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## Cross-sectional analysis of per capita supply of doctors of chiropractic and opioid use in younger Medicare beneficiaries

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### Abstract

**Objective**—The purpose of this study was to determine whether the per-capita supply of doctors of chiropractic (DCs) or Medicare spending on chiropractic care was associated with opioid use among younger, disabled Medicare beneficiaries.

**Methods**—Using 2011 data, at the hospital referral region level, we correlated the per-capita supply of DCs and spending on chiropractic manipulative therapy (CMT) with several measures of per-capita opioid use by younger, disabled Medicare beneficiaries.

**Results**—Per-capita supply of DCs and spending on CMT were strongly inversely correlated with the percentage of younger Medicare beneficiaries who had at least 1, as well as with 6 or more, opioid prescription fills. Neither measure was correlated with mean daily morphine equivalents per opioid user or per chronic opioid user.

**Conclusions**—A higher per-capita supply of DCs and Medicare spending on CMT were inversely associated with younger, disabled Medicare beneficiaries obtaining an opioid prescription. However, neither measure was associated with opioid dosage among patients who obtained opioid prescriptions.

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#### Contributorship

**Concept development** (provided idea for the research), WBW, CMG

**Design** (planned the methods to generate the results), WBW

**Supervision** (provided oversight, responsible for organization and implementation, writing of the manuscript), WBW

**Data collection/processing** (responsible for experiments, patient management, organization, or reporting data), WBW

**Analysis/interpretation** (responsible for statistical analysis, evaluation, and presentation of the results), WBW, CMG

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**Writing** (responsible for writing a substantive part of the manuscript), WBW, CMG

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**Other** (list other specific novel contributions)

#### CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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## Keywords

chiropractic; Medicare; opioids

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## Introduction

America has an expensive and expanding opioid use epidemic.<sup>1</sup> With increasing disability rates for back and neck pain conditions<sup>2</sup> and high use of opioids among such disabled patients,<sup>3</sup> one might anticipate that the opioid epidemic will worsen without changing current treatment patterns.

Addressing the opioid epidemic should be a public health priority. Spurred by a 16.3 percent increase in overdose deaths from legal opioid drugs in 2014, the Centers for Disease control has issued new guidelines to curb physicians opioid prescriptions, stating that ‘the risks are addiction and death, and the benefits are unproven.’<sup>4</sup>

A recent study examined the concentration of provider types who prescribe opioids to Medicare beneficiaries.<sup>5</sup> That study found that such prescribing is not concentrated among few provider types, as had been anticipated, but is distributed across many provider-types. While the study found that per-capita opioid prescription writing is concentrated among specialty services in pain, anesthesia, and physical medicine and rehabilitation, it found that internists and family practitioners prescribe over half of all opioid prescriptions. Another recent study disconcertingly found that legitimate opioid use in adolescence is associated with increased risk of long-term opioid use and possibly misuse in adults.<sup>6</sup> These studies suggest that opioids are prescribed by a variety of physician types and even limited use can have long-term implications.

Doctors of chiropractic (DCs) treat neck and back pain, are thought to be effective and trustworthy among the general population,<sup>7</sup> and according to their scope of practice do not prescribe medications. A higher supply of DCs appears to offset patients’ demand for primary care physician services for their back and neck pain,<sup>8</sup> raising the possibility that a higher supply of DCs might also reduce the number of opioid prescriptions that physicians write. Therefore the purpose of this study was to determine whether a higher supply of DCs or the use of chiropractic manipulative therapy (CMT) might be associated with lower use of prescription opioids, as measured by either obtaining an opioid prescription or the daily dose of opioids among patients who obtained an opioid prescription. To explore this possibility, we performed a cross-sectional analysis to examine the association between the per-capita supply of DCs or the use of CMT and use of opioids among younger, disabled Medicare beneficiaries.

## Methods

We obtained data on the supply of DCs per 1,000 Medicare beneficiaries and per-capita spending for CMT on Medicare beneficiaries in 2011 that were calculated for each of the 306 Dartmouth Atlas defined hospital referral regions (HRRs) from work funded by NIH

(R21AT008287) and published elsewhere.<sup>9</sup> Dartmouth College institutional Review Board approved this study (CPHS# STUDY00024094).

We used Part B Medicare fee-for-service data for 2011 to identify DCs who provided Medicare reimbursed CMT from bills for the following CPT codes: 98940, 98941, or 98942. Then, we confirmed that a DC was the provider for a visit that generated a bill for one of those codes by limiting bills to those with code 35 in the provider field. Finally, we obtained the National Provider Number from the bill, aggregated the number of unique DCs who were practicing in each HRR, and used the number of Medicare beneficiaries in the HRR as the denominator to generate the per-capita supply of DCs in each HRR.

We obtained 2011 measures of opioid use by Medicare beneficiaries who were younger than age 65 and who were continuously enrolled in Medicare A, B, and D from the literature.<sup>3</sup> The authors of the paper that provided the data indicated that, for such patients, from 2011 Medicare Part D files, they calculated the proportion of beneficiaries with at least 1 opioid prescription fill, the percentage with 6 or more fills (chronic users), and the mean daily morphine equivalent per opioid user and per chronic user. The values of those measures that were reported had been adjusted for age, sex, race, low-income subsidy, and prescription-defined hierarchical condition category.

## Statistics

Using the HRR as the unit of analysis in this cross-sectional study, we calculated Pearson correlation coefficients to explore associations between DC supply, per-capita spending on CMT, and measures of opioid use described above. We used SPSS v23 (released 2013, Armonk, NY: IBM Corporation) to conduct all analyses.

## Results

Per-capita supply of DCs and per-capita Medicare spending on CMT were strongly inversely correlated with the percentage of younger Medicare beneficiaries with at least 1, as well as with 6 or more, opioid prescription fills. Neither measure was statistically significantly correlated with mean daily morphine equivalents per opioid user or per chronic opioid user (Table 1).

## Discussion

In this exploratory analysis, we found a strong inverse correlation between the per-capita supply of DCs and the proportion of younger Medicare beneficiaries who filled opioid prescriptions. Further, we found a strong inverse correlation between the per-capita spending on CMT and the proportion of younger Medicare beneficiaries who filled opioid prescriptions. However, we found no relationship between opioid dosing for either patients who used any opioids or who were chronic opioid users – as measured by the mean daily morphine equivalent does – and the supply of DCs or Medicare spending on CMT.

These findings should be interpreted in light of a randomized controlled trial that examined 272 patients with acute or sub-acute neck pain.<sup>10</sup> That study randomized patients to one of

three arms: CMT, home exercise with advice, or medication management. Of the 182 patients with acute or sub-acute neck pain who were randomly assigned to CMT or home exercise with advice, none obtained prescription medications. However, 80 of the 90 patients randomly assigned to medication management were prescribed opioid medications. In this context, our findings suggest that, at least in this younger Medicare population, greater availability and use of an alternative spine pain treatment may be associated with a lower prevalence of opioid users but, perhaps as expected, have no impact on opioid dosing among those who obtain opioid prescriptions.

### Alternative Explanations

In this cross-sectional study, alternative explanations cannot be ruled out. These include that the findings are spurious or that some other factor drove our results: for instance, it is possible that patients who are averse to opioid use live in areas of low per-capita DC supply.

### Application of Study Findings

Addressing the increase in opioid use and the sequelae of such use should be a public health priority. While further study is warranted, our preliminary findings suggest that America's opioid epidemic might be reduced should Medicare consider a clinical trial of chiropractic spinal manipulation prior to conventional medical care for patients with neck or back pain.

### Limitations and Strengths

Our analysis uses large Medicare administrative datasets; use of other datasets from other insurers may have generated different results. Second, the study population that we studied consisted of younger, disabled Americans who were enrolled in Medicare fee-for-service; these patients are highly disabled and are likely to have a high prevalence of opioid use.<sup>3</sup> Given that back pain is the most common Social Security Disability Insurance (SSDI) program qualifying diagnoses and accounts for 30.5% of program participants and 40% of the growth in the SSDI enrollment since 1996,<sup>11</sup> it is likely that this population had a high prevalence of back pain. Examination of other populations might have resulted in different findings. Third, we examined only CMT and not other modalities that DCs might provide or spinal manipulation provided by non-DCs. Including those other modalities or other providers might generate different results. Finally, findings from our cross-sectional analysis are associative and do not suggest causation. More robust research designs are required to demonstrate causation.

Strengths of this study include the following. First, the very large datasets that were used cover the entire United States, and, therefore, are generalizable. Second, we were able to correlate DC supply with 2 measures of opioid use: any use and daily morphine equivalent of dosage. Our findings are consistent with medical practice and the potential impact of CMT on opioid use: given that DCs cannot prescribe opioids, one might reasonably expect that higher use of CMT would be associated with lower rates of opioid prescriptions. However, there is no reason to believe that a higher per-capita supply of DCs would be associated with differing dosages of opioids, if opioids were prescribed.

## Clinical Suggestions

Based upon our findings, we suggest that Medicare consider promoting a trial of CMT prior to use of conventional medical care for patients with neck or back pain. The rationale for use of CMT prior to medical care is that concurrent medical care might result in opioid prescriptions; however, further study that examines opioid use when CMT and conventional medical care are concurrently provided is warranted. Such an intervention might have several effects. First, it may both help stem the growth of opioid use and also reduce healthcare expenditures for the treatment of spine pain.<sup>12</sup> Second, by offsetting demand for primary care services,<sup>8</sup> it may effectively expand the primary care workforce. Third, it may reduce demands on the SSDI program in two ways: initial use of CMT for back pain has been associated with reduced disability rates at one year after injury,<sup>13</sup> and avoidance of use of opioids has been associated with lower disability rates one year following injury.<sup>14</sup>

## Conclusion

A higher per-capita supply of DCs and Medicare spending on CMT were inversely associated with younger, disabled Medicare beneficiaries obtaining an opioid prescription. However, neither measure was associated with opioid dosage among patients who obtained opioid prescriptions.

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**Practical Applications**

At the hospital referral region level, we found that per-capita supply of doctors of chiropractic and per-capita Medicare spending on chiropractic manipulative therapy were inversely associated with any use of opioids.

Per-capita supply and spending on chiropractic manipulative therapy were not associated with the mean daily dosage of opioids among patients who obtained opioid prescriptions.

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Table

Correlation coefficients for measures of the per-capita supply of doctors of chiropractic (DCs) and Medicare spending on CMT at the hospital referral region with measures of opioid utilization by younger, disabled Medicare beneficiaries.

	Percent of HRR beneficiaries with one or more opioid fills	Percent of HRR beneficiaries with 6 or more opioid fills	Mean daily morphine equivalents per user	Mean daily morphine equivalents per chronic user
Per-capita DC supply	-0.350 (p<0.001)	-0.397 (p<0.001)	-0.089 (0.118)	0.055 (0.334)
Per-capita fee-for-service spending on CMT	-0.233 (p<0.001)	-0.268 (p<0.001)	-0.106 (0.064)	-0.006 (0.918)

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