Neuromusculoskeletal Medicine (OMT) Review Article

Megan Franzetti*, MPH, Emily Dries, Brady Stevens, Lisa Berkowitz and Sheldon C. Yao, DO

Support for osteopathic manipulative treatment inclusion in chronic pain management guidelines: a narrative review

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Abstract

Context: Osteopathic manipulative treatment (OMT) is used to treat chronic pain conditions. However, few guidelines focusing on chronic pain management include recommendations for OMT.

Objectives: To evaluate previous literature on the use of OMT for improving chronic pain.

Methods: A literature search was conducted on MEDLINE/PubMed and ScienceDirect on August 26–27, 2019, using the terms "osteopathic," "chronic," and "pain," yielding a total of 312 MEDLINE/PubMed articles and 515 ScienceDirect articles. Eligibility criteria required that studies investigate pain, functional status, or medication usage through an experimental design, focusing on human subjects with chronic pain who had various forms of OMT administered by osteopathically trained individuals in which the comparator group received no intervention, a sham or placebo, or conventional care. Three authors independently performed literature searches and methodically settled disagreements over article selection.

Results: In the 22 articles included in our study that examined OMT use in chronic pain conditions, we evaluated primary outcomes of pain (22; 100%) and functional status (20; 90.9%), and the secondary outcome of medication usage (3; 13.6%). The majority of articles showed that OMT resulted in a significant decrease in pain levels as compared to baseline pain levels or the control group (20; 90.9%) and that OMT resulted in an improvement in functional status (17; 77.3%). In articles that did not find a significant difference in pain (2; 9.1%) or functional status (3; 13.6%), there were overall outcomes improvements noted. All articles that investigated medication usage (3; 13.6%) showed that OMT was effective in decreasing patients' medication usage. Our study was limited by its small sample size and multimodal comparator group exclusion.

Conclusions: OMT provides an evidence-based management option to reduce pain levels, improve functional status, and decrease medication usage in chronic pain conditions, especially low back pain (LBP). Pain management guidelines should include OMT as a resource to alleviate chronic pain.

Keywords: acute pain; chronic pain; fibromyalgia; functional status; low back pain; medication; migraine; OMT; osteopathic manipulative treatment.

Chronic pain can result from many causes, including back and neck pain, migraines, and fibromyalgia [1]. Data from the National Health Interview Survey in 2019 showed that 20.4% of adults had chronic pain and 7.4% of adults had chronic pain that frequently limited life or work activities in the past three months [2]. The NIH defines chronic back pain as pain lasting more than 12 weeks, even after the initial injury or cause of the acute pain has been treated, and reported that 20% of patients with acute low back pain (LBP) develop chronic low back pain (cLBP) [3]. Chronic pain is a leading cause of disability in the United States and is a major contributor to health care costs [4]. The CDC previously published a guideline for chronic pain management, citing the millions of adults in the United States who are prescribed opioids for chronic pain [5]. In the context of the opioid crisis, it is essential to study nonpharmacologic methods of pain reduction.

Osteopathic manipulative treatment (OMT) focuses on patient-centered care and utilizes hands-on diagnosis and treatment rooted in a deep understanding of anatomy and

***Corresponding author: Megan Franzetti**, MPH, NYIT College of Osteopathic Medicine, 101 Northern Blvd, Old Westbury, New York 11568-8000, USA, E-mail: mfranzet@nyit.edu. https://orcid.org/0000-0002-6874-5784
Emily Dries, Brady Stevens and Lisa Berkowitz, College of Osteopathic Medicine, New York Institute of Technology, Old Westbury, NY, USA
Sheldon C. Yao, DO, Department of Osteopathic Manipulative Medicine, New York Institute of Technology, Old Westbury, NY, USA

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physiology. Osteopathic medicine emphasizes "evaluating not only the painful region of the patient, but also the 'person who is in pain'" [6]. In 2005, the American Osteopathic Association (AOA) adopted a policy reinforcing the osteopathic physician's duty to treat patients with chronic pain and emphasized responsible prescribing practices of addictive drugs [7]. In 2016, the AOA updated its recommendations to include OMT for cLBP management [8]. OMT offers a unique opportunity for treating chronic pain. However, few guidelines for chronic pain management put forth by major medical societies include OMT as a recommendation for nonpharmacologic management of chronic pain.

The purpose of this study was to conduct a systematic literature review focusing on the efficacy of using various forms of OMT to treat chronic pain conditions through its effects on pain, functional status, and medication usage, demonstrating that the benefits of OMT provide evidence for incorporation into future guidelines focusing on chronic pain management.

Methods

A literature search was conducted via MEDLINE/PubMed and ScienceDirect on August 26–27, 2019, using the terms "chronic," "pain," "osteopathic," and "manipulation." MEDLINE/PubMed results were filtered using the Best Match feature, and ScienceDirect results were filtered using the Research Articles filter. We did not restrict the search by publication date. This search yielded a total of 312 MEDLINE/PubMed and 515 ScienceDirect articles (Figure 1).

Eligibility criteria were defined using the population, intervention, comparator, outcome, and study design (PICOS) strategy [9]. We included studies that investigated pain, functional status, or medication usage through an experimental design, focusing on human subjects with chronic pain who had various forms of OMT administered by osteopathically trained individuals in which the comparator group received no intervention, a sham or placebo, or conventional care. Studies were excluded if patients were in acute pain, if care was administered by nonosteopathically trained individuals, or if they used multimodal comparator groups or visceral OMT (Table 1).

Three authors (M.F., E.D., L.B.) independently performed literature searches in PubMed and ScienceDirect for relevant articles. The authors then compared the articles they selected and used the PICOS strategy to settle disagreements. The titles, abstracts, and keywords of potential articles were screened by the three authors to determine if the article met selection criteria.

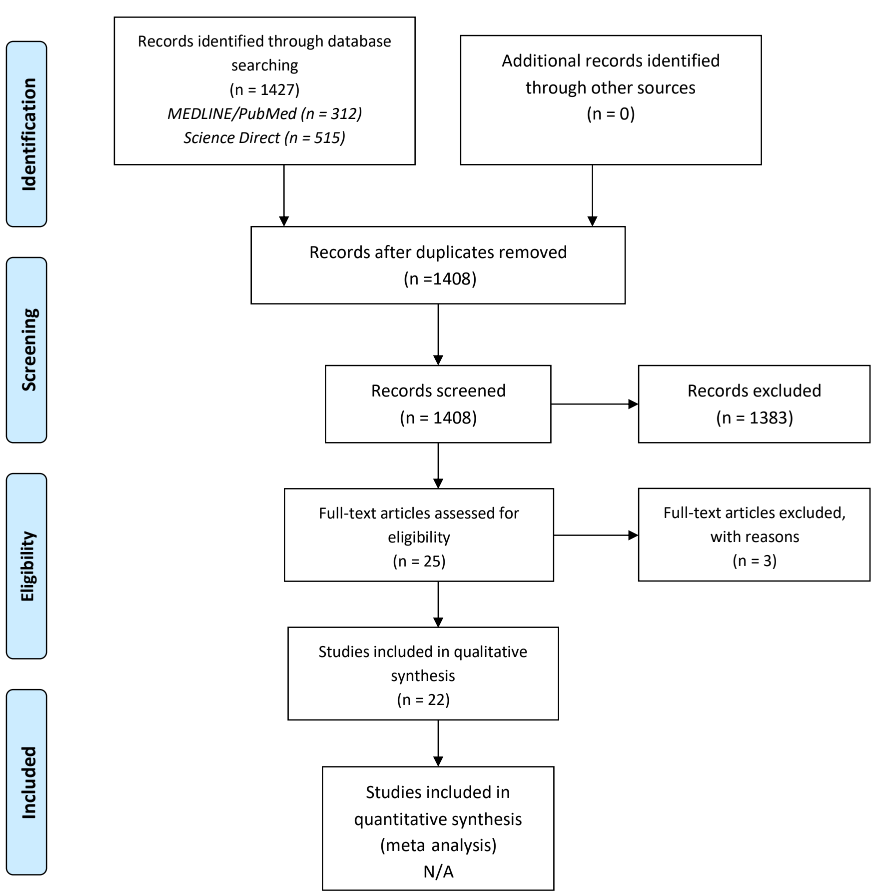

Figure 1: Preferred reporting items for systematic reviews and metaanalyses (PRISMA) flow diagram documenting the literature search process conducted for this systematic review. Eligibility was determined by the population, intervention, comparator, outcome, and study design (PICOS) strategy (Table 1).

Table 1: Eligibility criteria.

Study evaluation category	Inclusion criteria	Exclusion criteria
Population	Patients with chronic pain	Patients with acute or subacute pain, nonhuman subjects
Intervention	OMT administered by osteopathic physicians or osteopathic practitioners	Care administered by other professionals, nonosteopathic manipulation
Comparator	No intervention, sham/placebo, conventional care	Multimodal including OMT and visceral OMT
Outcomes	Pain, functional status, medication	None
Study design	Experimental study abstracts and experimental studies: randomized controlled trials, pilot studies, cohort studies	Case reports, case studies, literature reviews, study protocol, single subject studies
Language	English, English translation	None
Geography	United States, countries practicing osteopathy	None

OMT, osteopathic manipulative treatment.

Results

Our PubMed search yielded 312 articles; the ScienceDirect search yielded 515 articles. Application of inclusion and exclusion criteria yielded 22 articles for full-text evaluation (Figure 1).

Study characteristics

The 22 articles varied widely in their characteristics, but all examined the impact of OMT on chronic pain (Table 2); their dates of publication ranged from 2002 [10, 11] to 2019 [12]. Among the 22 articles, 11 investigated the effect of OMT on back pain [13–23], while three focused on upper extremity pain [11, 24, 25], two on headache [12, 26], two on neck pain [27, 28], and the remaining four articles investigated the effect of OMT on other chronic pain conditions, including temporomandibular disorder, psychological outcomes, fibromyalgia, and pelvic pain [10, 29–31]. Study sizes ranged from 20 [12] to 455 [16] participants. Study methodology varied in how OMT was implemented for patients in the treatment groups, as well as how patients in the control groups received treatment, if any. A variety of OMT techniques was used, including high-velocity, low-amplitude (HVLA), muscle energy, and myofascial techniques. The majority of studies (20; 90.9%) examined patients' functional status, whereas only three articles (13.6%) measured medication usage changes as a result of OMT treatment [16, 26, 29].

Primary outcome: pain

All studies [10–16, 18–28, 30, 31] measured pain as an outcome and showed that OMT can be used to reduce pain (Table 2). The majority of articles (20; 90.9%) showed a statistically significant reduction in pain levels as a result of OMT compared with baseline pain levels or groups not receiving OMT. These articles showed OMT's impact in relieving pain, reducing overall pain intensity, and increasing pain threshold. Only two articles (9.1%) found no significant difference in pain intensity perceived by patients who received OMT compared with patients who were managed with different treatment modalities [17, 29]. However, even in those articles, the OMT groups still experienced pain level reductions, suggesting that OMT is as effective as the current standard of care.

A variety of pain scales were used, with the Visual Analog Scale (VAS) being the most common tool (14; 63.6%). OMT was shown to be an effective option for managing chronic migraines through a reduction in scores on the Headache Impact Test 6 (HIT-6), a questionnaire used to assess pain intensity of migraines [26]. Chronic tension headaches were another condition for which OMT proved to be effective in reducing pain intensity, headache frequency, and duration of headaches [12]. For people with cervical pain, Galindez-Ibarbengoetxea et al. [27] showed that those treated with osteopathic techniques, such as HVLA, had decreased pain with range of motion (ROM) testing. OMT was effective in reducing pain levels in fibromyalgia and LBP [10].

Primary outcome: functional status

Twenty studies measured functional status as an outcome, 17 of which showed that OMT was significant in improving functional status (Table 2) [10–16, 19–24, 26, 27, 30, 31]. These articles showed an improvement in functional ability and demonstrated that OMT is effective at improving functional status in chronic pain conditions. Some articles

Table 2: Characteristics of previous OMT studies evaluated.

Study, first author, year	Chronic pain condition investigated	Intervention (number of participants)	Control (number of participants)	Outcome measurement	Findings intervention vs. control
Arguisuelas et al. (2017) [14]	LBP	MFR (n=27)	Sham MFR (n=27)	**Pain**: SF-MPQ, VAS **FS**: RMDQ, FABQ	**Pain:** Results showed reduced pain on the total SF-MPQ (mean difference MFR-sham: −7.8; 95% CI: −14.5 to −1.1) at week 12 (p=0.04) **FS:** Reduced disability (mean difference MFR-sham: −3.7; 95% CI: −7.6 to −0.2) at week 12 (p=0.03); and decreased fear-avoidance beliefs (p=0.05) at weeks 2 (mean difference MFR-sham: −14.3; 95% CI: −27.8 to −0.8) and 12 (mean difference MFR-sham: −13.5; 95% CI: −27.6 to 0.5)
Cerritelli et al. (2015) [26]	Headache (migraine)	OMT + medication (n=35)	Sham OMT + medication (n=35), medication alone (n=35)	**Pain**: HIT-6 questionnaire, pain intensity **FS**: days of migraine, functional disability, medication	**Pain**: HIT-6 score (mean change scores OMT-conventional care: −8.74; 95% CI: −12.96 to −4.52; p<0.001 and OMT-sham: −6.62; 95% CI: −10.85 to −2.41; p<0.001), pain intensity (OMT-sham: RR=0.42, 95% CI: 0.24 to 0.69; OMT-control: RR=0.31, 95% CI: 0.19 to 0.49) **FS**: days of migraine (OMT-conventional care: M=−21.06; 95% CI: −23.19 to −18.92; p<0.001 and OMT-sham: −17.43; 95% CI: −19.57 to −15.29; p<0.001), and functional disability (p<0.001) **Medication**: OMT significantly reduced the number of subjects taking medications (OMT n=7, sham n=32, and control n=35, p<0.001) and decreased the relative risk (OMT-sham: RR=0.22, 0.11 to 0.40; OMT-control: RR=0.20, 0.10 to 0.36).
Cuccia et al. (2010) [29]	Temporomandibular disorder	OMT (n=25)	CCT (n=25)	**Pain**: VAS **FS**: Temporomandibular index, ROM, medication	**Pain/FS:** OMT and CCT groups did not demonstrate any significant difference **Medication:** NSAIDs (X^2=4.083, p<0.001) andmuscle relaxants (X^2=4.878, p<0.001).
Deodato et al. (2019) [12]	Headache (tension)	OMT (n=10)	Medication (n=10)	**Pain**: Intensity, frequency (days/month), duration (hours) **FS**: forward head posture	**Pain**: OMT group intensity decreased from a mean (SD) score of 4.9 (1.4) to 3.1 (1.1) (p=0.002) and medication group intensity decreased from a mean (SD) score of 5.9 (0.7) to 4.2 (1.75) (p=0.03); OMT group frequency decreased from 19.8 (6) to 8.3 (6.2) days per month (p=0.002) and medication group frequency decreased from 23.4 (7.2) to 7.4 (8.7) days per month (p=0.003); OMT group duration of headaches decreased from 10 (4.2) to 6 (3) hours (p=0.01) and medication group duration decreased from 7.8 (2.9) to 3.6 (2.1) hours (p=0.002). **FS**: Forward head posture significantly improved in OMT group (p=0.003)

Table 2: (continued)

Study, first author, year	**Chronic pain condition investigated**	**Intervention (number of participants)**	**Control (number of participants)**	**Outcome measurement**	**Findings intervention vs. control**
Edwards et al. (2018) [30]	Psychological outcomes	OMT (n=58)	N/A	**Pain**: EQ-5D pain, McGill VAS **FS**: EQ-5D self-care, EQ-5D activities, EQ-5D Anxiety, GHQ 12, HADS anxiety, HADS total	**Pain**: EQ-5D pain decreased (p<0.0001), McGill VAS decreased (p<0.001) **FS**: EQ-5D self-care increased (p<0.01), EQ-5D activities increased (p<0.01), EQ5D Anxiety decreased (p<0.01), GHQ 12 current mental disorder decreased (p<0.001), HADS anxiety decreased (p<0.01), HADS total decreased (p<0.05)
Galindez et al. (2018) [27]	Neck pain (cervical)	HVLA (n=12)	CCF (n=13)	**Pain**: VAS **FS**: ROM	Both groups showed significant improvement in pain and ROM but HVLA was more effective **Pain**: (HVLA: p=0.004; CCF: p=0.015) **FS**: ROM (HVLA: Flexion p=0.001, right-side bending p=0.002, and left rotation p=0.005; CCF: Flexion p=0.026)
Gamber et al. (2002) [10]	Fibromyalgia	OMT + medication (n=6), OMT + teaching + medication (n=6)	Moist heat group (n=6), control group (current medication) (n=6)	**Pain**: Dolorimeter, CPEI, PPIRS **FS**: HAQ, CESDS	**Pain/FS:** Significant findings between the four treatment groups on measures of pain threshold, perceived pain, attitude toward treatment, ADLs, and perceived functional ability were found (p<0.05) favoring use of OMT. OMT combined with standard medical care was more efficacious in treating fibromyalgia than standard care alone.
Geldschläger (2004) [24]	Upper extremity pain (epicondylitis)	OMT (n=27)	Chiropractic techniques, antiphlogistics, cortisone injections (n=13)	**Pain**: Pressure pain test, Thomsen test, middle finger extension test **FS**: strength test	**Pain/FS:** Subjective pain sensation reduced from 50 to 33% (p<0.01) in the OMT group and from 48 to 32% (p=0.03) in the orthopedic group. A reduction of pain as well as an increase of power could be measured. The difference between the 2 treatment methods, however, was not statistically significant.
Hanson et al. (2016) [13]	LBP	OMT (n=24)	N/A	**Pain**: QVAS **FS**: ODI, PSFS	Pain intensity, disability, and function improved in most participants following treatment. **Pain**: QVAS (95% CI: 1.0, 3.0; p<0.0001) **FS**: ODI (95% CI: 9.3, 22.7; p<0.0001 for overall ANOVA), and PSFS (95% CI: 1.9, 4.3; p<0.0001)
Knebl et al. (2002) [11]	Upper extremity pain (shoulder)	OMT (n=14)	Placebo (n=15)	**Pain**: Perceived pain **FS**: Functional independence, ROM of the shoulder	**Pain/FS:** Over the course of treatment, both groups had significantly increased ROM (p<0.01) and decreased perceived pain (p<0.01). After treatment, those subjects who had received OMT demonstrated continued improvement in their ROM, while ROM in the placebo group decreased.
Küçükşen et al. (2013) [25]	Upper extremity pain (epicondylitis)	MET (n=41)	CSI (n=41)	**Pain**: pain scale **FS**: pain-free grip strength, DASH	**Pain:** Mean pain scale scores were significantly higher in the MET group than the CSI group at 6 weeks (p=0.004) but were significantly lower at 26 and 52 weeks (p=0.016 and p=0.01, respectively). **FS:** Mean pain-free grip strength scores in the MET group were significantly lower than the CSI group at 6 weeks (p=0.005) but higher at 52 weeks (p=0.007).

Table 2: (continued)

Study, first author, year	Chronic pain condition investigated	Intervention (number of participants)	Control (number of participants)	Outcome measurement	Findings intervention vs. control
Licciardone et al. (2016) [15]	LBP	OMT (n=175)	Sham OMT (n=170)	**Pain**: VAS **FS**: RMDQ	**Pain/FS:** There was a large treatment effect for recovery with OMT (RR, 2.36; 95% CI: 1.31 to 4.24; p=0.003), which was associated with a clinically relevant NNT (8.9; 95% CI: 5.4 to 25.5). This significant finding persisted after adjustment for potential confounders (OR, 2.92; 95% CI: 1.43 to 5.97; p=0.003)
Licciardone et al. (2013) [16]	LBP	OMT (n=230)	Sham OMT (n=225)	**Pain**: VAS **FS**: Medication	**Pain:** Patients receiving OMT were more likely than patients receiving sham OMT to achieve moderate (response ratio [RR] = 1.38; 95% CI: 1.16–1.64; p<0.001) and substantial (RR = 1.41; 95% CI: 1.13–1.76; p=0.002) improvements in LBP at week 12. **FS/Medication:** Patients receiving OMT used prescription drugs for LBP less frequently during the 12 weeks than did patients in the sham OMT group (use ratio=0.66, 95% CI: 0.43–1.00; p=0.048)
Licciardone et al. (2003) [17]	LBP	OMT (n=32)	Sham OMT (n=19), no-intervention control group (n=15)	**Pain**: VAS **FS**: SF-36, RMDQ, lost work or school days because of back pain, satisfaction with back care	**Pain/FS:** As compared with the no-intervention control subjects, the patients who received OMT reported greater improvements in back pain (p=0.64), better physical functioning (p=0.77) and mental health at 1 month (p=0.95), and fewer concurrent treatments at 6 months (p=0.82). The subjects who received sham manipulation also reported greater improvements in back pain and physical functioning and greater satisfaction than the no-intervention control subjects. VAS pain scale scores showed no statistically significant different decreases in pain between the OMT and sham groups (p=0.64). There were no significant benefits with OMT, as compared with sham manipulation.
Licciardone et al. (2014) [18]	LBP	OMT (n=95)	Sham OMT (n=91)	**Pain**: VAS	**Pain:** Sixty-two (65%) patients in the OMT group attained an initial clinical response vs. 41 (45%) patients in the sham OMT group (risk ratio [RR], 1.45; 95% CI: 1.11–1.90; p<0.001). Among patients with an initial clinical response prior to week 12, 13 (24%) patients in the OMT group vs. 18 (51%) patients in the sham OMT group relapsed (RR, 0.47; 95% CI: 0.26–0.83; p<0.01).

Table 2: (continued)

Study, first author, year	Chronic pain condition investigated	Intervention (number of participants)	Control (number of participants)	Outcome measurement	Findings intervention vs. control
Licciardone et al. (2013) [19]	LBP	LBPS OMT (n=135), HBPS OMT (n=95)	LBPS sham OMT (n=134), HBPS sham OMT (n=91)	**Pain**: VAS **FS**: RMDQ	**Pain:** There was a large effect size for OMT in providing substantial LBP improvement in patients with HBPS (RR, 2.04; 95% CI: 1.36–3.05; p<0.001). **FS:** This was accompanied by clinically important improvement in back-specific functioning on the RMDQ (RR, 1.80; 95% CI: 1.08–3.01; p=0.02). Both RRs were significantly greater than those observed in patients with LBPS.
Licciardone et al. (2014) [20]	LBP	OMT (n=230)	N/A	**Pain**: VAS **FS**: Biomechanical dysfunction	**Pain/FS:** Significant improvements in each biomechanical dysfunction were observed with OMT; however, only psoas syndrome remission occurred more frequently in LBP responders than nonresponders (p for interaction =0.002).
Licciardone et al. (2013) [21]	LBP	OMT (n=19)	Sham OMT (n=15)	**Pain**: VAS **FS**: TNF-α serum concentration	**Pain:** The reduction in LBP severity over 12 weeks was significantly greater in patients with diabetes mellitus who received OMT than the patients with diabetes mellitus who received sham OMT (mean between-group difference in changes in the VAS pain score, −17 mm; 95% CI: −32 mm to −1 mm; p=0.04). **FS:** A corresponding significantly greater reduction in TNF-α serum concentration was noted in patients with diabetes mellitus who received OMT, compared with those who received sham OMT (mean between-group difference, −6.6 pg/mL; 95% CI: −12.4 to −0.8 pg/mL; p=0.03).
Marx et al. (2009) [31]	Prostatitis/pelvic pain syndrome	OMT (n=20)	Placebo (n=15)	**Pain/FS**: IPSS, NIH-CPSI, QOL index	**Pain/FS:** Comparison of the results from the OMT and placebo groups revealed statistically significant differences in favor of the OMT group (p<0.0005).
Schwerla et al. (2008) [28]	Neck pain (nonspecific)	OMT + sham ultrasound (n=24)	Sham ultrasound only (n=16)	**Pain**: NRS	**Pain:** Average pain intensity decreased from 4.7 to 2.2 in the osteopathic group (p<0.0005) and from 4.8 to 4.0 in the control group (p=0.09).
Schwerla et al. (2015) [22]	LBP (postpartum)	OMT (n=40)	Control (n=40)	**Pain**: VAS **FS**: ODI	**Pain/FS:** The between-group comparison of changes revealed a statistically significant improvement in pain intensity in the OMT group (between-group difference of means, 4.8; 95% CI: 4.1 to 5.4; p<0.001) and level of disability (between-group difference of means, 10.6; 95% CI: 9.9 to 13.2; p<0.005).

Table 2: (continued)

Study, first author, year	Chronic pain condition investigated	Intervention (number of participants)	Control (number of participants)	Outcome measurement	Findings intervention vs. control
Vismara et al. (2012) [23]	LBP	OMT + SE (n=10)	SE only (n=11)	**Pain**: VAS **FS**: Kinematic of the thoracic and lumbar spine and pelvis during forward flexion, RMDQ, OQ.	**Pain/FS:** Combined rehabilitation treatment including OMT + SE showed to be effective in improving biomechanical parameters of the thoracic spine in obese patients with cLBP ($p<0.05$). These effects were not seen in the SE-only group.

ADL, activity of daily living; ANOVA, analysis of variance; CCF, craniocervical flexion; CCT, conventional conservative therapy; CESDS, Center for Epidemiological Studies Depression Scale; CI, confidence interval; cLBP, chronic low back pain; CPEI, Chronic Pain Experience Inventory; CPSI, Chronic Prostatitis Symptom Index; CSI, corticosteroid injections; DASH, Disabilities of the Arm, Shoulder, and Hand; EQ-5D, EuroQol five dimensions; FABQ, Fear-Avoidance Beliefs Questionnaire; FS, functional status; GHQ 12, General Health Questionnaire 12; HADS, Hospital Anxiety and Depression Scale; HAQ, Stanford Arthritis Center Disability and Discomfort Scales: Health Assessment Questionnaire; HBPS, high baseline pain severity; HIT, Headache Impact Test; HVLA, high-velocity, low-amplitude; IPSS, International Prostate Symptom Score; LBP, low back pain; LBPS, low baseline pain severity; MET, muscle energy techniques; MFR, myofascial release; NRS, numeric rating scale; NSAID, nonsteroidal anti-inflammatory drug; ODI, Oswestry Disability Index; OMT, osteopathic manipulative treatment; OQ, Oswestry Low Back Pain Disability Questionnaire; PPIRS, Present Pain Intensity Rating Scale; PSFS, Patient-Specific Functional Scale; QVAS, Quadruple Visual Analog Scale of 2.0 points; RMDQ, Roland-Morris Disability Questionnaire; ROM, range of motion; RR, relative ratio; SE, specific exercises; SEQ, Self-Evaluation Questionnaire; SF-MPQ, Short-Form McGill Pain Questionnaire; VAS, Visual Analog Scale.

(13.6%) found that there was no statistically significant difference in functional status improvement between patients who received OMT and those who did not [17, 25, 29]. However, both groups reported improved functional status over the course of treatment. Therefore, OMT qualifies as an effective means of improving functional status in chronic pain conditions.

Several authors used ROM to demonstrate improvements in functional status and found statistically significant improvements as a result of OMT [11, 12, 23, 27]. Furthermore, Knebl et al. [11] found that even after treatment, the OMT intervention group had continued improvement in ROM. To measure functional status, Gamber et al. [10] used activities of daily living (ADLs), Arguisuelas et al. [14] used disability, Hanson et al. [13] used the Oswestry Disability Index, and Licciardone et al. [19, 20] used back-specific functioning and improved biomechanical dysfunction. Each author found significant improvements in measures of functional status for their OMT treatment groups. Days without pain and quality of life were other common functional status measurements. Cerritelli et al. [26] showed that OMT can result in the functional improvement for migraine test subjects, as measured by the duration of migraines and functional disability. Marx et al. [31] used prostate-specific analyses and quality-of-life improvements to show an improvement in the functional status of patients with chronic pelvic pain syndrome. Licciardone [21] used TNF-α serum concentration to show improvement in functional status of diabetic patients who received OMT treatment. Gamber et al. [10] used discomfort scales, health assessments, self-evaluation, and depression ratings to illustrate that OMT resulted in an improved functional status in patients with fibromyalgia.

Some authors used mental health status to measure functional status. Edwards and Toutt [30] investigated functional status through the EuroQol five dimensions (EQ-5D), the General Health Questionnaire 12 (GHQ 12), and the Hospital Anxiety and Depression Scale (HADS). Gamber et al. [10] used perceived functional ability, and Arguisuelas et al. [14] used fear avoidance beliefs to measure functional beliefs. These authors reported significant improvement in functional status in subjects receiving OMT.

Secondary outcome: medication usage

The three articles measuring medication usage demonstrated statistically significant decreases in pain medication usage, including a decrease in the number of subjects taking pain medication and a decrease in the frequency of pain medication usage [16, 26, 29]. Cuccia et al. [29] showed a reduction in the use of antiinflammatory drugs and muscle relaxants due to OMT, although the study showed no significant difference in pain between the control group and the intervention group. Cerritelli et al. [26] demonstrated a decrease in the number of subjects taking pain medications, while Licciardone et al. [16] showed a decrease in the frequency of pain medication consumption in the OMT treatment group. These findings suggest that OMT may help reduce the number of pain medications prescribed to patients, and further research is needed, especially in the context of an opioid crisis.

Discussion

The previous studies included in this literature review demonstrated the significant effect of various forms of OMT on reducing chronic pain, increasing functional status, and decreasing medication usage. Patients treated with OMT had improved outcomes compared with groups without OMT. Few studies showed no significant difference in pain reduction or functional status between the treatment and control groups, but these studies still supported the benefits of OMT. All but one study showed a statistically significant improvement in chronic pain through improvement in at least one measurable outcome.

Medical society guidelines offer providers standardized, evidence-based recommendations for patient care. Guidelines have the potential to improve clinical outcomes and reduce referrals, emergency department visits, and costs [32]. This review has demonstrated a strong argument for adding OMT to chronic pain guidelines. A variety of manipulation techniques were employed and would be acceptable as part of future guidelines. There are several examples of chronic pain guidelines that could benefit from the addition of OMT in future iterations. The CDC's current guidelines for prescribing opioids for chronic pain recommend trying nonpharmacological management, including physical therapy, psychological therapy such as CBT, and exercise therapy [5]. The American Academy of Pain Medicine advocates for "more clinician training in a full range of available pain treatments and a team-based approach to pain care to include relevant clinic staff and pharmacists" [33]. The American Society of Anesthesiologists guidelines identify single modality interventions like physical or restorative therapy and psychological treatment that can be utilized as part of a multimodal approach to pain management [34]. The Institute for Clinical Systems Improvement lists spinal manipulation therapy as an option for passive physical treatment when forming a multidisciplinary approach to chronic pain [35]. Finally, the 2017 American College of Physicians guidelines for treating nonradicular LBP include a recommendation for spinal manipulation [36].

The addition of OMT to society guidelines like these for chronic pain management could increase physician awareness of the efficacy and feasibility of including OMT as part of a multidisciplinary approach to pain management; guidelines could include a statement like, "Referral to an osteopathic physician should be considered for evaluation with subsequent OMT based upon findings." OMT is an underutilized form of pain management that should be more widely used and innovatively applied to current health crises, including the opioid crisis. Future research should examine how the addition of OMT to chronic pain management guidelines increases the use of OMT and impacts those affected by the opioid crisis.

Limitations

This literature review had several limitations. First, we used only two databases to search for previous publications. It is possible that other relevant articles were contained in other databases, but the article overlap between the two databases suggested article saturation. Further, only experimental studies were included in the literature review. Studies with multimodal comparator groups were excluded to solely examine OMT's effect on chronic pain. These restrictions led to a smaller sample size. Our study was potentially limited by OMT provider skill sets and participant response bias in the included articles.

Conclusions

OMT is an adjunctive, nonpharmacological option for chronic pain management, but it has been underutilized. With awareness of the evidence showing OMT as a viable and effective treatment modality, providers may become more confident in their decision to include or refer patients for OMT as part of their treatment. This review summarized previous data showing that OMT can successfully be used to reduce pain levels, improve functional status, and lower medication usage in chronic pain conditions, providing evidence that this form of treatment should be incorporated into chronic pain management guidelines.

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