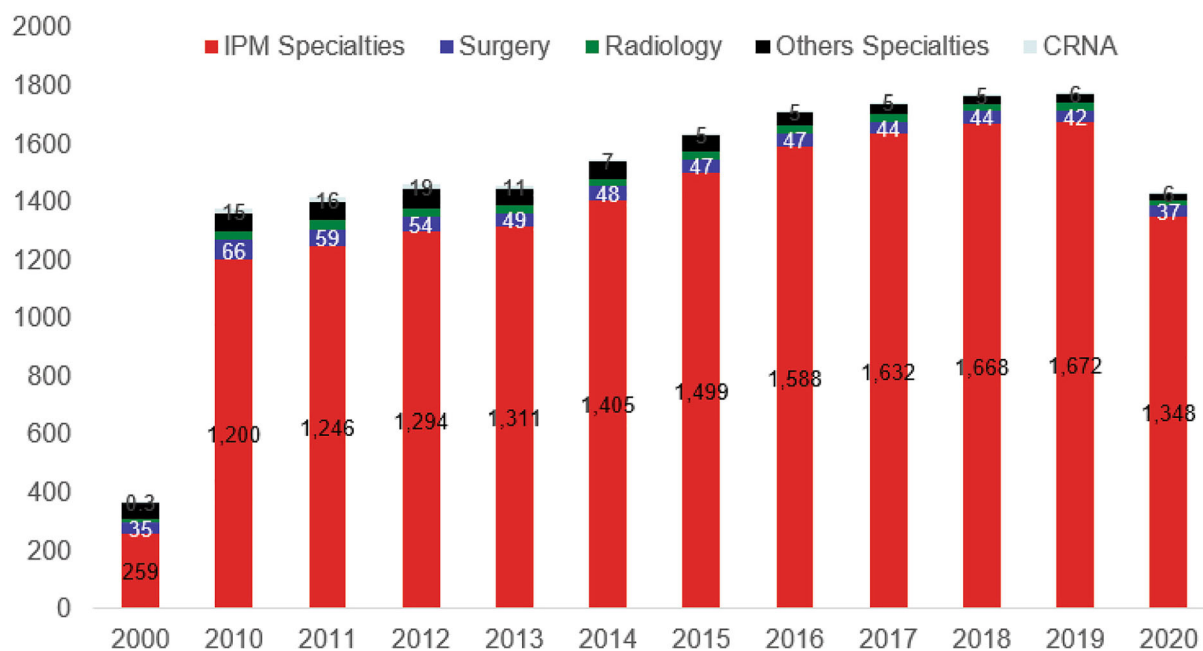
The greatest decline in growth rates during 2010 to 2019 occurred with lumbar/sacral facet joint injections, decreasing to 3.7% at an average annual rate of 0.7%. Comparatively, growth in lumbar/sacral facet neurolysis declined to 7.8% at an average annual rate of 4.7%, while cervical/thoracic neurolysis declined to 9.7% with an average annual rate of 6.5%.

One of the important findings of this analysis is the substantial drop in all services due to the COVID-19 pandemic that led to facility closures and lack of access to interventions. Comparing data from 2019 to 2020 for all cervical/thoracic and lumbar/sacral interventions there was a pronounced absolute decline of 16.6% in services at an average annual rate of –18.5%. The declines were based on only 9 months of data in 2020; had the entire data from 2020 been available, the declines would

**Table 4** Utilizations of facet joint interventions by specialty the Medicare population from 2000 to 2020 (only for primary codes)

Specialty	IPM specialties			Surgery			Radiology			Other specialties			(CRNA, NP, PA)			Total		
	Services	%	Rate	Services	%	Rate	Services	%	Rate	Services	%	Rate	Services	%	Rate	Services	%	Rate
F2000	102,467	71.1	259	13,714	9.5	35	5,841	4.1	15	22,032	15.3	56	103	0.1	0.3	144,157	364	
F2010	563,114	87.3	1200	31,104	4.8	66	14,072	2.2	30	30,044	4.7	64	6863	1.1	15	645,197	1375	
F2011	601,824	88.2	1246	28,544	4.2	59	14,761	2.2	31	29,746	4.4	62	7597	1.1	16	682,472	1413	
F2012	650,963	88.6	1294	27,222	3.7	54	15,300	2.1	30	31,450	4.3	63	9576	1.3	19	734,511	1460	
F2013	680,423	90.3	1311	25,398	3.4	49	12,850	1.7	25	29,556	3.9	57	5695	0.8	11	753,922	1453	
F2014	751,742	91.1	1405	25,440	3.1	48	12,385	1.5	23	32,185	3.9	60	3535	0.4	7	825,287	1543	
F2015	823,086	91.7	1499	26,046	2.9	47	13,000	1.4	24	32,826	3.7	60	2784	0.3	5	897,742	1635	
F2016	897,451	92.7	1588	26,429	2.7	47	13,911	1.4	25	27,196	2.8	48	2881	0.3	5	967,868	1713	
F2017	946,641	93.6	1632	25,713	2.5	44	14,713	1.5	25	21,198	2.1	37	3022	0.3	5	1,011,287	1744	
F2018	994,354	94.2	1668	26,316	2.5	44	15,663	1.5	26	16,091	1.5	27	3147	0.3	5	1,055,571	1771	
F2019	1,023,256	94.3	1672	25,607	2.4	42	16,550	1.5	27	16,442	1.5	27	3624	0.3	6	1,085,479	1774	
F2020	843,679	94.1	1348	23,095	2.6	37	12,952	1.4	21	12,651	1.4	20	3931	0.4	6	896,308	1432	
2000–2020																		
Change	723.4%	32.4%	421.3%	68.4%	-72.9%	6.6%	121.7%	-64.3%	40.4%	-42.6%	-90.8%	-63.6%	3716.5%	513.8%	2316.2%	521.8%	293.6%	
GM	11.1%	1.4%	8.6%	2.6%	-6.3%	0.3%	4.1%	-5.0%	1.7%	-2.7%	-11.2%	-4.9%	20.0%	9.5%	17.3%	9.6%	7.1%	
2000–2010																		
Change	449.6%	22.8%	364.3%	126.8%	-49.3%	91.6%	140.9%	-46.2%	103.5%	36.4%	-69.5%	15.2%	6563.1%	1388.7%	5528.9%	347.6%	278.1%	
GM	18.6%	2.1%	16.6%	8.5%	-6.6%	6.7%	9.2%	-6.0%	7.4%	3.2%	-11.2%	1.4%	52.2%	31.0%	49.6%	16.2%	14.2%	
2010–2019																		
Change	81.7%	8.0%	39.3%	-17.7%	-51.1%	-36.9%	17.6%	-30.1%	-9.8%	-45.3%	-67.5%	-58.0%	-47.2%	-68.6%	-59.5%	68.2%	29.0%	
GM	6.9%	0.9%	3.8%	-2.1%	-7.6%	-5.0%	1.8%	-3.9%	-1.1%	-6.5%	-11.7%	-9.2%	-6.8%	-12.1%	-9.6%	5.9%	2.9%	
2010–2020																		
Change	49.8%	7.8%	12.3%	-25.7%	-46.6%	-44.4%	-8.0%	-33.7%	-31.0%	-57.9%	-69.7%	-68.4%	-42.7%	-58.8%	-57.1%	38.9%	4.1%	
GM	4.1%	0.8%	1.2%	-2.9%	-6.1%	-5.7%	-0.8%	-4.0%	-3.6%	-8.3%	-11.3%	-10.9%	-5.4%	-8.5%	-8.1%	3.3%	0.4%	
2019–2020																		
Change	-17.5%	-0.1%	-19.4%	-9.8%	9.2%	-11.8%	-21.7%	-5.2%	-23.5%	-23.1%	-6.8%	-24.8%	8.5%	31.4%	6.0%	-17.4%	-19.3%	





**Fig. 4** Frequency of facet joint interventions rates by specialty groups from 2000 to 2020, in Medicare recipients

have likely been more severe. Another important finding was the significant isolated decline in lumbar/sacral facet joint injections from 2010 to 2019, and an even greater drop in both services and rate during 2019–2020 of  $-18.7\%$  and  $-20.6\%$ , respectively. In addition, the data show that the  $2.2\%$  growth of facet joint interventions was less than the  $3\%$  growth of the Medicare beneficiary population from 2010 to 2019. There was also a decrease in episodes from 2019 to 2020 of  $19.3\%$  compared to the Medicare population growth of  $2.3\%$ , which was less than the prior years because of the significant number of COVID-19 deaths.

Analysis of various expenditures in 2020 shows both Medicare and Medicaid expenditures for physicians and clinical services slowed in 2020 [11]. Even then, Medicare spending increased  $0.5\%$ , which is down from the  $8.9\%$  increase in 2019, with the deceleration driven by a decline in all interventional techniques from 2019 to 2020. In particular, there was a decrease in epidural interventions and percutaneous adhesiolysis procedures when compared to earlier years [3, 17, 19, 20, 22].

There was a reversal of growth and decline of facet joint interventions from 2010 to 2019,

These declines after 2010 may be attributed to multiple health care regulations initiated by the Affordable Care Act (ACA) [64–70], enactment of multiple LCDs [53–58], advocacy in the favor of radiofrequency neurotomy procedures [71], and reduced reimbursement rates [66, 72, 73]. In addition, disagreements as to the lack of indications and medical necessity may also have significant influence on reduced services, which extends beyond the Medicare FFS population to managed care organizations and includes those of Medicaid, all of Medicare, and services provided by commercial payers.

Overall decline in utilization patterns is often described as a positive sign; however, this can also imply impaired access. Further, this may also indicate denial of procedures which do not meet controversial criteria and “evidence” in the diagnosis and treatment of facet joint pain [43, 47, 74–90]. The focus should be to develop evidence-based data founded on pragmatic trials with real-world evidence [83, 84].

Similar to any epidemiological or analytic study, this analysis incorporates some limitations including lack of availability of data from approximately  $40\%$  of the participants enrolled in the Medicare Advantage Plans. Another

**Table 5** Utilizations of facet injections services (only primary codes) by place of service

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2010–2020 (%)	GM (%)	2019–2020 (%)
ASC	165,322	182,611	201,479	206,951	226,984	255,222	283,928	300,287	317,056	326,143	256,970	55.4	4.5	- 21
Percent	25.6	26.8	27.4	27.4	27.5	9.9	27.9	27.9	27.9	27.9	27.9	8.9	0.9	0
Rate	352	378	401	399	424	465	503	518	532	533	410	16.5	1.5	- 23
HOPD	153,076	166,331	178,806	185,453	197,478	213,073	236,836	247,673	261,222	270,541	220,953	44.3	3.7	- 18
Percent	23.7	24.4	24.3	24.6	23.9	23.7	24.5	24.5	24.7	24.9	24.7	3.9	0.4	- 1
Rate	326	344	355	357	369	388	419	427	438	442	353	8.2	0.8	- 20
Office	326,799	333,472	354,226	361,518	400,825	429,447	447,104	463,327	477,293	488,795	418,385	28.0	2.5	- 14
Percent	50.7	48.9	48.2	48.0	48.6	47.8	46.2	45.8	45.2	45.0	46.7	- 7.8	- 0.8	4
Rate	697	690	704	697	749	782	791	799	801	799	668	- 4.1	- 0.4	- 16
Total	645,197	682,414	734,511	753,922	825,287	897,742	967,868	1,011,287	1,055,571	1,085,479	896,308	38.9	3.3	- 17
Rate	1375	1413	1460	1453	1543	1635	1713	1744	1771	1774	1432	4.1	0.4	- 19

Rate: Rates per 100,000 Medicare beneficiaries

limitation is the lack of monthly data for 2020, which might have demonstrated greater declines in the utilization of facet joint interventions.

## CONCLUSIONS

No one can fully understand the extent of the detrimental effects of COVID-19 on patient care. The COVID-19 pandemic significantly impacted the utilization patterns of facet joint interventions producing an overall decline of 18.5%. Facet joint interventions grew at a slow rate from 2010 to 2019 with an overall annual increase of only 2.2% per 100,000 Medicare recipients. The decreasing number of facet joint interventions and other interventional procedures in conjunction with the reduced number of prescriptions and dosages of opioids is most certainly creating access issues for chronic pain patients [4]. A change in the regulatory and practice atmosphere is required to improve access to care for patients with chronic spinal pain.

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**Compliance with Ethics Guidelines.** This article is based on previously conducted studies and does not contain any studies with human participants or animals performed by any of the authors.

**Data Availability.** Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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