JAOA ORIGINAL CONTRIBUTION

Impact of Osteopathic Manipulative Treatment on Cost of Care for Patients With Migraine Headache: A Retrospective Review of Patient Records

Erik Schabert, DO
William Thomas Crow, DO

Context: Migraine headache is highly prevalent in the United States, resulting in large healthcare expenditures.

Objective: To determine whether the use of osteopathic manipulative treatment (OMT) at an osteopathic family practice residency clinic affected the cost of treating patients with migraine headache, compared with non-OMT care at the osteopathic clinic and care at an allopathic family practice residency clinic.

Methods: A retrospective review of electronic medical records from patients treated for migraine at two residency clinics within the Florida Hospital organization from July 1, 2002, to June 30, 2007. One of the clinics was osteopathic and offered OMT services, and the other clinic was allopathic and did not offer OMT. All costs compiled during the office visits and costs of prescribed medications were tabulated for each patient. Patients' pain-severity ratings, as reported in office visits in 2006 and 2007, were also tabulated.

Results: Electronic medical records from 631 patients, representing 1427 migraine-related office visits, were analyzed. Average cost per patient visit was approximately 50% less at the osteopathic clinic than at the allopathic clinic ($195.63 vs $363.84, respectively; $P<.001$). This observed difference was entirely attributable to the difference in the average number of medications prescribed per visit at the two clinics, with 0.696 prescriptions at the osteopathic clinic and 1.285 prescriptions at the allopathic clinic ($P<.001$). This difference in prescription number resulted in a lower average medication cost per visit at the osteopathic clinic than at the allopathic clinic ($106.94 vs $284.93, respectively; $P<.001$). Patients at the osteopathic clinic were 5 years younger on average than at the allopathic clinic ($P<.001$). No statistically significant difference was observed between the two practices in patients' ratings of pain severity.

Conclusion: The inclusion of OMT in a treatment regimen for patients with migraine headache may lower the cost of the treatment regimen. However, further study is needed to confirm these results.

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Migraine headache is highly prevalent in society, with large migraine-related healthcare expenditures each year in the United States. Approximately 18% of women and 6% of men have migraine in the United States, and the annual direct medical costs for these patients are approximately $100 to $200 greater per patient-year than for the general population.[1-3] Considering that these reported costs include only costs of physician and hospital visits and do not include the thousands of dollars per patient spent annually on medication for migraine prevention and treatment, the total cost burden of migraine on the US healthcare system is likely to be substantially greater.[4]

Any intervention that can reduce the annual costs of treating patients with migraine has great potential benefit to society. Although several studies,[5-9] as well as much anecdotal evidence, suggest that osteopathic manipulative treatment (OMT) and chiropractic spinal manipulation have some efficacy in treating patients with migraine, little research has been completed concerning the effect of OMT on migraine-related medical costs. The current study evaluates the effects on medical costs of using OMT as an adjunct treatment for patients with migraine.

Materials and Methods

We reviewed electronic medical records (EPIC Systems Corp, Verona, Wis) of all patients with a diagnosis of migraine who were treated from July 1, 2002, to June 30, 2007, in two family practice residency programs affiliated with Florida Hospital. One of these residency programs was at an osteopathic clinic, and the other was at an allopathic clinic. Both clinics were located in Orlando, Fla. The study protocol was approved by the institutional review board at Florida Hospital System in Orlando.

The following patient health information was obtained from the medical records:

- EPIC patient identification number
- patient date of birth

From Florida Hospital East Orlando in Orlando.

Address correspondence to William Thomas Crow, DO, Director, Family Practice and Neuromusculoskeletal Medicine Residency, Florida Hospital East Orlando, 7975 Lake Underhill Rd, Suite 210, Orlando, FL 32822-8204.

E-mail: thomas.crow.do@flhosp.org

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- date of patient office visit
- Current Procedural Terminology (CPT) code for office visit
- medications prescribed for migraine
- medication refills for migraine
- treatment procedures performed (eg, OMT, trigger point injections)
- referrals to neurologist
- radiology tests ordered secondary to migraine

Only those office visits in which a diagnosis of migraine was coded using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes for migraine (ie, 346.XX) were included in the current study. No patient records having such codes were excluded from analysis.

The cost for each medication was obtained from Walgreens' pharmacy Web site (http://www.walgreens.com/pharmacy/) in January 2008. Medication costs were excluded from review if the patient had additional primary indications for the medication besides migraine. For example, the cost of narcotic pain medication was not included in the analysis if the patient had severe chronic back pain in addition to migraine. The costs of all other medical services (eg, office visit, radiology services, referrals) were based on the regional Medicare fee schedule for Orlando in 2007.

To analyze costs, the cost data were divided into three patient groups: osteopathic clinic patients who received OMT at any office visit during their course of treatment, osteopathic clinic patients who did not receive OMT at any time during their treatment, and allopathic clinic patients. Costs per office visit were evaluated according to total costs compiled per office visit (including costs of prescribed medications), cost of the office visit itself, and costs of medications prescribed per office visit. The number of medications prescribed per office visit was also analyzed.

To evaluate the relative effectiveness of treatment given to patients at the osteopathic clinic vs the allopathic clinic, patients' ratings of pain severity—obtained at each visit—and patients' ages and sexes were tabulated and compared between the two practices. Unfortunately, pain-severity data did not begin to be entered into the reviewed patient records until 2006, so these data were available for only 2006 and 2007. Pain-severity numbers were reported on a 0-to-10 scale, with 0 representing no pain and 10 representing the worst pain imaginable.

The data were compiled, and patient health information was analyzed, in an aggregate manner using Microsoft Office Excel and Access software (Microsoft Corp, Redmond, Wash). Statistical analysis, consisting of factoral analysis and one-way analysis of variance (ANOVA) on dependent variables, was performed using SPSS statistical software (version 14.0 for Windows; SPSS Inc, Chicago, Ill).

Table 1
Impact of OMT on Cost of Care for Patients With Migraine: Total Cost per Office Visit

	Family Practice Residency Clinic Type			
	DO, OMT (n=94)	DO, No OMT (n=300)	MD (n=1033)	All (N=1427)
Cost, Mean US $	203.76	187.50	363.84	316.22

Abbreviations: DO, osteopathic family practice residency clinic; MD, allopathic family practice residency clinic; OMT, osteopathic manipulative treatment.

Table 2
Impact of OMT on Cost of Care for Patients With Migraine: Total Cost Analysis per Office Visit

	ANOVA Measure			
Source	SS	MS	F Score*	*P* Value
DO vs MD	8501654.426	4250827.213	18.510	<.001
Within Group Error Factor	327020453.585	229649.195	NA	NA
Total	335522108.581	NA	NA	NA

*df=2.

Abbreviations: ANOVA, analysis of variance; DO, osteopathic family practice residency clinic; MD, allopathic family practice residency clinic; MS, mean square; NA, not applicable; OMT, osteopathic manipulative treatment; SS, sum of squares.

Results

Records from a total of 631 patients with a diagnosis of migraine were reviewed in the current study. The ages of patients ranged from 12 years to 95 years. Two hundred thirteen patients (33.76%) were treated in the osteopathic clinic—24 (11.27%) of whom received OMT. Four hundred eighteen patients (66.24%) were treated in the allopathic clinic. The patient population consisted of 111 (17.59%) men (34 in the osteopathic cohort, 77 in the allopathic cohort) and 520 (82.41%) women (179 in the osteopathic cohort, 341 in the allopathic cohort).

The 631 patient records comprised a total of 1427 migraine-related office visits—394 (27.61%) in the osteopathic cohort and 1033 (72.39%) in the allopathic cohort. Of the 394 visits at the osteopathic clinic, 94 (23.86%) visits included OMT, and 300 (76.14%) visits did not include OMT. The OMT techniques used during various visits included counterstrain; high-velocity, low-amplitude technique; ligamentous articular strain tech-

Table 3
Impact of OMT on Cost of Care for Patients With Migraine: Prescription Drug Cost per Office Visit

	Family Practice Residency Clinic Type			
	DO, OMT (n=94)	DO, No OMT (n=300)	MD (n=1033)	All (N=1427)
Cost, Mean US $	110.63	103.25	284.93	235.02

Abbreviations: DO, osteopathic family practice residency clinic; MD, allopathic family practice residency clinic; OMT, osteopathic manipulative treatment.

Table 4
Impact of OMT on Cost of Care for Patients With Migraine: Prescription Drug Cost Analysis per Office Visit

	ANOVA Measure			
Source	SS	MS	F Score*	*P* Value
DO vs MD	9235719.331	4617859.670	20.070	<.001
Within Group Error Factor	327628913.127	230076.481	NA	NA
Total	336864632.457	NA	NA	NA

**df*=2.

Abbreviations: ANOVA, analysis of variance; DO, osteopathic family practice residency clinic; MD, allopathic family practice residency clinic; MS, mean square; NA, not applicable; OMT, osteopathic manipulative treatment; SS, sum of squares.

nique; muscle energy; and osteopathy in the cranial field.

Average cost of care per visit at the osteopathic clinic was $203.76 for visits in which the patient received OMT and $187.50 for visits in which the patient did not receive OMT. Average cost of care per visit at the allopathic clinic was $363.84 (*Table 1*). The costs for both the OMT and the non-OMT osteopathic cohorts represented statistically significant reductions compared with the cost for the allopathic cohort ($P<.001$) (*Table 2*).

The cost differential observed between the osteopathic and allopathic practices was accounted for by the difference in migraine medication costs associated with visits at each clinic. The average cost of medication prescribed at the osteopathic clinic per visit was $110.63 and $103.25, respectively, for OMT visits and non-OMT visits. The average cost of medication prescribed at the allopathic clinic per visit was $284.93 (*Table 3*). The difference in prescribed medication costs between the two practices was statistically significant ($P<.001$) (*Table 4*).

The difference observed in medication costs between the osteopathic and allopathic practices was also influenced by a separate statistically significant difference in prescribing patterns. In the osteopathic practice, an average of 0.696 prescriptions per visit were issued to patients. In the allopathic practice, an average of 1.285 prescriptions per visit were issued to patients (*Table 5*). This nearly 2-fold difference in prescription number between the clinics met a level of statistical significance ($P<.001$), as shown in *Table 6*.

We considered whether the difference in medication costs between the osteopathic and allopathic practices was related to a possible greater use of triptans in the allopathic residency program than in the osteopathic residency program. However, we found no statistically significant difference between the osteopathic and allopathic residency programs in the number of triptans prescribed ($P=.22$).

There was little difference between the osteopathic and allopathic clinics in terms of the cost of the office visits themselves—as opposed to total costs compiled during the visits. The average cost of the office visit at the osteopathic clinic was $93.12 for OMT visits and $84.25 for non-OMT visits, while the average cost of the office visit at the allopathic clinic was $78.91 (*Table 7*). The difference between these costs at the osteopathic clinic vs allopathic clinic did not meet a level of statistical significance ($P<.01$), as shown in *Table 8*.

One hundred forty-three patients (67%) in the osteopathic residency program were seen for more than one office visit, compared with 255 patients (61%) in the allopathic residency program. The visits of 16 patients (7.51%) at the osteopathic clinic extended over a period of more than 1 year, compared with 48 patients (11.48%) at the allopathic clinic. Because of these relatively small sample sizes, obtaining meaningful data regarding costs of migraine-related treatment over an extended period was impossible.

We found a statistically significant difference in age of patients between the two practices, with patients in the osteopathic practice having mean ages of 37.43 years for the OMT group and 36.94 years for the non-OMT group, and patients in the allopathic practice having a mean age of 42.08 years ($P<.001$). However, we do not believe that the 5-year difference in mean age between patients in the osteopathic and allopathic practice is clinically significant, because it would be unlikely to involve differences in comorbidities or other clinically meaningful factors. Although a difference was also observed in the gender makeup of patients at the two clinics, with the osteopathic clinic having 179 patients (84.04%) who were women and the allopathic clinic having 341 patients (81.58%) who were women, this difference was not statistically significant ($P=.083$).

With regard to patient ratings of pain severity, we found no statistically significant difference between any of the three patient groups. The mean reported pain-severity level was

3.84 for patients seen in the osteopathic practice and 3.52 for patients seen in the allopathic practice (P=.509).

Comment

The current study demonstrated a statistically significant cost savings in treatment of patients with migraine at the osteopathic family practice residency clinic, compared with the allopathic family practice residency clinic. The study also identified a statistically significant difference in patient age (as well as a statistically nonsignificant difference in patient sex) between the two practices. Although it is impossible to attribute the cost differences observed between the osteopathic and allopathic clinics to differences in patient age and sex, it is plausible that these demographic factors could have had some sort of impact on cost.

We find it interesting that the use or lack of use of OMT during the reported office visits had no statistically significant impact on treatment cost at the osteopathic clinic. The reason for this lack of impact on cost is unclear. Perhaps a majority of patients seen in the osteopathic practice received OMT at other, unreported visits that they made to the osteopathic clinic, or perhaps some other factor unique to the osteopathic family practice residency was involved. The osteopathic residency program observed in the current study included a combined family practice and neuromusculoskeletal medicine (NMM) residency. Perhaps the presence of osteopathic physicians and full-time faculty who were specifically trained in OMT at the osteopathic clinic resulted in a high incidence of OMT being integrated with traditional migraine-related treatment of patients.

It is important to note that the cost differences identified in the current study between the osteopathic and allopathic clinics were entirely caused by differences in the cost of medications prescribed, and this difference in medication cost tracked precisely with the difference in number of prescriptions issued at the two clinics. This finding raises two questions. Were these differences simply the result of the use of OMT reducing the amount of medications needed to control migraine symptoms, or were the differences caused by some other factor that affected the prescribing practices of osteopathic family practice residents?

The osteopathic family practice residents were more likely than the allopathic family practice residents to use more intensive (ie, higher-numbered) office visit codes in billing. Hence, costs for the office visits themselves were slightly higher at the osteopathic clinic than at the allopathic clinic. The more intensive coding may indicate that the osteopathic residents spent more time with their patients than did the allopathic residents. Perhaps this was the reason that the osteopathic residents were able to prescribe less medication.

We did not collect data on specialist referrals, emergency department visits, or medications prescribed by providers outside the two clinics that were part of the current study. Such data would be helpful in more accurately assessing the cost-effectiveness of OMT in treating patients with migraine. However, this type of information was impossible to collect because of the retrospective nature of the current study.

Neither the osteopathic nor allopathic residency program during the period of retrospective analysis used an accepted standard of migraine outcomes in their documentation (eg, Headache Impact Test, Migraine Disability Assessment). Furthermore, no standardization of documentation was used regarding the number of migraine attacks and number of days of attack per month; the level of disability (besides pain severity) associated with the headache; the number of missing work days; or any other validated disability scoring system. Therefore, no conclusions about the quality of care in the osteopathic clinic vs the allopathic clinic can be assessed based on published standards.

Table 5
Impact of OMT on Cost of Care for Patients With Migraine: Prescription Drugs per Office Visit, No.

	Family Practice Residency Clinic Type			
	DO, OMT (n=94)	DO, No OMT (n=300)	MD (n=1033)	All (N=1427)
Prescription Drugs, Mean No.	0.702	0.690	1.285	1.121

Abbreviations: DO, osteopathic family practice residency clinic; MD, allopathic family practice residency clinic; OMT, osteopathic manipulative treatment.

Table 6
Impact of OMT on Cost of Care for Patients With Migraine: Prescription Drug No. Analysis per Office Visit

	ANOVA Measure			
Source	SS	MS	F Score*	*P* Value
DO vs MD	99.872	49.936	33.989	<.001
Within Group Error Factor	2092.155	1.469	NA	NA
Total	2192.027	NA	NA	NA

*df=2.

Abbreviations: ANOVA, analysis of variance; DO, osteopathic family practice residency clinic; MD, allopathic family practice residency clinic; MS, mean square; NA, not applicable; OMT, osteopathic manipulative treatment; SS, sum of squares.

Table 7
Impact of OMT on Cost of Care for Patients With Migraine: Cost of Office Visit

	Family Practice Residency Clinic Type			
	DO, OMT (n=94)	DO, No OMT (n=300)	MD (n=1033)	All (N=1427)
Cost, Mean US $	93.12	84.25	78.91	80.97

Abbreviations: DO, osteopathic family practice residency clinic; MD, allopathic family practice residency clinic; OMT, osteopathic manipulative treatment.

Table 8
Impact of OMT on Cost of Care for Patients With Migraine: Cost of Office Visit Analysis

	ANOVA Measure			
Source	SS	MS	F Score*	*P* Value
DO vs MD	21482.039	10741.020	16.386	<.01
Within Group Error Factor	933418.593	655.491	NA	NA
Total	954900.633	NA	NA	NA

**df*=2.

Abbreviations: ANOVA, analysis of variance; DO, osteopathic family practice residency clinic; MD, allopathic family practice residency clinic; MS, mean square; NA, not applicable; OMT, osteopathic manipulative treatment; SS, sum of squares.

Because of the limited number of patients who were followed for 1 year or more, it was impossible to evaluate the long-term costs of migraine-related care at the osteopathic clinic vs the allopathic clinic—or the effectiveness of OMT in the management of migraine. The reason for the large number of single office visits at both the osteopathic and allopathic clinics may be related to the fact that these clinics were family practice residency clinics, and their patients wanted to receive follow-up care from neurologists. However, the reason for the lack of continuity of care is unclear.

Conclusion

The current study was designed to begin an evaluation of the potential impact of OMT on cost of treating patients with migraine headache. Although the results did not definitively answer whether OMT reduces such costs, the study did raise interesting questions to be evaluated by further studies.

Among data that should be examined in further studies are effects on migraine-related costs of number of emergency department visits, specialist referrals, and outside provider prescriptions. Validated migraine disability scoring systems should be used to compare data between treatment groups.

A potential confounding factor for organizations seeking to reproduce the results of the current study is the skill of OMT practitioners. The osteopathic physicians who performed the OMT services reported in the current study were either participating in an NMM residency or were supervised by NMM faculty. As such, OMT specialists directed treatment. Further studies should evaluate the general skill of OMT practitioners when analyzing research results.

With additional cuts in Medicare reimbursements looming as a result of the ever-rising costs of healthcare in the United States, any intervention that can significantly reduce the cost of treating patients with high-prevalence medical conditions, such as migraine headache, is of great interest. Thus, further evaluation of OMT and osteopathic medical training as a cost-saving measure in the treatment of patients with migraine could be an important step in reducing rising healthcare costs.

References

1. Elston Lafata J, Moon C, Leotta C, Kolodner K, Poisson L, Lipton RB. The medical care utilization and costs associated with migraine headache. *J Gen Intern Med*. 2004;19:1005-1012. http://www.pubmedcentral.nih.gov/articlerender.fcgi?tool=pubmed&pubmedid=15482552. Accessed June 26, 2009.

2. Edmeads, J, Mackell JA. The economic impact of migraine: an analysis of direct and indirect costs. *Headache*. 2002;42:501-509.

3. Stang PE, Crown WH, Bizier R, Chatterton ML, White R. The family impact and costs of migraine. *Am J Manag Care*. 2004;10:313-320. http://www.ajmc.com/issue/managed-care/2004/2004-05-vol10-n5/May04-1792p313-320. Accessed June 26, 2009.

4. Etemad LR, Yang W, Globe D, Barlev A, Johnson KA. Costs and utilization of triptan users who receive drug prophylaxis for migraine versus triptan users who do not receive drug prophylaxis. *J Manag Care Pharm*. 2005;11:137-144. http://www.amcp.org/data/jmcp/Original%20Research-137-144.pdf. Accessed June 26, 2009.

5. Ranieri SR, Nicholas AS, Kriebel RM, Goldstein FJ, Coughlin PM. Evaluation of the effect of osteopathic manipulative treatment on headache pain: single vs multiple modality treatment [abstract P13]. *J Am Osteopath Assoc*. 1998;98:391.

6. Tuchin PJ, Pollard H, Bonello R. A randomized controlled trial of chiropractic spinal manipulative therapy for migraine. *J Manipulative Physiol Ther*. 2000;23:91-95.

7. Nelson CF, Bronfort G, Evans R, Boline P, Goldsmith C, Anderson AV. The efficacy of spinal manipulation, amitriptyline and the combination of both therapies for the prophylaxis of migraine headache. *J Manipulative Physiol Ther*. 1998;21:511-519.

8. Parker GB, Tupling H, Pryor DS. A controlled trial of cervical manipulation of migraine. *Australian N Z J Med*. 1978;8:589-593.

9. Parker GB, Pryor DS, Tupling H. Why does migraine improve during a clinical trial? Further results from a trial of cervical manipulation for migraine. *Australian N Z J Med*. 1980;10:192-198.