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HHS Public Access
Author manuscript
Spine (Phila Pa 1976). Author manuscript; available in PMC 2020 August 15.

Published in final edited form as:
Spine (Phila Pa 1976). 2019 August 15; 44(16): 1154–1161. doi:10.1097/BRS.0000000000003033.

Healthcare Costs and Opioid Use Associated with High-Impact Chronic Spinal Pain in the United States

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Abstract

Study design.—Descriptive analysis of secondary data.

Objective.—Estimate healthcare costs and opioid use for those with high-impact chronic spinal (back and neck) pain.

Summary of Background Data.—The US National Pain Strategy introduced a focus on high-impact chronic pain—i.e., chronic pain associated with work, social and self-care restrictions. Chronic neck and low-back pain are common, costly, and associated with long-term opioid use. Although chronic pain is not homogenous, most estimates of its costs are averages that ignore severity (impact).

Methods.—We used 2003–2015 Medical Expenditures Panel Survey (MEPS) data to identify individuals with chronic spinal pain, their healthcare expenditures, and use of opioids. We developed prediction models to identify those with high- versus moderate- and low-impact chronic spinal pain based on the variables available in MEPS.

Results.—We found that overall and spine-related healthcare costs, and the use and dosage of opioids increased significantly with chronic pain impact levels. Overall and spine-related annual per person healthcare costs for those with high-impact chronic pain ($14,661 SE: $814; and $5,979 SE: $471, respectively) were more than double that of those with low-impact, but still clinically significant, chronic pain ($6,371 SE: $557; and $2,300 SE: $328). Those with high-impact chronic spinal pain also use spine-related opioids at a rate almost four times that of those with low-impact pain (48.4% versus 12.4%), and on average use over five times the morphine equivalent daily dose (MEDD) in mg (15.3 SE: 1.4 versus 2.7 SE: 0.6). Opioid use and dosing increased significantly across years, but the increase in inflation-adjusted healthcare costs was not statistically significant.

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Level of Evidence: 3

The manuscript submitted does not contain information about medical device(s)/drug(s).

Conclusions.—Although most studies of chronic spinal pain do not differentiate participants by the impact of their chronic pain, these estimates highlight the importance of identifying chronic pain levels and focusing on those with high-impact chronic pain.

Keywords

High-impact chronic pain; healthcare costs; prevalence of opioid use; average opioid dose; low-back pain; neck pain; spinal pain; Medical Expenditure Panel Survey

Introduction

In 2016 the US Department of Health and Human Services released the National Pain Strategy (NPS).[1] Its goal was to decrease the prevalence of all types of pain, and associated disability and morbidity, with a focus on high-impact chronic pain. High-impact chronic pain was defined as that "associated with substantial restriction of participation in work, social, and self-care activities for 6 months or more."[1,p11] One task of the NPS's Population Research work group was to determine how to best identify those with high-impact chronic pain.[2]

Although there is not yet consensus on how persons with high-impact chronic pain should be identified, several approaches have been proposed and studied, including algorithms based on responses to various Patient-Reported Outcomes Measurement Information System items;[2,3] various items from the National Health Information Survey (NHIS),[4] and its Adult Functioning and Disability Supplement;[5,6] and the well-validated chronic pain scale (GCPS).[7]

Neck and low-back pain are common types of chronic pain.[8–10] These spinal pain conditions are costly[8,11–18] and can be associated with long-term opioid use and its adverse effects.[19–21] However, even though chronic pain has important variation in terms of severity and impact,[2,8] most estimates of healthcare costs and opioid use report averages across all those with chronic spinal pain.[12,13,18–20] Three studies that identified those with high-impact chronic pain found their healthcare utilization[5–7] and opioid use[7] were higher than for those with lower-impact chronic pain. However, a detailed examination of costs and opioid use requires the ability to measure these outcomes in individuals at all levels of chronic pain impact.

One previous study utilized the Medical Expenditure Panel Survey (MEPS), a US-representative detailed source of healthcare utilization and costs, to estimate the costs associated with pain severity in patients with several chronic pain conditions.[22] This study identified those with moderate or severe pain using one item from the SF-12,[23] and found that those with moderate pain had annual healthcare expenditures $4,516 higher than those with no pain, and persons with severe pain had healthcare expenditures $3,210 higher than those with moderate pain (2008 USD). Unfortunately, this study only examined one year's data and used a limited definition of pain severity.

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The present study used 13 years of MEPS data to examine per person overall and spine-specific treatment costs and opioid use for those with chronic spinal pain across impact levels.

Methods

Data

We used data from the 2003 to 2015 Household Component (HC) of the MEPS to examine the healthcare costs and utilization of adult (≥18 years) respondents with chronic spinal pain.[24] The MEPS (http://meps.ahrq.gov/mepsweb/) is a set of large-scale surveys of noninstitutionalized civilians across the US administered by the Agency for Healthcare Research and Quality (AHRQ).[25] In addition to being a large, well-validated, publicly-available, nationally-representative dataset,[26,27] the MEPS contains medical expenditures paid by all payers, including out-of-pocket costs paid by patients. Starting in 2000, MEPS included a set of self-reported health-related variables, including the SF-12.[23]

New MEPS panels of approximately 15,000 individuals are drawn each year and data are collected in five interview rounds over two full calendar years for each individual. In the HC interview, respondents are asked about their health conditions and the services used to treat them. The interviewers capture these self-report conditions verbatim and trained coders map these conditions to full International Classification of Disease, 9th Revision (ICD-9) codes, which are later truncated to 3-digits to protect confidentiality. A Clinical Classification Code (CCC), a mutually exclusive categorization of ICD-9 codes administered by the AHRQ, is also reported for each condition. With the respondent's permission more detailed information on healthcare utilization and expenditures is obtained from healthcare providers.

We used the Full-Year Consolidated Data files (which contain demographics, SF-12 responses and other individual characteristics), and the Event files (which contain data on medical events and expenditures) for our analyses. Through 2012 the Event files also contained event-specific 3-digit ICD-9 codes and CCCs. For 2013–2015 these codes were obtained from the Medical Conditions files. Of the available Events files, we used those for Prescribed Medicines, Hospital Inpatient Stays, and Emergency Room, Outpatient, and Office-based Medical Provider Visits.

We did not use files for Dental Visits, Other Medical Expenses, or Home Health Visits because their impact on total costs has been found to be small.[17] Costs were adjusted for inflation to 2015 dollars using the monthly medical care Consumer Price Index.[28]

We identified spine-related medical events as those with a CCC of 205 (which covers 66 ICD-9 codes), or with ICD-9 codes 846 and 847. The AHRQ classifies those with "Spondylosis, intervertebral disc disorders & other back problems" as having a CCC of 205.[29] This classification includes those with an ICD-9 of 724, which includes the largest group of low-back pain patients (724.2 lumbago),[17,30–33] and the ICD-9 723, which includes the largest group of neck pain patients (723.1 Cervicalgia).[32] The ICD-9 codes 846 (sacroiliac sprain/strain) and 847 (other back sprain/strain) cover other common types of back pain not included in CCC 205. This set of codes has been used by other studies to

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identify spinal pain in the MEPS.[17,18,33–35] We then identified those with *chronic* spinal pain during a year as those with any spine-related healthcare use, in two consecutive interview rounds during that year. Nonchronic spinal pain was defined as those with any spine-related healthcare use during a year who did not qualify as having chronic pain.

Chronic pain impact level

The NPS Population Research work group lists the development of measures to identify those with high-impact chronic pain as one of its not-yet-met goals.[2] Several schemes have been proposed for these measures.[2–6,22] We based our classification of impact level on a previously developed and validated scheme called the graded chronic pain scale (GCPS).[7] This system classifies patients into three levels of chronic pain impact:

- Low-impact pain – low pain intensity, low activity restriction (Grade I)
- Moderate-impact pain – high pain intensity, low activity restriction (Grade II)
- High-impact pain – substantial activity restriction (Grade III/IV)

The MEPS does not include direct measurement of chronic pain impact via the GCPS, but it does contain respondent demographics and the SF-12.[23] We used three large longitudinal datasets[36–38] that contained the GCPS, as well as demographics and SF-12 items, to develop prediction models for GCPS-based chronic pain impact levels, as described below. We then applied these prediction models to the SF-12 data collected during round 2 to estimate individuals' chronic pain impact levels in the first year of their 2-year MEPS participation, and used round 4 SF-12 values to estimate impact levels for the second year.

Analysis

We used two logistic models to predict impact level: one estimating the probability that an individual had high-impact chronic pain, and one estimating the probability that remaining individuals had low- versus moderate-impact pain. We first identified the variables to include in these models by using forward selection stepwise logistic regression with a goal of minimizing the Bayesian Information Criterion (BIC) fit statistic. If an added variable reduced the BIC by at least 10 it was considered to be "very strong evidence" that the model with the lower BIC better fit the data.[39] Once we identified the best model for in-sample prediction within each of the three datasets, we calculated both in-sample and out-of-sample areas under the receiver operating curves (ROC AUCs; a measure of predictive ability) across the three datasets and chose the models with the best predictors for identifying high-impact chronic pain, since that was the focus of the NPS,[1] to apply to the MEPS data. A ROC AUC of 0.5 indicates no predictive ability. Higher values have been classified as follows: 0.6 to 0.7 as poor predictive ability, 0.7 to 0.8 as acceptable, 0.8 to 0.9 as excellent, and more than 0.9 as outstanding.[40]

Individuals' inflation-adjusted healthcare costs by category and opioid use were regressed on year and chronic pain impact level to estimate 2015 annual costs and opioid use for chronic spinal pain and for each impact level. Observations were weighted to match population estimates and standard errors were adjusted for multiple within-individual measurements.

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All analyses were performed using Stata/IC 14.2 for Windows (64-bit x86–64), College Station, Texas.

This study was exempted from review by RAND's Institutional Review Board.

Results

We estimated the prevalence of chronic spinal pain in the 2003–2015 overall MEPS sample to be 6.0% (Table 1). These individuals were responsible for 13.8% of the medical events included in MEPS. Of those with chronic pain, 88.4% had SF-12 and other demographic data available to estimate impact levels. Two-thirds of this chronic spinal pain group had an ICD-9 associated with low-back pain.

The lower part of Table 1 shows the breakdown of the chronic pain group by imputed impact level. The sum of individuals across impact levels is greater than the total number with chronic pain because each individual in MEPS has two years of data and they can have different impact levels each year. The prediction model for high-impact chronic pain included SF-12 questions on pain interference with normal work, physical health and emotional problems interfering with social activities, and limitations on moderate activities. The prediction model for moderate- versus low-impact chronic pain included the first and last of these. No demographic variables entered either model, and the best predictive models were estimated on the largest dataset.[36] More detail on prediction modeling results can be found in Table, Supplemental Digital Content 1 and Table, Supplemental Digital Content 2. The ROC AUCs for predicting high-impact chronic pain were 0.91 (outstanding) in-sample and 0.85 (excellent) and 0.77 (acceptable) in the two out-of-sample datasets. The ROC AUCs for predicting moderate- versus low-impact chronic pain were 0.72 (acceptable) in-sample and 0.66 and 0.60 (poor) out-of-sample. Therefore, our ability to identify those with high-impact chronic pain was better than our ability to split the remainder into moderate- versus low-impact pain.

Table 2 shows the levels of certain demographics (age, sex, race, ethnicity, marital status, employment), and the physical and mental component summary scores of the SF-12 for different chronic spinal pain groups. Those with high-impact chronic spinal pain were significantly more likely to be older, female, black, and Hispanic, to have lower (worse) mental and physical SF-12 component summary scores, and less likely to be white, Asian, married, and employed.

Table 3 shows the average per person overall and spine-related annual healthcare costs in 2015 USD for those with chronic spinal pain, by chronic pain impact level, and for those with nonchronic spinal pain. There was no statistically significant difference between the estimates for those with chronic pain with and without SF-12 data available. Overall and spine-related costs increased significantly across impact levels ($p<.001$). Those with nonchronic pain had significantly lower costs than those with chronic pain for both overall and spine-related costs. In addition, the spine-related cost of nonchronic pain was significantly lower than those with low-impact chronic spinal pain. The average annual cost

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increases shown in Table 3 indicate that inflation-adjusted treatment costs did not significantly increase over time.

Table 4 shows the average annual per person healthcare costs by cost category and impact level for overall and spine-related costs. For overall and spine-related costs for those with moderate and high-impact chronic spinal pain, the most expensive cost category was inpatient care. The office-based and outpatient other category (e.g., providers such as physician's assistants, occupational therapists, physical therapists, and psychologists) was the most expensive for those with low-impact pain, and second largest cost for the other impact levels.

Table 5 shows opioid use in terms of average morphine equivalent daily dose in mg (MEDD) across all individuals in each group, and the percentage of the group who used opioids prescribed for any reason or specifically for spinal pain. The coefficients for the year variables for the chronic pain patients indicate a statistically significant average annual increase in MEDD and the prevalence of opioid use from 2003 to 2015. Opioid use and dosing for those with nonchronic pain did not significantly increase across years.

Discussion

This analysis of MEPS data showed that healthcare costs for patients with chronic spinal pain increased across chronic pain impact levels for overall costs, spine-related costs, and all cost components (e.g., hospital, medications, primary care). Costs did not significantly increase across years after adjusting for inflation, but overall and spine-related healthcare costs for those with high-impact chronic pain were more than double that of those with low-impact, but still clinically significant, chronic pain: 130% higher for overall costs and 160% higher for spine-related costs. Opioid dosage and usage also increased across chronic pain levels for any and spine-related opioid use. There was a statistically significant annual increase in opioid dosage and use for all levels of chronic pain, and those with high-impact chronic pain had a frequency of usage that was 3 to 4 times higher and average dosing that was 5.5 times higher than those with low-impact chronic pain. Patients with high-impact chronic spinal pain (i.e., with substantial activity limitations) obviously have different healthcare needs and should be studied and treated as a separate subgroup within chronic spinal pain.

A variety of methods have been used to measure chronic pain impact on healthcare utilization[2,5,7,33,41] and costs.[22,42] Results consistently show that utilization and costs increase with chronic pain impact. This study adds to the growing evidence that high-impact chronic pain results in substantially higher healthcare costs than that of lower-impact chronic pain. Our overall estimated cost difference between high- and moderate-impact chronic pain ($5,004) was in line with the difference reported in the Gaskin and Richard study[22] (~$4500 in 2015 USD).

Our estimate of the prevalence of chronic spinal pain compares to other similar studies. Smith et al used 2000–2007 MEPS data, the same ICD-9 codes, and identified those with chronic back pain if they reported being bothered by back pain, reported a back-pain

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disability day, or used any health services for back pain during at least three of the five rounds that make up a 2-year panel.[18] Excluding individuals with spine-related inpatient visits, this study found that between 4% and 6% of the US adult population reported chronic back pain. Our estimated prevalence of 6% included those with spine-related inpatient visits. Our study also estimated that over 40% of those with chronic spinal pain had high-impact chronic pain. Another study using an NHIS-based definition of high-impact chronic pain also found that about 40% of their chronic pain population had high-impact chronic pain.[4]

Finally, other studies also found that opioid use increased with chronic pain impact level,[7] and that opioid use and other analgesics combined with opioids were higher in those reporting moderate and severe chronic back pain severity.[41] Our study also found increasing use of opioids as well as increasing MEDD by chronic pain impact level, and that usage and dosing increased significantly over the 2003–2015 period. The years 2011–2012 were the height of opioid prescriptions,[43] so this increase may not be continuing today.

Our study has several limitations. First, MEPS data are subject to patient self-report errors although MEPS attempts to minimize these errors by verifying data with providers and payers. Second, MEPS healthcare expenditures have shown underreporting by 10 to 18 percent[44,45] indicating that our estimates of the cost of high-impact chronic pain may be too low. Third, the MEPS only contains three-digit ICD-9 codes in the public use dataset which limited our ability to more specifically identify conditions. Finally, since no direct measure of chronic pain impact exists in the MEPS, we predicted impact levels using models developed on other large datasets that contained MEPS-available variables. Our ability to identify those with high-impact chronic pain was acceptable to excellent. However, our ability to separate the remaining chronic spinal pain population into those with moderate- versus low-impact pain was poor. Therefore, the estimates given for those population subsets should be interpreted with caution, and future research should validate our results using data with direct measures of chronic pain impact.

Overall and spine-related healthcare costs and opioid use and dosage for those with chronic spinal pain significantly and substantially increase with chronic pain impact. Those with high-impact chronic pain have more than double the overall and spine-related healthcare costs of those with low-impact chronic pain, and are five times as likely to use opioids. Clinicians should be aware of the healthcare needs of those with high-impact chronic pain and future clinical trials should consider recruiting and/or reporting results by patients' chronic pain impact level. Our study's estimates highlight the importance of identifying those with different levels of chronic pain and developing effective interventions for those with high-impact chronic pain.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments:

The authors would like to acknowledge Gabriela Armenta, Andrew Dick, Prodyumna Goutam, and Nishtha Mishra for their contributions to this study. The authors would also like to acknowledge the following individuals and

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institutions who generously shared their data for this study: Dr. J. David Cassidy; Dr. Mitch Haas at the University of Western States; and the University of Warwick.

This work was conducted as part of a larger project on the appropriateness of spinal mobilization and manipulation for chronic back pain and chronic neck pain funded by National Center for Complementary and Integrative Health, National Institutes of Health, Grant No. 1U19AT007912-01.

Relevant financial activities outside the submitted work: grants.

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Table 1.

Numbers of adults (>18 years) with different conditions in the Medical Expenditure Panel Survey (MEPS) data

	Number of adult individuals*	Percent of US adults	Percent of adult medical events
Surveyed in MEPS & with medical events (2003–2015)	130,767	100.0%	100.0%
With at least one spinal (CCC 205 or ICD-9 of 846 or 847) event	17,776	16.9%	27.4%
With chronic spinal pain	5,824	6.0%	13.8%
With chronic spinal pain & with impact level (SF-12) data available	5,151	5.3%	12.6%
With chronic low-back pain (ICD-9 724) & impact level (SF12) data available	3,457	3.6%	8.5%
With chronic neck pain (ICD-9 723) & impact level (SF12) data available	778	0.8%	2.2%
With pain from chronic sacroiliac sprain/strain (ICD-9s 846 and 847) & impact level (SF-12) data available	428	0.4%	1.1%
With chronic spinal pain & predicted to have low impact chronic spinal pain	2,100	2.4%	5.3%
With chronic spinal pain & predicted to have moderate impact chronic spinal pain	967	1.1%	2.7%
With chronic spinal pain & predicted to have high impact chronic spinal pain	2,401	2.2%	5.8%

CCC 205 = Clinical Classification Code that includes "Spondylosis, intervertebral disc disorders & other back problems"; ICD-9 = International Classification of Diseases, 9th Revision; SF-12 = 12-item short form of the Medical Outcomes Survey

*The total number of individuals across each chronic pain impact level sum to more than are shown as having chronic spinal pain and SF-12 data because some individuals experienced different chronic pain impact levels across their two years of data.

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Table 2.

Characteristics of the various groups in the sample; mean (SD) or frequency

	All MEPS	Any Spinal Event*	All Chronic†	Low Impact‡	Moderate Impact§	High Impact//
Age - years	45.6 (18.0)	50.0 (16.8)¶	51.6 (16.4)¶	50.7 (16.0)¶	54.7 (16.4)	54.2 (14.6)¶
Female - proportion	0.52 (0.5)	0.56 (0.5)¶	0.58 (0.5)¶	0.56 (0.5)	0.55 (0.5)**	0.59 (0.5)**
White - proportion	0.81 (0.4)	0.86 (0.3)¶	0.87 (0.3)**	0.92 (0.3)	0.91 (0.3)¶	0.86 (0.3)¶
Black - proportion	0.12 (0.3)	0.08 (0.3)¶	0.08 (0.3)	0.04 (0.2)	0.05 (0.2)¶	0.10 (0.3)¶
Asian - proportion	0.05 (0.2)	0.03 (0.2)¶	0.02 (0.2)**	0.02 (0.2)	0.02 (0.1)**	0.01 (0.1)¶
Other race - proportion	0.03 (0.2)	0.03 (0.2)	0.03 (0.2)	0.02 (0.1)	0.03 (0.2)	0.03 (0.2)
Hispanic - proportion	0.14 (0.3)	0.09 (0.3)¶	0.07 (0.3)¶	0.06 (0.2)	0.05 (0.2)**	0.08 (0.3)¶
Married - proportion	0.52 (0.5)	0.57 (0.5)¶	0.57 (0.5)	0.62 (0.5)	0.61 (0.5)¶	0.54 (0.5)¶
Never Married - proportion	0.28 (0.4)	0.18 (0.4)¶	0.17 (0.4)¶	0.18 (0.4)**	0.14 (0.3)	0.12 (0.3)#
Employed - proportion	0.67 (0.5)	0.64 (0.5)¶	0.60 (0.5)¶	0.76 (0.4)¶	0.62 (0.5)¶	0.38 (0.5)¶
SF-12 PCS score	49.5 (10.7)	44.6 (12.7)¶	42.7 (13.0)¶	51.3 (6.5)¶	39.4 (7.7)¶	27.6 (8.6)¶
SF-12 MCS score	51.1 (9.8)	49.7 (10.6)¶	49.3 (10.9)¶	52.3 (8.6)#	53.4 (9.0)¶	42.4 (12.1)¶

MEPS = Medical expenditure panel survey; SF-12 PCS = the physical component summary score of the 12-item short form of the medical outcomes survey; SF-12 MCS = the mental component summary score of the 12-item short form of the medical outcomes survey; for both higher numbers indicate better outcomes.

*The symbols for statistical significance in this column refer to the difference between those with any spine-related medical event and the entire MEPS adult sample.

†The symbols for statistical significance in this column refer to the difference between those with chronic spinal pain (any spine-related healthcare use, including medications, in two consecutive interview rounds during that year) and those with any spine-related medical event.

‡The symbols for statistical significance in this column refer to the difference between those with low and those with moderate-impact chronic spinal pain.

§The symbols for statistical significance in this column refer to the difference between those with moderate and those with high-impact chronic spinal pain.

//The symbols for statistical significance in this column refer to the difference between those with high and those with low impact chronic spinal pain.

¶These differences are statistically significant at p<.001.

#These differences are statistically significant at p <.01.

**These differences are statistically significant at p <.05.

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Table 3.

Average per person annual all-payer healthcare costs for different groups with spinal pain in 2015$; Estimated coefficient (SE)

	N	Overall healthcare costs	Spine-related healthcare costs
Chronic spinal pain	6968	$9,781 ($530) *	$3,915 ($309) *
Average annual increase		$81 ($72)	$9 ($41)
Chronic spinal pain among individuals with impact level (SF-12) data available †	6177	$10,087 ($600) *	$4,038 ($350) *
Average annual increase		$118 ($80)	$26 ($46)
Chronic spinal pain by impact level ‡	6177		
Low impact chronic pain	2,366	$6,371 ($557) *	$2,300 ($328) *
Moderate impact chronic pain	1,003	$9,657 ($741) *	$4,301 ($489) *
High impact chronic pain	2,808	$14,661 ($814) *	$5,979 ($471) *
Average annual increase		$142 ($77)	$37 ($45)
Nonchronic spinal pain §	15,059	$5819 ($346) *	$1054 ($94) *
Average annual increase		-$2 ($53)	-$4 ($12)

SF-12 = 12-item short form of the Medical Outcomes Survey

*Coefficient statistically significant at p<.001.

†No statistically significant differences between coefficients estimated for all chronic spinal pain and chronic spinal pain with impact level data available. P-values for differences were .38 and .26 for overall and spine-related healthcare costs, respectively.

‡Differences in coefficients across impact levels all statistically significant at p<.001 for overall healthcare costs. The same is true for spine-related costs with one exception. The difference between high and moderate impact pain levels for spine-related healthcare costs was statistically significant at p=0.012.

§Differences between nonchronic and chronic spinal pain statistically significant at p<.001. Difference between nonchronic spinal pain and low impact chronic pain for overall costs is not statistically significant (p=.840), but the difference between nonchronic spinal pain and low impact chronic pain is statistically significant at p<.001

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Table 4.

Average per person annual all-payer overall and spine-only healthcare by cost category and chronic pain impact level in 2015USD; Estimated coefficient (SE)

	Overall Healthcare Costs				Only Spine-Related Costs			
	Low impact	Moderate impact	High impact	Annual Increase	Low impact	Moderate impact	High impact	Annual Increase
Office and outpatient primary care	$925 ($90) *	$1322 ($198) *	$1765 ($135) *	$13 ($12)	$140 ($36) *	$369 ($94) *	$516 ($66) *	−$1 ($5)
Outpatient specialty care	$400 ($107) *	$674 ($147) *	$854 ($266) †	$9 ($16)	$13 ($34)	$168 ($76) ‡	$166 ($41) *	−$5 ($4)
Office and outpatient other	$1,961 ($134) *	$2,251 ($187) *	$2,599 ($146) *	$13 ($15)	$1,104 ($82) *	$1,337 ($163) *	$1,462 ($100) *	−$4 ($11)
Imaging	$221 ($41) *	$345 ($50) *	$510 ($52) *	-$7 ($5)	$143 ($37) *	$201 ($38) *	$295 ($31) *	−$6 ($4)
Emergency department	$380 ($109) *	$466 ($78) *	$694 ($106) *	$22 ($11)	$145 ($96)	$159 ($51) †	$210 ($54)*	$11 ($8)
Medications	$721 ($233) †	$952 ($175) *	$2,000 ($182) *	$24 ($21)	$41 ($33)	$162 ($40) *	$804 ($56) *	−$7 ($6)
Hospital	$1763 ($379) *	$3,648 ($576) *	$6,239 ($590) *	$68 ($58)	$715 ($259) †	$1905 ($431) *	$2527 ($427) *	$49 ($40)
Total	$6,371 ($557) *	$9,657 ($741) *	$14,661 ($814) *	$142 ($77)	$2300 ($328) *	$4,301 ($489) *	$5,979 ($471) *	$37 ($45)

* Coefficient statistically significant at p<.001.

† Coefficient statistically significant at p<.01.

‡ Coefficient statistically significant at p<.05.

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Table 5.

Opioid use: average morphine equivalent daily dose (MEDD) in mg and percentage of patients in each group using opioids for any opioid prescription and for opioid prescriptions for spine-related pain

	Low Impact Chronic Pain	Moderate Impact Chronic Pain	High Impact Chronic Pain	Year	Nonchronic spinal pain	Year
Any opioids						
MEDD (SE)[†]	3.46 (0.7)	7.02 (1.6)	18.84 (1.5)	0.40 (0.1)	3.07 (0.3)	0.11 (0.0)
% using[‡]	17.5%	32.8%	57.5%	0.6%	23.5%	0.0%
Spine-related opioids						
MEDD (SE)[†]	2.74 (0.6)	4.88 (0.9)	15.35 (1.4)	0.33 (0.1)	1.36 (0.2)	0.03 (0.0)
% using[‡]	12.4%	24.5%	48.4%	0.7%	12.2%	0.0%

MEDD = Morphine equivalent daily dose

All coefficients were statistically significant at p<.001 except those for the nonchronic year coefficients. The year coefficients for nonchronic spinal pain for any opioids were statistically significant at p=.025 for MEDD and p=.001 for % using, but the year coefficients for spine-related opioids were not statistically significant.

[†]Differences in MEDD between high-impact chronic pain and low- or moderate-impact chronic pain are all statistically significant at p<.001. The difference in MEDD between low- and moderate-impact chronic pain are statistically significant at p=.041 and p=.036 for any opioid use and spine-related opioid use, respectively. Differences in MEDD between nonchronic spinal pain and low-impact chronic pain are not statistically significant (p=.526) for overall opioids and statistically significant at p=.020 for spine-related opioids.

[‡]Percentage of patients using opioids differs across all pain impact levels at p<.001. Differences in the percentage of patients using opioids between nonchronic spinal pain and low-impact chronic pain are statistically significant at p<.001 for overall opioids and not statistically significant (p=.122) for spine-related opioids.