ORIGINAL ARTICLE

Patterns of initial treatment and subsequent care escalation among medicare beneficiaries with neck pain: a retrospective cohort study

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Abstract

Purpose To compare long-term care escalation encounters among three care patterns for new episodes of neck pain among Medicare beneficiaries.

Methods We examined Medicare claims spanning a four-year period for beneficiaries with new episodes of neck pain beginning in 2019. All patients were continuously enrolled under Medicare parts A, B, and D and aged 65–99 years. We calculated the cumulative frequency and propensity- weighted rate ratios for escalated care encounters across three distinct, index-visit related neck pain treatment cohorts: 1) Spinal manipulative therapy; 2) Primary care without prescription analgesics within 7 days; 3) Primary care with prescription analgesics within 7 days.

Results When compared to the primary care without analgesics cohort, the spinal manipulative therapy cohort was associated with a 64% lower rate (RR 0.36, 95% CI 0.35,0.37) for long-term care escalation encounters, while the primary care with prescription analgesics cohort was associated with an 8% higher rate (RR 1.08; 95% CI 1.05,1.10).

Conclusion Initial spinal manipulative therapy was associated with a significant reduction in downstream care escalation encounters among Medicare beneficiaries with new episodes of neck pain. Our study contributes to a growing body of evidence supporting the integration of non-pharmacological care strategies for neck pain management.

Keywords Neck pain · Spinal manipulation · Prescription drugs · Primary care physicians · Health care utilization

Introduction

The prevalence of neck pain (NP) among adults over the age of 65 in the United States (US) is reported to be 9.7% [1], impacting approximately 3.9 million older adults and peaking between the ages of 70–74 years. Healthcare spending related to neck pain has increased at a rate six times faster than its prevalence, suggesting a rise in the use of high-cost care options such as injection procedures and fusion surgeries. [2–4].

Medicare is a federal health insurance program primarily serving Americans aged 65 and over, providing coverage for inpatient (Part A) and outpatient (Part B) care. In 2021, around 64 million beneficiaries were enrolled in Medicare Parts A and B, with approximately 49 million also opting for prescription drug coverage (Part D). [5] Spinal Manipulative Therapy (SMT) is the only chiropractic service covered by Medicare, and chiropractors perform 97% of all SMT procedures reimbursed by the program [6]. Over a 10-year period, chiropractic users in the U.S. averaged 8.3 visits annually, with an average cost of $87 USD per visit, resulting in total yearly expenditures of $721 USD per user [7].

Most studies on pain management among Medicare beneficiaries have focused on low back pain. Therefore, there is a critical need for more research on non-pharmacological management of NP, particularly in light of new clinical practice guidelines [8]. Such guidelines discourage the initial use of prescription drugs and emphasize non-pharmacological therapies such as SMT [9]. Physicians may also prescribe

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non-pharmacological care in the form of referrals and/or recommendations for self-care.

The comparative long-term value of therapies for NP is markedly influenced by their efficiency. The Institute of Medicine identified efficiency, or avoidance of waste, as one of the key domains of healthcare quality [10]. Spine care often involves highly specialized, expensive, and invasive interventions (e.g., imaging studies, injection procedures, prescription medications, and surgeries), for which the benefits over more conservative options are unclear [11, 12]. The observed trends in the adoption of such interventions among Medicare beneficiaries present notable concerns, with substantial increases in the utilization of spinal injection procedures [3], opioid medications [13], cervical discectomy and fusion procedures [4], and MRI studies [14].

Because NP often becomes chronic, patients who suffer from persistent NP often seek long-term supportive care to manage their symptoms and preserve function, with SMT being a common treatment option [15]. However, the comparative long-term value of spinal manipulation as compared to prescription drugs is uncertain since there have been few studies of downstream effects [16], and randomized controlled trials lack sufficient follow-up to evaluate long-term outcomes [17]. For studies of chronic spinal pain, the National Institutes of Health recommends evaluation of clinical data for at least 12 months [18].

In this study we assessed long-term efficiency by evaluating care escalation encounters, defined as interventions that represent an increase in the complexity of care and utilize resources that go beyond the usual course of treatment [19]. The rate of these encounters was compared among three mutually exclusive cohorts of Medicare beneficiaries between 2019 and 2021. These cohorts were identified based on index visit provider-treatment strategy combinations for a new episode of NP and included: chiropractic-spinal manipulative therapy (DC-SMT); and primary care with (PC-A) or without (PC-NA) analgesic medications. It was hypothesized that beneficiaries initiating treatment with DC-SMT would exhibit lower rates of care escalation encounters when compared to PC-A or PC-NA.

Methods

This retrospective cohort study was developed utilizing insurance claims data from Medicare beneficiaries aged 65–99 years continuously enrolled in Parts A, B and D from 2018 to 2021.

General methods for similar research using Medicare administrative data have been described previously [20]. The cohorts included beneficiaries with an index visit for a new episode of NP (Online Resource 1) in 2019 and excluded patients with a diagnosis of cancer or use of hospice care in

2018 to avoid confounding for opioid medication prescriptions. We defined a new episode of NP as the recording of at least one paid claim with a primary diagnosis of NP during a 90-day period, preceded by a 90-day washout period with no paid claims for NP. Three treatment cohorts were identified based on the index visit provider for a new episode of NP in 2019; the DC-SMT cohort received only spinal manipulation from a chiropractor (specialty code 35); the PC-NA cohort visited a primary care physician (PCP—specialty codes 01, 08 or 11) without filling an analgesic prescription within seven days; and the PC-A cohort visited a PCP and filled a prescription for an analgesic medication within seven days (Analgesic medication list available upon request). Medicare coverage guidelines restrict reimbursement for chiropractic services to spinal manipulation, making chiropractic care synonymous with spinal manipulation in Medicare claims data [21].

Demographic characteristics, comorbid conditions, and Charlson Comorbidity Index (CCI) scores were identified utilizing Medicare Parts A and B data from 2018 (lookback period). The Research Triangle Institute (RTI) race codes were collapsed from seven categories into four due to small frequencies, and two markers of low income (dual enrollment in Medicare/Medicaid and Part D subsidy) were collapsed into one variable, as the correlation among these variables was near 100%. Beneficiaries with the presence of either marker were considered low income. Chronic conditions were selected based on evidence from the literature linking them with opioid prescriptions [22].

Analgesic medications were identified by 10-digit National Drug Codes from Medicare Part D claims, selected based on treatment guidelines [23] and expert opinion (*co-author JDL*). Outcomes were measured as cumulative counts of care escalation encounters among the three treatment cohorts across a two-year follow-up period. These encounters, identified using methods previously established by the research team [20, 24–26], included diagnostic imaging studies, medical specialist visits, surgical procedures, emergency department (ED) visits, hospitalizations, and injection procedures. (Online Resource 2).

To account for variability in episode duration among beneficiaries, we calculated time-standardized incidence rates by aggregating data on care escalation encounters and person-months (calculated as episode duration in days divided by 30.44) for each cohort. The incidence rates per 1,000 person-months were then determined using the formula: $\frac{Total[Escalation\,encounter\,type]}{Total\,Person\,Months} \times (1000)$. Similarly, we calculated incidence rates for 'Total Escalation' by aggregating all care escalation encounters by cohort over the two-year follow-up period.

We employed a series of regression techniques to ascertain associations between initial treatment cohort and care

escalation. To ensure the accuracy and relevance of our findings, our models were adjusted for a comprehensive range of individual characteristics and health status indicators identified during a one-year lookback period, including: Age category; Gender; Race/Ethnicity; Low Income Status; Charlson Comorbidity Index (CCI) score, and a range of chronic conditions (i.e., hip or knee osteoarthritis, fibromyalgia, opioid use disorder, depression, and low back pain). Logistic regression was used to compute propensity scores based on the covariates listed above. These scores were then used for weighting by the inverse probability of treatment using Poisson regression with robust standard errors, as advocated by Zou [27]. All covariates were included in this weighted model to perform a doubly-robust estimation, which helps to address any limitations in the ability of the propensity weights to optimally balance treatment cohorts [28]. This process was performed for each type of care escalation encounter, as well as for cumulative escalation encounters (i.e., total escalation). All analyses were conducted in SAS version 9.3 [29].

Results

Application of all specified inclusion and exclusion criteria to the study sample resulted in a super-cohort of 291,604 beneficiaries with an office visit for NP. Among this super-cohort, 23,243 (8%) beneficiaries filled an analgesic prescription within seven days following a PCP visit (PC-A cohort), 85,765 (29%) visited a PCP but did not fill an analgesic prescription within the seven-day window (PC-NA cohort), and 182,596 (63%) received spinal manipulation from a chiropractor (DC-SMT cohort) (Table 1).

Within the DC-SMT cohort, 92% of the beneficiaries identified as White, 62% had co-existing low back pain, and 5% were categorized as low income. In contrast, the PC-NA cohort exhibited the greatest ethnic diversity, included a higher proportion of low-income beneficiaries (15%), and had the highest prevalence of chronic conditions. Propensity weighting effectively normalized the standard mean differences among cohorts, thereby facilitating a less biased cohort comparison (Online Resource 3).

Table 2 presents cumulative, prevalence and time-adjusted incidence rates for each escalation encounter type by cohort. The rate of escalation encounters per 1000 person-months was markedly lower in the DC-SMT cohort, ranging from 77.8% lower for hospitalizations (versus the PC-NA cohort) to 93.3% lower for surgical procedures (versus the PC-A cohort).

Table 3 presents weighted rate ratio (RR) estimates for escalated care encounters. The DC-SMT cohort exhibited a 64% reduced rate of cumulative escalation encounters compared to the PC-NA cohort (RR = 0.36, 95% CI: 0.35–0.37),

as well as markedly reduced rates across all individual care escalation procedures. Alternatively, the PC-A cohort was associated with an 8% increased rate of cumulative escalation encounters (RR = 1.08, 95% CI: 1.05–1.10) compared to the PC-NA cohort, with increased rates of medical specialist visits and imaging studies along with decreased rates of surgical procedures and ED visits. Covariates significantly associated with escalation encounters included: Age (10% lower rate in youngest group); Low-income status (17% lower rate versus those not classified as low income); Race/Ethnicity (8–16% higher rates versus White); Gender (4% lower rate for females); and Chronic conditions (33% higher rate for opioid use disorder) (Online Resource 4).

Discussion

The demographic and clinical characteristics of our study cohorts, as presented in Table 1, are in concordance with the limited available literature evaluating NP among Medicare beneficiaries. The DC-SMT cohort demonstrated younger ages, a higher proportion of males, limited ethnic diversity, fewer comorbid conditions, and fewer indicators of low-income status when compared to the other cohorts. Corroborating our observations, Whedon et al.[30] found that Medicare beneficiaries with NP opting for SMT, as opposed to medical care, were significantly younger, predominantly male, almost exclusively white (97%), and exhibited a lower average CCI score. Similarly, in their systematic review on disparities in chiropractic care utilization, Gliedt et al.[31] identified that individuals seeking chiropractic care were more likely to be White and belong to the highest income bracket. Finally, Weigel et al.[32] observed that Medicare beneficiaries receiving SMT for spine-related conditions, compared to those receiving medical care, were more likely to be white (96% versus 87%) and belong to the highest income quartile (41% versus 31%).

A systematic review by Farabaugh et al.[33] compared costs and healthcare utilization among adults with spine-related disorders utilizing chiropractic versus medical care. Consistent with our results, this review revealed large scale differences in healthcare utilization favoring chiropractic care. Specifically, 15 studies reported lower utilization of diagnostic imaging, eight indicated a reduction in surgeries, seven showed decreased hospitalizations, five pointed to fewer injection procedures, five highlighted reduced referrals for specialist consultations, and two demonstrated fewer ED visits in patients utilizing chiropractic versus medical care. Among the 44 studies reviewed, six focused on Medicare populations and six evaluated NP related diagnoses. A recent study not included in the aforementioned systematic review evaluated escalated care encounters for new episodes of NP associated with different initial providers [15]. The authors

Table 1 Cohort characteristics

	DC-SMT Cohort (n = 182,596)		PC-NA Cohort (n = 85,765)		PC-A Cohort (n = 23,243)	
	Mean	SD	Mean	SD	Mean	SD
Age	75.5	5.9	76.0	6.6	75.6	6.4
	n	%	n	%	n	%
Age category						
66–70 years	56,301	31	20,403	24	5792	25
71–75 years	58,542	32	25,208	30	7047	30
76–80 years	37,766	21	19,531	23	5286	23
81–85 years	19,609	11	11,946	14	3130	13
86–99 years	10,378	6	8677	10	1988	9
Sex						
Female	120,445	66	58,313	68	15,214	65
Male	62,151	34	27,452	32	8029	35
Race/ethnicity						
Black	2016	1	4483	5	1395	6
Hispanic	3709	2	5015	6	1203	5
White	168,349	92	68,924	81	19,113	82
Other/Unknown	8552	5	7343	9	1532	7
CCI score						
0	121,250	68	52,586	61	14,264	61
1	42,522	24	22,965	27	6172	27
2	11,228	6	6961	8	1747	8
3	2747	2	2049	3	495	2
4+	1686	1	1204	1	284	1
Chronic conditions						
Depressive disorder	13,904	8	8665	10	2023	9
Fibromyalgia	4224	2	2778	3	529	2
Low back pain	113,061	62	31,174	36	7167	31
Opioid use disorder	810	0.5	1218	1	164	1
Hip Osteoarthritis	2835	1.5	1874	2	444	2
Knee Osteoarthritis	10,039	5.5	6363	7	1460	6
Low-income Marker	8458	5	12,531	15	2433	10

N = number; SD = Standard Deviation; DC-SMT = Spinal Manipulative Therapy; PC-NA = Primary Care No Analgesics; PC-A = Primary Care with Analgesics; CCI = Charlson Comorbidity Index; Low Income Marker = Dual Enrollment and/or Part D Subsidy;

Table 2 Prevalence and rate of escalation encounters by cohort

Escalation Encounter	DC-SMT (n = 182,596)		PC-NA (n = 85,765)		PC-A (n = 23,243)	
	Encounters	Rate*	Encounters	Rate*	Encounters	Rate*
Medical specialist	16,660	16.1	24,670	95.0	6883	110.8
Injection procedures	2494	2.4	4042	15.6	1421	22.9
Surgical procedures	429	0.4	1344	5.2	371	6.0
Hospitalizations	55	0.1	126	0.5	42	0.7
ED visits	95	0.1	215	0.8	37	0.6
Imaging studies	7251	7.0	8186	31.5	2249	36.2
Total escalation	26,984	26.1	38,583	148.5	11,003	177.1

DC-SMT = Spinal Manipulative Therapy; PC-NA = Primary Care No Analgesics; PC-A = Primary Care with Analgesics; ED = Emergency Department

*per 1000 person months; Total Escalation = sum of escalation encounters over 2-year follow-up

Table 3 Escalation encounter rate estimates

Cohort Comparison	Rate Ratio (95% CI)	*p* value
Total Escalation		
DC-SMT versus PC-NA	0.36 (0.35, 0.37)	< 0.0001
PC-A versus PC-NA	1.08 (1.05, 1.10)	< 0.0001
Medical specialist visits		
DC-SMT versus PC-NA	0.32 (0.31, 0.33)	< 0.0001
PC-A versus PC-NA	1.07 (1.03, 1.11)	< 0.0001
Injection procedures		
DC-SMT versus PC-NA	0.36 (0.33, 0.39)	< 0.0001
PC-A versus PC-NA	1.10 (0.99, 1.21)	0.08*
Imaging studies		
DC-SMT versus PC-NA	0.45 (0.44, 0.46)	< 0.0001
PC-A versus PC-NA	1.11 (1.07, 1.15)	< 0.0001
Surgical procedures		
DC-SMT versus PC-NA	0.08 (0.07, 0.11)	< 0.0001
PC-A versus PC-NA	0.68 (0.55, 0.85)	0.001
Hospitalizations		
DC-SMT versus PC-NA	0.23 (0.15, 0.35)	< 0.0001
PC-A versus PC-NA	1.42 (0.88, 2.28)	0.15*
Emergency Department		
DC-SMT versus PC-NA	0.12 (0.09, 0.15)	< 0.0001
PC-A versus PC-NA	0.49 (0.34, 0.70)	0.001

CI = Confidence Interval; *DC-SMT* = Spinal Manipulative Therapy; *PC-NA* = Primary Care No Analgesics (reference); *PC-A* = Primary Care with Analgesics; Total Escalation = sum of escalation encounters over 2-year follow-up. *Did not reach statistical significance

concluded that initiating care with PCPs, as opposed to chiropractors, was associated with a statistically significant increase in the odds of care escalation encounters: x-rays (89%); computed tomography scans (540%); magnetic resonance imaging scans (450%); injection procedures (510%); and surgical interventions (570%).

A substantial proportion (63%) of participants in our investigation opted for chiropractic care (SMT) over primary care (37%) as the initial treatment modality for NP, a finding which aligns with two previous studies. Fenton et al.[15] reported that chiropractors constituted the first line of care for 45% of patients presenting with new episodes of NP, in contrast to 33% initiating with PCPs. Similarly, Whedon et al.[30] observed that, over a one-year period, 65% of individuals experiencing NP sought chiropractic care (SMT), whereas 45% consulted a PCP. Finally, a recent scoping review evaluating chronic pain management strategies among Medicare beneficiaries found that SMT was the most common noninvasive, nonpharmacological option among the 33 included studies [8].

The observation that 92% of index visits meeting our inclusion criteria were addressed through conservative, non-pharmacological interventions underscore alignment with guideline-recommended practices for managing NP.

Despite only 8% of beneficiaries initially receiving pharmacotherapy, utilization of over-the-counter medications was not assessed and cannot be ruled out.

This study's scope was limited by the exclusion of Medicare Advantage plans, which represented approximately 40% of the Medicare beneficiary demographic in 2021. [5] This exclusion could affect the generalizability of our findings across Medicare populations. Although conservative care is appropriate for most NP cases, specific clinical scenarios may necessitate escalated care. However, administrative claims data lack the detailed clinical granularity required to precisely identify such instances. Additionally, the absence of data on non-prescription medication use may have led to conservative estimates of analgesic utilization. Although we employed robust methodological strategies to reduce selection bias among the treatment cohorts, inherent limitations regarding retrospective observational studies prevent elimination of all potential confounders. Furthermore, administrative claims data do not include direct measures of clinical status such as NP severity or functional limitations. While not evaluated in the current study, cost considerations are important when selecting between treatment options. Finally, observational study designs inherently restrict the ability to ascertain causal relationships.

Conclusion

Initial chiropractic care, in the form of SMT, was associated with significantly reduced downstream care escalation encounters when compared to initial primary care with or without analgesic medications. Our study contributes to a growing body of evidence supporting the integration of non-pharmacological care into healthcare strategies for NP management.

Declarations

Ethics approval The project protocols were reviewed and approved by the Institutional Review Board of the Southern California University of Health Sciences.

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