Data Analysis

National and Geographic Trends in Medicare Reimbursement for Pain Management 2014-2023

George Wiest, BMus[1], Alexander Dorius, MBA[1], Carson Bateman, BS[3], and Miles Day, MD[3]

From: [1]Texas Tech University Health Sciences Center School of Medicine, Lubbock, TX; [2]University of Utah School of Medicine, Salt Lake City, UT; [3]Department of Anesthesiology, Texas Tech University Health Sciences Center, Lubbock, TX

Address Correspondence:
Miles Day, MD
Department of Anesthesiology, Texas Tech University Health Sciences Center
3601 4th St Stop 7415, Lubbock, TX 79430-7415
E-mail: miles.day@ttuhsc.edu

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Background: Increasing enrollment in Medicare has coincided with reductions in reimbursement for various procedures, including interventional pain procedures. No previous analysis of state-to-state differences in Medicare reimbursement rates for practicing pain management physicians has been performed.

Objective: To quantify recent national and geographical trends for interventional pain procedures.

Study Design: This study used datasets from the Centers for Medicare and Medicaid Services to identify the top 10 highest-grossing Current Procedure Terminology (CPT) codes for pain procedures and for evaluation and management (E/M) from 2014 to 2023. Data analysis took place during May 2023.

Methods: Primary outcomes were calculated inflation-adjusted rates of yearly percent change (YPC) for each CPT code, state, territory, and U.S. Census region. An independent samples t-test compared the national YPC rates of procedure to those of E/M reimbursement. Medicare reimbursements throughout the United States for interventional pain procedures and clinic evaluations were measured from 2014-2023.

Results: From 2014 to 2023, inflation-adjusted Medicare reimbursement for interventional pain procedures decreased yearly by an average of 3.63%. In comparison, clinic evaluation reimbursement decreased by only 0.87% yearly and was significantly different from procedure reimbursement ($P < 0.001$). Pain management procedure reimbursement decreased the most in Illinois (-4.26%), Wyoming (-3.88%), Wisconsin (-3.87%), Nevada (-3.83%) and Kansas (-3.82%). Meanwhile, rates for Puerto Rico (-1.94%), Massachusetts (-3.24%), Washington (-3.31%), New York (-3.39%), and West Virginia (-3.47%) decreased the least. When states were grouped into U.S. Census regions, no significant regional differences in pain management procedure reimbursement changes could be observed.

Limitations: Only the facility prices of the top 10 highest-grossing procedure and E/M CPT codes that had available data for 2014 to 2023 could be included in our analysis; trends for private insurance reimbursement could not be analyzed.

Conclusions: Medicare reimbursement rates for interventional pain procedures have decreased from 2014 to 2023, both nationally and in each region of the U.S. Our analysis suggests that certain states and territories have experienced less favorable reimbursement trends than others. This issue is worthy of attention as larger proportions of the U.S. population become eligible for Medicare coverage; should these trends continue, interventional pain physicians may consider moving their practices to areas that are less affected. Major efforts are required to preserve the quality of care that Medicare beneficiaries receive and to remedy the problem of depreciating reimbursement.

Key words: Medicare, reimbursement, pain management, health care policy, economics, physician fees, finance, GPCI, social determinants of health

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As the baby-boomer generation ages and retires from the workforce, Medicare enrollment and the proportion of Americans on Medicare continue to increase (1,2). Medicare must maintain a balanced budget (3), so the increasing strain placed on the system by the changing ratio of people withdrawing from to people paying into the program ought to generate concern and a willingness to study trends within Medicare. Because Medicare functions under a fee-for-service model, whenever a physician or other health care professional performs any procedure or service for a Medicare beneficiary, they will receive a reimbursement of a specific predetermined amount (4). Each unique procedure or service is assigned a 5-digit Current Procedure Terminology (CPT) code, and the given amount reimbursable for each code is revisited and published annually by the Centers for Medicare & Medicaid Services (CMS) (5). The CPT system has been ubiquitously adopted in the private sector to convey medical and billing data more efficiently (6).

Physician reimbursement through Medicare for every coded procedure performed is determined via a fixed formula; the reimbursement cost is the sum of 3 variables: Physician Work, Practice Expense, and Malpractice Insurance. Each variable is multiplied by its own index, known as the Geographic Practice Cost Index (GPCI). To account for geographic variation (i.e., where in the nation a procedure is performed), each of the 3 aforementioned factors must be multiplied by a coefficient of the GPCI; CMS is required to update GPCI indices every 3 years (7). The sum of these geographically adjusted variables, representing the total Relative Value Units (RVUs) of that procedure, is then multiplied by a conversion factor (CF), or a finite dollar amount (8). The equation yields a reimbursement amount that is specific for one coded procedure and one location. For context, the Medicare CF for the year 2023 is $33.06 per RVU (9). The impact of geographic location on reimbursement was a major focus of this study.

Because CMS makes all pricing information available to the public, Medicare remains a reliable model for understanding larger trends in the American health care industry (6,10). For example, Medicare is the single largest payor in the nation and is rapidly growing (2,11). Additionally, rates set by CMS are thought to be benchmarks used by other private payors (12,13).

Extant trends within Medicare show a pattern of decreasing reimbursement in recent years. For example, recent viable studies have shown decreasing reimbursement in various specialties such as orthopedics, neurosurgery, emergency medicine, and others (11,14-17). Conceivably, no medical specialty has been spared from these trends, including interventional pain management. These trends ought to be explored and understood if quality of care is to be preserved. Investigation into reimbursement trends within pain management is limited; no recent study has examined geographic trends in Medicare reimbursement for pain management. We analyzed Medicare reimbursement patterns from 2014 to 2023 for all states in the U.S. and territories to determine geographic changes in pain management reimbursement and to robustly quantify current geographical trends for the information of interventional pain physicians and their patients.

Methods

Using the CMS's Medicare Physician & Other Practitioners - by Provider and Service dataset, we filtered by the Provider Type category to identify "Pain Management" physicians. Next, we selected for CPT code utilization to identify the top 10 interventional pain procedures and top 10 evaluation and management (E/M) codes by gross revenue in 2019 (18). Data from the year 2019 were chosen to avoid any confounding effect of pandemic-related bias in determining the highest-grossing codes billed by interventional pain physicians. Only codes that were extant through the entire study period were analyzed. Table 1 shows the 20 codes that were analyzed in this study, including the fraction of the revenue each one contributed (percentage share).

Since Medicare is geographically organized into Medicare Administrative Contractor (MAC) localities, facility prices for each of the 20 CPT codes were collected for all MAC modifiers and options for years 2014 to 2023. A facility price is defined as the dollar amount from the fee schedule due when a physician provides the service in a facility setting (18). Facility and nonfacility prices differ in their reimbursement rates, so to allow for thorough comparison, we opted to consider only facility prices in this study. Additionally, all prices were adjusted for inflation and converted into 2023 dollars, using the latest consumer price index (CPI) data at the time of analysis (May 2023), provided by the U.S. Department of Labor's Bureau of Labor Statistics (19).

We then calculated an average yearly percent change (YPC) for each code and performed an independent samples t-test with an α of 0.05 to determine statistical significance between procedures and E/M codes. A YPC in overall Medicare reimbursement was

Table 1. *Inflation-adjusted changes in physician reimbursement by CPT code, sorted from highest-to-lowest-grossing.*

CPT Code	Code Description	% Share	Average YPC (%)
Procedures	n/a	n/a	n/a
64635	Destroy lumbar or sacral facet joint nerves	29.0%	-4.76%
64483	Inject anesthetic/steroid into lumbar or sacral nerve	22.7%	-3.25%
63650	Implant neuroelectrodes	16.5%	-3.01%
64493	Inject lumbar or sacral facet joint	12.1%	-3.19%
27096	Inject sacroiliac joint	5.2%	-3.23%
64636	Destroy lumbar or sacral facet joint nerves	4.5%	-3.31%
64494	Inject lumbar or sacral facet joint	3.5%	-3.24%
64484	Inject anesthetic/steroid into lumbar or sacral nerve	2.5%	-3.24%
64495	Inject lumbar or sacral facet joint	2.2%	-3.24%
20610	Inject/aspirate joint or bursa	1.6%	-3.15%
Evaluation and Management	n/a	n/a	n/a
99214	Established patient office visit, 30-39 minutes	44.8%	-0.43%
99213	Established patient office visit, 20-29 minutes	21.4%	0.00%
99204	New patient office visit, 45-59 minutes	20.3%	-2.58%
99205	New patient office visit, 60-74 minutes	3.7%	-2.03%
99215	Established patient office visit, 40-54 minutes	3.3%	0.05%
99203	New patient office visit, 30-44 minutes	2.9%	-1.90%
99232	Subsequent hospital care, 35 minutes	1.5%	-1.72%
99233	Subsequent hospital care, 50 minutes	1.0%	-1.25%
99309	Subsequent nursing facility care, 30 minutes	0.6%	-0.97%
99212	Established patient office visit, 10-19 minutes	0.4%	0.98%

then calculated for each state, territory, and region. A single-factor analysis of variance was performed, resulting in a significant difference ($P < 0.05$). The nonparametric post hoc test, the Games-Howell test, was also performed to ascertain statistical differences among regions' average YPC, since the variances were non-homogenous when we performed Levene's test ($P < 0.05$). In the analysis, representation for each procedure was weighted by that procedure's gross revenue to better represent the financial implications of the procedure's rate changes. Conversions and analyses were performed by the authors via Mathematica. All data analyzed for this study were publicly available, so local institutional review board approval was not required.

Results

From 2014 to 2023, inflation-adjusted Medicare reimbursement for interventional pain procedures decreased by 28.3%. This figure equates to an average decrease of 3.63% per year (SD = 0.28%) during the 10-year period. By comparison, clinic evaluation reimbursement decreased by only 0.87% yearly for the same period, or by 7.55% over 10 years. Evaluation and management reimbursement was significantly different from procedure reimbursement ($P < 0.001$). Fig. 1 demonstrates the average change in Medicare reimbursement for each year studied for E/M and procedures.

Reimbursement decreased for all procedures analyzed. The procedure that saw the least decrease in reimbursement was open spinal cord stimulator implantation (CPT 63650), for which reimbursement decreased by 3.01% yearly. Meanwhile, the procedure associated with the most decrease in reimbursement was destruction of lumbar or sacral facet joint nerves (CPT 64635), for which reimbursement decreased by 4.76% each year. Notably, 64635 was the highest-grossing procedure, representing 29% of the revenue of all the procedures analyzed.

Pain management procedure reimbursement decreased the most per year in Illinois (-4.26%), Wyoming (-3.88%), Wisconsin (-3.87%), Nevada (-3.83%), and Kansas (-3.82%). By contrast, rates for Puerto Rico (-1.94%), Massachusetts (-3.24%), Washington (-3.31%), New York (-3.39%), and West Virginia

(-3.47%) decreased the least. Fig. 2 demonstrates the average YPC for each state or territory. The state closest to the average was Michigan (-3.63%), and the median was Alaska (-3.67%).

When states were grouped regionally, there were no significant differences in pain management procedure reimbursement changes among regions when performing the Games-Howell test ($P > 0.05$). Of the 4 U.S. Census regions, the Midwest and Northeast saw the greatest and least annual decreases (-3.77% and -3.61%), respectively. Of the 7 regions measured by the Bureau of Economic Analysis (BEA), the greatest and least yearly decreases occurred in the Great Lakes and the Mideast (-3.85% and -3.60%), respectively. Fig. 3 demonstrates the average YPC for the BEA regions.

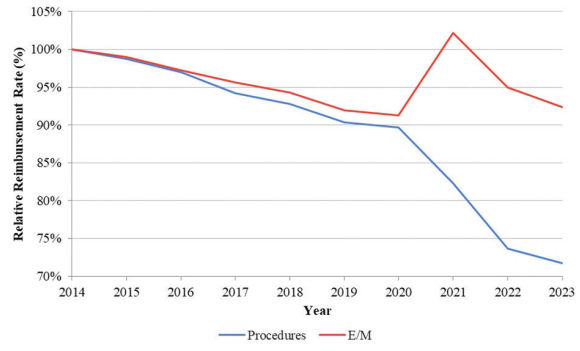

Fig. 1. *Average change in Medicare reimbursement 2014-2023 for procedure and E/M reimbursement, relative to 2014.*

Discussion

Our study shows that Medicare reimbursement rates for interventional pain procedures have decreased from 2014 to 2023, both nationally and in each part of the country. Reimbursement for pain procedures has decreased over 10 years by 28.3% when adjusted for inflation, and every procedure analyzed was noted to have a percent decrease as well. These decreases prove increasingly relevant as operational costs and labor expenses increased considerably throughout the timeframe of this study (20,21). When we analyzed reimbursement decline regionally, we found no region significantly differed from any other, whether grouped into the U.S. Census regions or the more granular BEA regions. Interestingly, this finding may suggest that these trends are not primarily regionally motivated.

One puzzling observation pertains to Puerto Rico, which, in our study, had the lowest relative rate of decrease in Medicare reimbursement for pain procedures (-1.94%) of any state or territory investigated. Notably, Puerto Rico's (geographically) closest neighbor, the U.S. Virgin Islands (-3.64%), was much closer to the mean state yearly percent change of -3.63%. Puerto Rico's

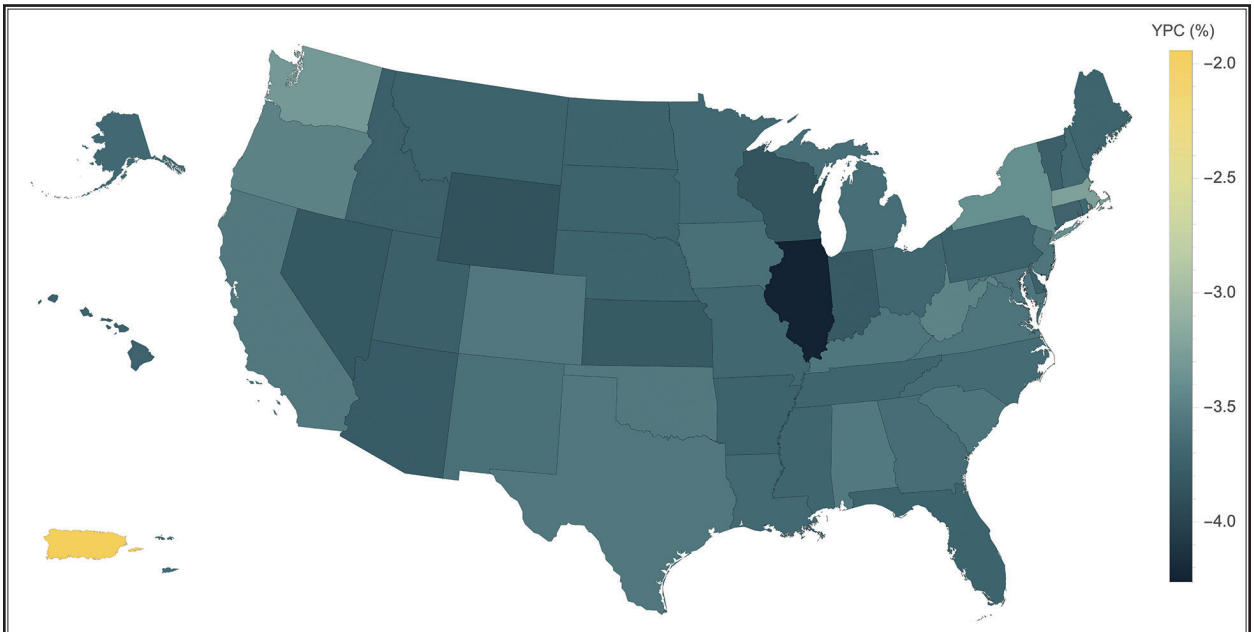

Fig. 2. *Average yearly percent change in Medicare reimbursement for each state and territory.*

rate of change was over 4 standard deviations (SD = 0.28%) away from that of Massachusetts, the state with the next lowest rate (-3.24%), and an astonishing 6 standard deviations away from the mean and median, marking the territory as a clear outlier. During the same period, studies focused on other specialties have similarly found Puerto Rico to be an outlier, (22,23). Though the reasons for this observation are not entirely clear, it must be noted that recent literature has described the Puerto Rican health care system to have significant inequities when compared to the mainland U.S. at best and to be on the verge of collapse at worst (24-28). When its GPCI was compared to those of other states and territories, Puerto Rico had the most favorable GPCI adjustment from 2014 to 2023, which dramatically improved its change in facility price despite changes in CF and inflation. We looked closer at the changes in GPCI adjustments from 2014 to 2023 and found an overall net increase for Puerto Rico (work GPCI: 0%; practice expense GPCI: +45.7%; malpractice GPCI: +263.1%). Compared to other states and territories, these GPCI increases offset some of the national decreases; for example, Massachusetts had relatively small changes in GPCI adjustments (work GPCI: +0.7%; practice expense GPCI: -0.3%, malpractice GPCI: +16.3%). Perhaps recent adjustments to GPCI for Puerto Rico have been made to correct for its initially low GPCI adjustment.

Our results may seem to contradict the claims made by Romaniuk et al (29), who demonstrate in their 2022 study that from 2000 to 2019, inflation-adjusted Medicare reimbursement for spinal cord stimulator procedures increased significantly. A close examination of the details demonstrates that the claims of that study are not necessarily mutually exclusive with ours. In fact, the Romaniuk et al (29) study builds on the groundwork of Haglin et al (14), who claim that reimbursement decreased for the top 20 highest-grossing neurosurgery procedures from 2000-2018. It should be noted that none of the codes analyzed by Haglin et al (14) were analyzed in our study or by Romaniuk et al; Romaniuk et al (29) analyzed only 2 procedure codes, 63650 and 63655. Code 63650 was one of the 10 procedure codes we analyzed. Though the popularity of spinal cord stimulators clearly had an impact on generating more reimbursement money in the early 2000s, our study shows that by 2023, instances of code 63650 had decreased by 3.01% on average each year since 2014. Another key difference in these studies is that while Romaniuk et al (29) analyzed trends over the course of 20 years (which included notable Medicare reforms in 2006 and the passage of the Affordable Care Act), our study comprises the years of the pandemic, which no doubt played a role in shaping these trends. The pandemic's effects seem to have affected pain

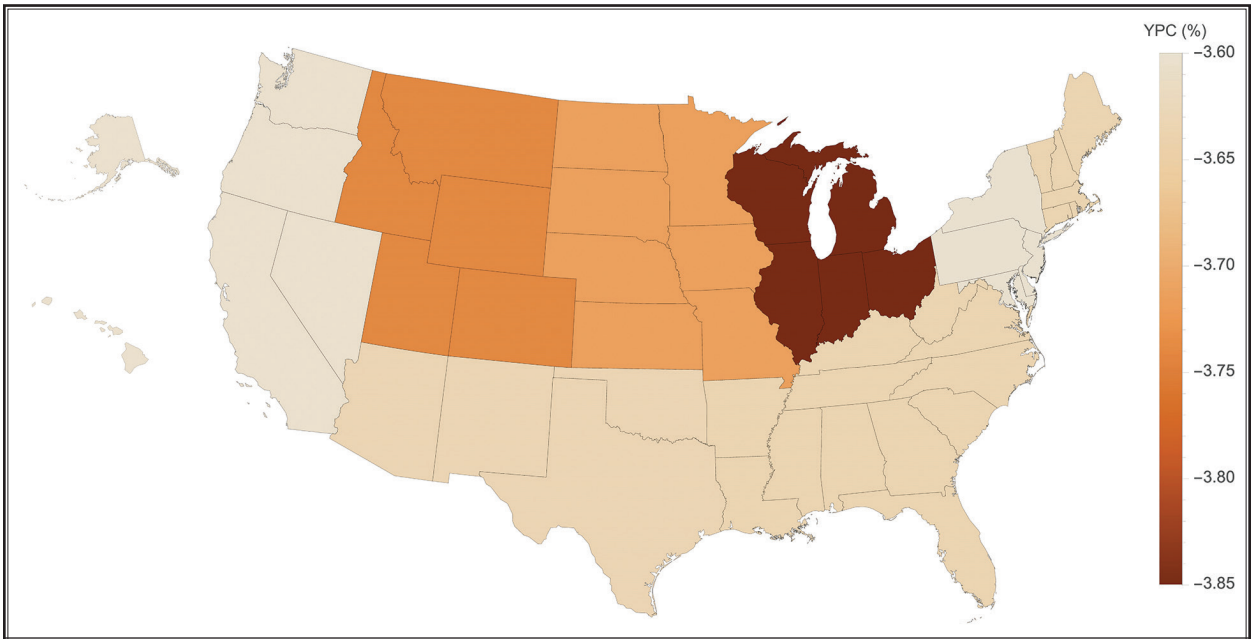

Fig. 3. *Average yearly percent change in Medicare reimbursement for all BEA regions.*

management's change in reimbursement not because of active decreases in Medicare reimbursement but due to rampant increases in inflation that were not remediated with adjustments for it.

Pain management physicians are projected to continue experiencing greater financial pressure caused not only by inflation but also by increasing expenses in administration, facility, technology, and supply. Smoldt et al (30) found that primary care physician practice expenses increased by more than 60% from 2000 to 2014 and would likely continue to increase. Target efforts to improve compensation for physician practice expenses should be a major emphasis as lobbyists attempt to counter these declines. One way to participate would be to support the American Medical Association's efforts to survey physicians' practice expenses to update the methodology, which continues to use data from 2006 (31).

The compound effect of Medicare's presence as the largest payor (2,6) and the industry's emulation of Medicare's rate adjustments means these declines have major financial repercussions for pain management physicians. First, these changes may imply challenges for physicians in taking Medicare beneficiaries, which would worsen access to and quality of care for patients. To this point, Rosenow and Orrico (32) observed that in response to declines in reimbursement, surveyed neurosurgeons used various means, such as offering fewer appointment times or limiting referrals, to restrict the number of Medicare patients they saw. Second, pain management physicians may succumb to shorter patient visits to compensate for decreasing reimbursement. Lastly, these financial pressures may continue fueling the consolidation of smaller practices or groups to strengthen bargaining power, improve economies of scale, and share overhead costs. These issues are national, but because of the geographic variation, the implications may further exacerbate these problems on a state or regional scale. Further research is needed to understand the implications of these geographic differences to identify if access, quality care, practice structure, and lengths of patient visits are affected by the state or region.

Limitations

We recognize a few limitations inherent in our study. Firstly, we analyzed only the top 10 highest-grossing procedure and E/M CPT codes and only the facility prices for those codes (because facility and non-facility prices do not compare). Secondly, only codes that had available data for 2014 to 2023 could be included in our analysis; we were limited by the availability and accuracy of what CMS published. These data do not exist in a vacuum, and thus any confounding influence of the COVID pandemic could not be completely avoided. We chose the top 10 highest-grossing codes based on data from 2019, since the next most recent data on gross revenue came from 2021, and we wanted to avoid any pandemic-related bias in that regard. Lastly, trends for private insurance reimbursement could not be analyzed, because these data are not made available by most private payors. Nevertheless, though CMS is a federally affiliated entity, the trends it sets influence much of the rest of the health care sector.

Conclusions

Our analysis suggests that certain states and territories have experienced less favorable reimbursement trends than others. The trends explored in our study can be partially understood when health care public policy is considered. Nevertheless, greater awareness and understanding is warranted for all health care stakeholders and policymakers. This issue is worthy of attention as larger proportions of the U.S. population become eligible for Medicare coverage. Should reimbursement disparities continue to increase, interventional pain physicians may limit the number of Medicare patients they see or even consider moving their practice to areas that are less affected. To preserve the quality of care that Medicare beneficiaries receive, greater advocacy is needed to resolve the issue on both the state and national level. Additionally, future investigation should focus on the role of advocacy, lobbying strategies, and policy change to identify solutions to the problem of depreciating reimbursement.

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Authorship contributions: GW: writing—original draft, data curation. AD: writing—original draft, review and editing. CB: formal analysis. MD: writing—review and editing, supervision.

The data that support the findings of this study are available from the corresponding author upon reasonable request. GW had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of its analysis. The authors declare that the content of the article was composed in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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