Osteopathic Manipulative Treatment of Somatic Dysfunction Among Patients in the Family Practice Clinic Setting: A Retrospective Analysis

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Context: Relatively little has been published about contemporary use of osteopathic manipulative treatment (OMT) in family practice.

Objective: To provide an “epidemiology” of somatic dysfunction, assessing prevalence and severity of somatic dysfunction encountered in the family practice setting, also characterizing physician use of OMT.

Design: Retrospective analysis of Outpatient Osteopathic SOAP Note Form data collected in 1998 and 1999 by 20 osteopathic medical trainee-investigators under the supervision of seven site-based osteopathic physicians.

Setting: Three university-based, osteopathic family practice clinics.

Results: The authors analyzed records for 1331 patient encounters and 424 adult patients. The mean (SD) age of patients was 56.9 years (16.2 years), and 71% were women. The median number of days between repeat encounters was 29 days. Somatic dysfunction was diagnosed in 418 (31%) patient encounters, affecting a total of 1199 anatomic regions (2.9±1.2 anatomic regions per patient). Investigators used OMT in 335 (25%) patient encounters to treat a total of 952 anatomic regions (2.8±1.2 anatomic regions per patient). For women, the odds ratio for receiving OMT was 1.4 (95% confidence interval [CI], 1.0–2.2); for patients using analgesics, anti-inflammatory agents, or muscle relaxants, the odds ratio was 2.2 (95% CI, 1.2–4.1). Immediately after OMT, investigators reported that patients’ somatic dysfunction resolved or improved in a total of 747 (96%) anatomic regions.

Conclusion: Somatic dysfunction was diagnosed in almost one-third of patient encounters. In one-quarter of patient encounters, investigators used OMT.

Somatic dysfunction is defined as “impaired or altered function of related components of the somatic (body framework) system: skeletal, arthrodial, and myofascial structures, and related vascular, lymphatic, and neural elements.”1 The palpatory diagnosis of somatic dysfunction and the use of osteopathic manipulative treatment (OMT) by osteopathic physicians to relieve or ameliorate patient discomfort and pain are hallmarks of osteopathic principles and practice. Nevertheless, the literature contains few published studies about the prevalence of somatic dysfunction or the frequency of its diagnosis and treatment by osteopathic physicians.

The previously validated Outpatient Osteopathic SOAP Note Form (SNF) Series was developed by the Louisa Burns Osteopathic Research Committee of the American Academy of Osteopathy2,3 to provide osteopathic physicians with a tool to objectively measure and record the diagnosis and treatment of somatic dysfunction during patient encounters.

The standardized SNF instructions facilitate its use in clinical practice as well as during the collection of data for research studies. A previous study has demonstrated that physicians take the same amount of time (ie, approximately 4 minutes) to complete the SNF as conventional physician progress notes.3 Furthermore, the SNF appears to capture more clinical information than do physician progress notes, particularly with regard to the severity of somatic dysfunction and the response of patients with this diagnosis to OMT as a treatment modality.3

We performed a retrospective analysis of SNF data to measure the prevalence and severity of somatic dysfunction encountered in the osteopathic family practice setting and to characterize physician use of and patient response to OMT in this setting.

Methods

Three family practice clinic sites affiliated with Midwestern University’s Chicago College of Osteopathic Medicine (CCOM) in Downers Grove, Ill, contributed patient records for this retrospective study. Patients who presented for medical care at these family practice clinics from March 4, 1998, through January 20, 1999, were eligible for inclusion in the study. Twenty osteopathic medical students, interns, and residents served as investigators for this study, completing SNF...
Patient records under the supervision of any of seven osteopathic physicians at these family practice sites.

Patient records were selected for review serially as patients were seen in participating clinics during regular outpatient clinic hours. During patient encounters, investigators collected SNF data and applied diagnostic coding using the standardized form and instructions.3

Because one of the goals of this study was to capture data on somatic dysfunction and OMT at the aggregate level, the same patient may have contributed data to the study database through multiple encounters.

In addition, so that we might estimate the prevalence of somatic dysfunction and its treatment during adult patient encounters in osteopathic family practices, patients under the age of 18 years were excluded from the study database prior to analysis.

The institutional review board of Midwestern University initially approved the study protocol for gathering patients’ SNF data at the three CCOM-affiliated clinics. The institutional review board of the University of North Texas Health Science Center at Fort Worth—Texas College of Osteopathic Medicine subsequently approved the analysis of the SNF data gathered at CCOM sites.

The primary focus of the present study involved the SNF’s musculoskeletal table, which is now located on the Outpatient Osteopathic Assessment and Plan Form of the revised 2002 edition of this form. This table was used to collect data on the musculoskeletal evaluation of 13 anatomic regions: head, cervical, upper thoracic (T1–T4), midthoracic (T5–T9), lower thoracic (T10–T12), lumbar, sacrum/pelvis, pelvis/innominate, lower extremities (left and right), upper extremities (left and right), and ribs.

For each of the patient’s anatomic regions, the investigator “graded” the somatic dysfunction present based on the four diagnostic criteria of somatic dysfunction, commonly represented in the osteopathic medical literature by the mnemonic TART:

- T: tissue texture abnormality (effusions, laxity, stability, tone);
- A: asymmetry (crepitation, defects, masses, misalignment);
- R: restriction of motion (contracture); and
- T: tenderness (pain).

The scoring criteria for levels of somatic dysfunction were as follows:

1—None: No somatic dysfunction present or background levels of somatic dysfunction only.
2—Mild: More than background levels of somatic dysfunction, minor TART elements present.
3—Moderate: Obvious TART elements, which may or may not be overtly symptomatic, with significant restriction of motion and/or tenderness elements present.
4—Severe: Key lesions with significant symptomatology, including restriction of motion and/or tenderness elements that “stand out” with minimal search or provocation.

Figure 1. Distribution of the number of anatomic regions diagnosed with somatic dysfunction and treated with osteopathic manipulative treatment in family practice clinics.
The severity index for the somatic dysfunction present in any given anatomic region was computed as the weighted mean severity for all patient encounters in which a somatic dysfunction was diagnosed in that particular region. This index was computed using the aforementioned grading and scoring criteria.

Investigator use of OMT to treat each of the 13 anatomic regions was handled as a dichotomous variable in our analysis. For each region treated, the investigator reported the patient’s immediate response to OMT on the SNF’s ordinal four-point scale: R, somatic dysfunction is completely resolved without evidence of it having ever been present; I, somatic dysfunction is improved but not completely resolved; U, somatic dysfunction is unchanged or the same after treatment as it was before treatment; W, somatic dysfunction has worsened or been aggravated after treatment.

The age and sex of patients, prevalence and severity of somatic dysfunction, and use of and response to OMT by anatomic region treated were summarized using standard descriptive statistics. Basic SNF data, such as the patient’s age, sex, and date of encounter may not have been captured at each patient encounter because these data were available elsewhere within the patient’s clinic record and were not consistently reported in duplicate on the SNF.

We subsequently developed indices to quantify the severity and burden of somatic dysfunction and patient response to OMT by anatomic region.

The severity index for the somatic dysfunction present in any given anatomic region was computed as the weighted mean severity for all patient encounters in which a somatic dysfunction was diagnosed in that particular region. This index was computed using the aforementioned grading and scoring criteria.

The burden of somatic dysfunction was defined for each anatomic region by the product of: (1) the prevalence of somatic dysfunction diagnosed in that region in all patient encounters, and (2) the severity index rating of somatic dysfunction for that region. This metric integrates the prevalence and severity dimensions of somatic dysfunction for a population of patients in the clinical setting under investigation, yielding a composite measure of the burden of somatic dysfunction for each anatomic region.

Theoretically, a high burden of somatic dysfunction would be observed in anatomic regions characterized by high prevalence and severity ratings, whereas a low burden would be observed in anatomic regions characterized by low prevalence and severity ratings. Intermediate levels of burden would be observed in anatomic regions characterized by less extreme scenarios.

The burden of somatic dysfunction for any given anatomic region may range from 0 (no prevalent dysfunction) to 300 (100% prevalence of severe dysfunction). Because the burden of somatic dysfunction is a continuous metric without estab-

<table>
<thead>
<tr>
<th>Anatomic Region</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Total</th>
<th>Severity†</th>
<th>Burden‡</th>
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<tbody>
<tr>
<td>Head</td>
<td>20 (49)</td>
<td>19 (46)</td>
<td>2 (5)</td>
<td>41</td>
<td>1.56</td>
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<td>66 (37)</td>
<td>7 (4)</td>
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<td>19.5</td>
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<td></td>
</tr>
<tr>
<td>T1–T4</td>
<td>107 (47)</td>
<td>103 (45)</td>
<td>19 (8)</td>
<td>229</td>
<td>1.62</td>
<td>27.8</td>
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<tr>
<td>T5–T9</td>
<td>100 (51)</td>
<td>79 (40)</td>
<td>17 (9)</td>
<td>196</td>
<td>1.58</td>
<td>23.2</td>
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<tr>
<td>T10–T12</td>
<td>48 (71)</td>
<td>14 (21)</td>
<td>6 (9)</td>
<td>68</td>
<td>1.38</td>
<td>7.1</td>
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<td>Lumbar</td>
<td>94 (54)</td>
<td>64 (37)</td>
<td>15 (9)</td>
<td>173</td>
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<td>20.1</td>
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<td>Sacrum/Pelvis</td>
<td>75 (47)</td>
<td>67 (42)</td>
<td>18 (11)</td>
<td>160</td>
<td>1.64</td>
<td>19.8</td>
</tr>
<tr>
<td>Pelvis/Innominate</td>
<td>17 (55)</td>
<td>10 (32)</td>
<td>4 (13)</td>
<td>31</td>
<td>1.58</td>
<td>3.7</td>
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<td>Upper</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>7 (39)</td>
<td>6 (33)</td>
<td>5 (28)</td>
<td>18</td>
<td>1.89</td>
<td>2.6</td>
</tr>
<tr>
<td>Right</td>
<td>5 (28)</td>
<td>7 (39)</td>
<td>6 (33)</td>
<td>18</td>
<td>2.06</td>
<td>2.8</td>
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<tr>
<td>Left</td>
<td>8 (33)</td>
<td>14 (58)</td>
<td>2 (8)</td>
<td>24</td>
<td>1.75</td>
<td>3.2</td>
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<tr>
<td>Right</td>
<td>11 (46)</td>
<td>11 (46)</td>
<td>2 (8)</td>
<td>24</td>
<td>1.63</td>
<td>2.9</td>
</tr>
<tr>
<td>Ribs</td>
<td>9 (24)</td>
<td>24 (63)</td>
<td>5 (13)</td>
<td>38</td>
<td>1.89</td>
<td>5.4</td>
</tr>
</tbody>
</table>

* Investigator-reported data were available for 1331 patient encounters. Somatic dysfunction was diagnosed in 418 (31%) patient encounters, affecting a total of 1199 anatomic regions. Percentages reported were rounded for diagnosis of somatic dysfunction by anatomic region. Therefore, the sum of these percentages may not equal 100%.
† Severity index was computed as a weighted mean (1, mild; 2, moderate; 3, severe) for all patient encounters in which somatic dysfunction was diagnosed.
‡ The burden of somatic dysfunction for each anatomic region was computed as the product of the prevalence of somatic dysfunction in that region (%) and the severity index for that region.
lished cutpoints, cluster analysis was used to detect natural groupings of anatomic regions in the data.4

Cluster analysis was used to split the anatomic regions into two to 12 clusters, in a stepwise fashion, based on prevalence and severity of somatic dysfunction. Clusters were determined by maximizing between-cluster variation relative to within-cluster variation. The Euclidean distance metric was used for clustering, and the prevalence and severity of somatic dysfunction were standardized as z scores to adjust for dissimilar scales and skewness in the data. The optimal clustering solution was then selected based on the F ratios for each stepwise analysis.

We grouped patient records by age category (ie, 18–39 years, 40–59 years, and 60 years or older), sex, medication use, and the number of anatomic regions with somatic dysfunction present. Contingency tables were then used to assess investigator use of OMT by these variables. Multiple logistic regression was used to compute adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for the factors associated with investigator use of OMT.

An OMT response index was also computed as a weighted mean using the criteria described above and the following scale to describe the patient’s condition after treatment: 1, resolved; 0.5, improved; 0, unchanged; and −0.5, worse. The underlying assumptions in the creation of this scale were that:

- 0 represents the neutral point of no response (ie, unchanged),
- positive values represent improvement and negative values represent worsening,
- the responses “improved” and “worse” are of equal magnitude but in opposite directions, and
- 1 represents resolution, though there is no comparable value or descriptor in the negative direction on the SNF.

Data collection and database management functions were performed using two software programs. Data gathered in the first database management program (SPSS for Windows; SPSS Inc, Chicago, Ill) were imported into a statistical software package (SYSTAT for Microsoft Windows; SPSS Science, Chicago, Ill) for subsequent statistical analysis. Contingency tables and the χ² test were used to analyze categorical data. All hypotheses were tested at the .05 level of statistical significance.

**Results**

One family practice clinic site provided records for 704 (53%) patient encounters, another contributed records for 453 (34%), and a third site provided 174 (13%) for review. Together, the three study sites contributed records for a total of 1331 patient encounters for 424 adult patients.

The mean age of patients for encounters in which this demographic data were recorded on the SNF (n=848) was 56.9 years (SD, 16.2 years; median, 57 years). For all patient

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Figure 2. Cluster analysis depicting the burden of somatic dysfunction by anatomic region in patients seen in family practice clinics. C indicates cervical; H, head; L, lumbar; LLE, left lower extremity; LUE, left upper extremity; PI, pelvis/innominate; R, ribs; RLE, right lower extremity; RUE, right upper extremity; SP, sacrum/pelvis; and T, thoracic.
Somatic dysfunction was most commonly diagnosed in patients in the following anatomic regions: T1–T4 (17% of patient encounters), T5–T9 (15%), cervical (13%), lumbar (13%), and sacrum/pelvis (12%) (Table 2). The frequency of OMT use by investigators was substantially lower when investigators were treating patients’ upper extremities as compared with all other anatomic regions (Table 2). The adjusted ORs and 95% CIs for factors associated with investigator use of OMT are presented in Table 3. There was no association between patient age and investigator use of OMT; however, there was an association between patient sex and the use of OMT, with women being more likely than men to receive OMT (OR, 1.4; 95% CI, 1.0-2.2). Patient use of analgesics, non-steroidal anti-inflammatory agents, or muscle relaxants was also associated with use of OMT (OR, 2.2; 95% CI, 1.2-4.1).

Data on patients’ immediate responses to OMT were recorded for 779 (82%) of the total number of anatomic regions treated (n=952). Overall, symptoms associated with patients’ diagnosed somatic dysfunctions were reported to have resolved or improved after treatment in 747 (96%) anatomic regions, remained unchanged in 32 (4%) regions, and worsened in no regions (χ²=1114, P<.001). Generally, similar anatomic region–specific findings were also observed (Table 4). Consequently, the OMT response indices did not differ substantially among most anatomic regions. The lowest levels of beneficial response to OMT were observed for patients with somatic dysfunction in the right lower extremity and pelvis/innominate regions, whereas the anatomic region most likely to respond favorably to this treatment modality was the ribs.

**Comment**

The results of our retrospective analysis of SNF data describe the “epidemiology” of somatic dysfunction as well as investigator use of—and patient response to—OMT in the family practice setting. In our study, investigators diagnosed somatic...
dysfunction in almost one-third of adult patient encounters. The somatic dysfunction diagnosed often involved multiple anatomic regions for each patient.

The burden of somatic dysfunction, a novel composite measure based on prevalence and severity, served as the basis for grouping anatomic regions using cluster analysis. The three anatomic region groups that emerged can generally be labeled as one of the following:

- **I**: high prevalence of somatic dysfunction (thoracic T1–T4 and T5–T9, lumbar, sacrum/pelvis, and cervical);
- **II**: low prevalence of somatic dysfunction (left and right upper extremities, left lower extremity, and ribs); and
- **III**: low severity of somatic dysfunction (right lower extremity, pelvis/innominate, head, and thoracic T10–T12).

Investigator use of OMT for somatic dysfunction comprised a substantial portion of the practice at the three clinic sites providing data to the authors for analysis. In approximately one-fourth of patient encounters, investigators used OMT. Treatment was frequently perceived by the investigator to have immediately improved patients’ somatic dysfunction. For somatic dysfunction of the upper extremities, OMT was used less frequently even though patient response to treatment in these anatomic regions appeared to be comparable to the response noted in other regions.

Multivariate analysis revealed that women were more likely than men to receive OMT. This finding is consistent with data on lifetime use of OMT reported in the Osteopathic Survey of Health Care in America, a random national telephone survey of the adult population.5

Furthermore, we found that when patients used analgesics, nonsteroidal anti-inflammatory agents, or muscle relaxants, they were more likely to receive OMT from investigators. This association suggests that osteopathic physicians in family practice may be more likely to use OMT to complement medication rather than as an alternative to it. Superficially, this finding appears to contradict those of a well-known clinical trial of OMT in patients with subacute low back pain, in which the osteopathic treatment group used less medication than the standard care group.6 However, in the present retrospective study, the patients who did not receive OMT may not represent an appropriate comparison group because few of them were diagnosed with somatic dysfunction. Although patient response to OMT was largely favorable in our study, these results should be interpreted with caution, as explained below, because of the potential for biased measurement of response.

We acknowledge potential limitations of the current study. Some of these potential limitations are attributable to a methodology based on retrospective analysis of available patient encounter data rather than on a formal, prospectively planned research design. Thus, unlike a randomized clinical trial, for example, it is possible that the patients most likely to respond to OMT were selected to receive it or that the patients in this population may have requested OMT.

### Table 3

<table>
<thead>
<tr>
<th>Factor</th>
<th>OMT Used, No. (%)</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, y</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>18–39†</td>
<td>44 (34)</td>
<td>85 (66)</td>
<td>1</td>
</tr>
<tr>
<td>40–59</td>
<td>157 (46)</td>
<td>185 (54)</td>
<td>1.3</td>
</tr>
<tr>
<td>≥60</td>
<td>97 (26)</td>
<td>280 (74)</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men†</td>
<td>95 (34)</td>
<td>183 (66)</td>
<td>1</td>
</tr>
<tr>
<td>Women</td>
<td>236 (34)</td>
<td>450 (66)</td>
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</tr>
<tr>
<td><strong>Medication‡</strong></td>
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</tr>
<tr>
<td>No†</td>
<td>287 (32)</td>
<td>610 (68)</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>48 (62)</td>
<td>29 (38)</td>
<td>2.2</td>
</tr>
</tbody>
</table>

* The data presented are based on multiple logistic regression analysis of results from all 1331 patient encounters for which investigators recorded data by anatomic region. Odds ratios are adjusted for the other variables noted as well as for the number of anatomic regions with somatic dysfunction. Totals do not sum to 1331 because of missing data. OMT indicates osteopathic manipulative treatment.

† Referent group.

‡ Patients were asked to report any medications they were currently taking. Patients taking no medications and patients taking medication(s) other than analgesics, nonsteroidal anti-inflammatory agents, or muscle relaxants were included in the “No” group for Medication. Patients taking analgesics, nonsteroidal anti-inflammatory agents, or muscle relaxants were placed in the “Yes” group.
findings suggest that greater experience in providing OMT does not appear to result in substantially better clinical outcomes or greater patient satisfaction.7

Finally, it is unclear if the patients seeking medical care in university-based family practice clinics are representative of patients visiting osteopathic physicians in community-based settings.

Our results were based on all available SNF data, including multiple and unequal numbers of encounters for many patients. Although, at the individual level, the methodology we have chosen has the disadvantage of giving greater weight to patients with many encounters (ie, relative to those with one or few encounters), at the aggregate level, our study design has the advantage of more accurately reflecting the frequency of somatic dysfunction and clinician use of OMT in a family clinic setting.

Finally, cluster analysis allows for more objective identification of natural groupings in the data for the burden of somatic dysfunction and its component dimensions of prevalence and severity of somatic dysfunction. Although many of the groupings by anatomic region using this statistical method also make “clinical sense,” some may not. The disparate grouping of the left and right lower extremities also, the investigator who provided OMT to a given patient was the same one given the task of assessing the patient’s immediate response to treatment. Therefore, such assessments were not blinded and may have been vulnerable to biased measurement. For example, in the 779 anatomic regions treated with OMT by investigators, there was not even one reported case of a patient’s condition worsening immediately after OMT.

In addition, we found investigators used OMT in 22 (7%) patient encounters for which the presence of diagnosed somatic dysfunction was not indicated in the SNFs. For these 22 patient encounters, it is unclear if OMT represents: (1) the use of OMT during a follow-up session in response to previously diagnosed somatic dysfunction, (2) a “preventive” use of OMT, or (3) simply erroneous documentation. Even if this number entirely represents the latter, its infrequent occurrence should not materially affect the validity or interpretation of our findings.

The ability of clinicians and researchers to apply our findings to other clinical settings should also be addressed. Because patients were evaluated and treated by osteopathic trainees, it is unclear if our results can be generalized to experienced osteopathic physicians. Nevertheless, recent findings suggest that greater experience in providing OMT does not appear to result in substantially better clinical outcomes or greater patient satisfaction.7

Finally, it is unclear if the patients seeking medical care in university-based family practice clinics are representative of patients visiting osteopathic physicians in community-based settings.

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ities is perhaps the most obvious example of a statistical observation that cannot be interpreted readily in terms of clinical plausibility.

Conclusion
Despite the potential limitations noted, we believe our analysis of SNF data provides a unique perspective on clinician use of and patient response to OMT in the treatment of somatic dysfunction in the family clinic setting. It is our hope that this data will provide the necessary impetus for researchers to conduct and publish additional studies on somatic dysfunction and OMT using the SNF in a variety of clinical settings. It is only through such studies that the osteopathic medical profession will acquire a better understanding of the epidemiology of somatic dysfunction and the effectiveness of OMT in contemporary osteopathic medical practice.

Acknowledgments
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References


