

**Evidence to support osteopathic treatment of
musculoskeletal pain- a summary table of evidence
(Sept 2013)**

- **Key messages**

- Research relevant to osteopathic treatment of musculoskeletal pain comes from a number of manual therapy professions, namely chiropractic and physiotherapy in addition to osteopathy. Much of the research has focused on spinal manipulation and mobilisation.
- **Low-back pain (LBP):** There is good quality evidence, in the form of systematic reviews and randomised controlled trials, showing that spinal manipulation is effective in treating low-back pain. One systematic review by Licciardone and colleagues looked specifically at osteopathic treatment for LBP and found that it significantly reduces LBP.
- **Neck pain:** There is evidence for manual therapy (manipulation (cervical and thoracic), mobilisation and myofascial techniques) for the treatment of non-specific neck pain, especially when combined with exercises.
- **Headache:** There is evidence that spinal manipulation may be effective in treating tension-type headache and cervicogenic headache; there is evidence to suggest that some manual therapies, including spinal manipulation, may be more effective than some pharmaceutical drugs in the prophylactic treatment of migraine. Spinal manipulation appears to be superior to massage for cervicogenic headaches.
- **Shoulder pain:** There is a fair level of evidence for manual and manipulative therapy combined with multimodal exercise therapy for rotator cuff injuries,

disorders and/or diseases and frozen shoulder (when utilising proprioceptive exercises). There is also a fair level of evidence for soft tissue or myofascial treatments for soft tissue disorders of the shoulder. There is limited evidence for high velocity low amplitude manipulation with soft tissue release and exercise for minor neurogenic shoulder pain. There is insufficient evidence for the treatment of osteoarthritis of the shoulder.

- **Low-limb pain:** There is fair evidence to support the use of manipulative therapy, combined with multimodal or exercise therapy for knee osteoarthritis, patellofemoral pain syndrome and ankle inversion sprain. There is limited evidence for its use in hip osteoarthritis, plantar fasciitis, metatarsalgia, and hallux limitus/rigidus.
- **Scoliosis:** The efficacy of manual therapy in adolescent idiopathic scoliosis is inconclusive due to lack of good quality research.
- Many studies have failed to report adverse events; future studies must incorporate adverse event reporting.

You can read summaries of individual papers in the tables below.

Systematic reviews

Author and date	Full reference	Methodology	Findings	Comments
Pennick V and Liddle D, 2013	Pennick V, Liddle D. Interventions for preventing and treating pelvic and back pain in pregnancy. <i>Cochrane Database Syst Rev.</i> 2013; 8	Inclusion criteria: randomised controlled trials (RCTs) evaluating any intervention for preventing or back or pelvic pain in pregnancy; the women in the trials could be in any stage of their pregnancy provided they were at risk of developing or had back or pelvic pain. Quasi-randomised trials were excluded. Risk of bias was assessed using <i>The Cochrane Handbook for Systematic Reviews of Interventions</i> .	<p>For LBP, there was low-quality evidence that in general, the addition of exercise significantly reduced pain and disability; and water-based exercise significantly reduced LBP-related sick leave. Low-quality evidence from single trials suggested no significant difference in pain or function between two types of pelvic support belt, between osteopathic manipulation (OMT) and usual care or sham ultrasound (sham US). Very low-quality evidence suggested that a specially-designed pillow may relieve night pain better than a regular pillow.</p> <p>For pelvic pain, there was moderate-quality evidence that acupuncture significantly reduced evening pain better than exercise; both were better than usual care. Low-quality evidence from single trials suggested that adding a rigid belt to exercise improved average pain but not function; acupuncture was significantly better than sham acupuncture for improving evening pain and function, but not average pain; and evening pain relief was the same following either deep or superficial acupuncture.</p> <p>For lumbo-pelvic pain, there was moderate-quality evidence that an eight- to 20-week exercise program reduced the risk of women reporting lumbo-pelvic pain; but a 16- to 20-week training program was no more</p>	Physiotherapy, OMT, acupuncture, a multi-modal intervention, or the addition of a rigid pelvic belt to exercise seemed to relieve back or pelvic pain more than usual care alone. When reported, adverse events were minor and transient.

			<p>successful than usual care at preventing pelvic pain. Low-quality evidence suggested that exercise significantly reduced lumbo-pelvic-related sick leave, and improved function. Low-quality evidence from single trials suggested that OMT significantly reduced pain and improved function; either a multi-modal intervention that included manual therapy, exercise and education (MOM) or usual care significantly reduced disability, but only MOM improved pain and physical function; acupuncture improved pain and function more than usual care or physiotherapy; pain and function improved more when acupuncture was started at 26- rather than 20- weeks' gestation; and auricular (ear) acupuncture significantly improved these outcomes more than sham acupuncture.</p>	
Rubinstein S et al, 2012	Rubinstein SM, Terwee CB, Assendelft WJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for acute low-back pain. <i>Cochrane Database Syst Rev.</i> 2012;12;9:CD008880. doi: 10.1002/14651858.CD008880.pub2.	Inclusion criteria: randomised controlled trials (RCTs) with patients with acute low back pain, including referred pain into buttocks and legs. The authors did not include sciatica specifically. Included trials of chiropractic, manual therapy and osteopathy. The reviewers used GRADE to assess the quality of evidence.	<p>High quality evidence suggests that there is no clinically relevant difference between spinal manipulative therapy (SMT) and other interventions for reducing pain and improving function in patients with chronic low-back pain. Determining cost-effectiveness of care has high priority.</p> <p>In summary, SMT appears to be no better or worse than other existing therapies for patients with acute low-back pain.</p>	Spinal manipulative therapy is equal to other existing therapies for acute low-back pain.
Furlan AD et al, 2012	Furlan AD, Yazdi F, Tsertsvadze A, Gross A, Van Tulder M, Santaguida L, Gagnier J, Ammendolia C, Dryden T, Doucette S, Skidmore B, Daniel R,	This study included 147 randomised trials and 5 non-randomised trials. CAM treatments included were acupuncture, massage, spinal manipulation and mobilization for neck and low back pain.	The overall evidence suggests that manipulation and mobilisation are an effective treatment modality compared to other therapies. This was mostly limited to immediate and short-term post treatment periods. This was mostly evident in pain	Manipulation and mobilisation are an effective treatment modality compared to other therapies.

	<p>Ostermann T, Tsouros S. A systematic review and meta-analysis of efficacy, cost-effectiveness, and safety of selected complementary and alternative medicine for neck and low-back pain. <i>Evidence- Based Complementary and Alternative Medicine</i>. 2012;2012:953139.</p>		<p>rather than disability outcomes.</p>	
<p>Posadzki P, Ernst E, 2012</p>	<p>Posadzki P, Ernst E. Spinal manipulations for tension-type headaches: a systematic review of randomized controlled trials. <i>Complement Ther Med</i>. 2012;20(4):232-239</p>	<p>5 RCTs including a total of 348 patients with tension-type headaches were eligible for inclusion. The methodological quality of the trials was assessed using the Cochrane tool and the Jadad score. Meta-analysis was not possible due to the statistical and clinical heterogeneity of the studies.</p>	<p>4 of the 5 RCTs suggest that spinal manipulation (SM) is more effective than drug therapy, SM plus placebo, sham SM plus amitriptyline or sham SM plus placebo, usual care or no intervention. Due to lack of detailed description of the treatments, replication of the RCTs would be difficult if not impossible. Evidence for SM as a treatment option for tension type headaches is mostly positive, however not conclusive due to clinical and statistical heterogeneity of primary studies. More research in this area is warranted.</p>	<p>Evidence for spinal manipulation for the treatment of tension-type headaches is positive although not yet conclusive.</p>
<p>Vincent K et al, 2012</p>	<p>Vincent K, Maigne JY, Fischhoff C, Lanlo O, Dagenais S. Systematic review of manual therapies for nonspecific neck pain. <i>Joint Bone Spine</i>. Epub</p>	<p>RCTs evaluating manual therapies on pain and function in patients with acute or chronic neck pain were examined for this review. Manual therapies included manipulation, mobilization and myofascial techniques but excluded massage and mechanical traction. Exclusion criteria were trauma-related neck pain populations, cervicobrachial neuralgia and neck pain related headaches. Also excluded were RCTs in which only very</p>	<p>The authors conclude that manual therapies contribute to improve pain and function in adults with non-specific neck pain. There was moderate evidence for the short-term effects of thoracic manipulation combined with electrothermal therapy. Moderate evidence for short-, medium-, and long-term effects of cervical manipulation. In chronic neck pain and neck pain of variable duration the level of evidence was limited for all interventions. Adding exercises to manual therapies</p>	<p>Manual therapies contribute to improve pain and function in adults with non-specific neck pain, especially when combined with exercises.</p>

		short-term effects were assessed (i.e., immediate and within a few days). 27 RCTs were included in the review, 18 of which were deemed to be of high quality. Cochrane Back Review Group criteria were used to evaluate level of evidence.	consistently produced greater efficacy.	
Chaibi A, Russell MB, 2012	Chaibi A, Russell MB. Manual therapies for cervicogenic headache: a systematic review. <i>J Headache Pain.</i> 2012;13(5):351-359	7 RCTs were included in the review. 1 applied physiotherapy and temporomandibular mobilisation and 6 applied cervical manipulation techniques (SMT). 4 studies were conducted by chiropractors, 2 by physiotherapists and 1 by a physician.	Current RCTs suggest that physiotherapy and SMT might be an effective treatment in the management of cervicogenic headache (CH). The RCTs mostly included participants with infrequent CH.	SMT may be effective in the management of cervicogenic headache. No RCTs of osteopathic intervention were identified in the search in this review. There did not appear to be any information regarding adverse effects.
Brantingham JW et al, 2012	Brantingham JW, Bonnefin D, Perle SM, Cassa TK, Globe G, Pribicevic M, Hicks M, Korporaal C. Manipulative therapy for lower extremity conditions: update of a literature review. <i>J Manipulative Physiol Ther.</i> 2012;35(2):127-166	Inclusion criteria required a diagnosis and manipulative therapy (mobilisation and manipulation). Exclusion criteria were pain referred from spinal sites, referral for surgery, and conditions contraindicated for manipulative therapy. Clinical trials were assessed using a modified Scottish Intercollegiate Guidelines Network ranking system.	There is limited evidence for manipulative therapy (MT) combined with multimodal or exercise therapy (ET) for hip osteoarthritis. There is fair evidence for MT of the knee and/or full kinetic chain, and of the ankle and/or foot, combined with multimodal or ET for knee osteoarthritis, patellofemoral pain syndrome, and ankle inversion sprain. There is limited evidence for MT of the ankle and/or foot combined with multimodal or ET for plantar fasciitis, metatarsalgia, and hallux limitus/rigidus. There is insufficient evidence for MT of the ankle and/or foot combined with multimodal or ET for hallux abducto valgus.	

Rubinstein SM et al, 2011	Rubinstein SM, van Middelkoop M, Assendelft WJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for chronic low-back pain. Cochrane Database Syst Rev. 2011;2: CD008112	Inclusion criteria: RCTs which examined the effectiveness of spinal manipulation or mobilisation in adults with chronic low-back pain. All settings and types of pain were considered, however studies which exclusively examined sciatica were excluded. Primary outcomes were pain, functional status and perceived recovery. Secondary outcomes were return-to-work and quality of life. GRADE was used to assess the quality of the papers.	26 RCTs representing a total of 6070 participants were included, of which 9 had a low risk of bias. There is high quality evidence that spinal manipulative therapy (SMT) has a small, statistically significant but not clinically relevant, short-term effect on pain relief and functional status compared to other interventions. The robustness of the findings were confirmed by sensitivity analyses. There is varying quality of evidence that SMT has a statistically significant effect on the above outcomes when added to another intervention. There is low quality evidence that SMT is not statistically significantly more effective than inert interventions or sham SMT for the previously mentioned outcomes.	No serious complications were observed with spinal manipulative therapy.
Chaibi A, Tuchin PJ, Russell MB, 2011	Chaibi A, Tuchin PJ, Russell MB. Manual therapies for migraine: a systematic review. J Headache Pain. 2011;12(2):127-133	Inclusion criteria: RCTs written in English using manual therapy for migraine were evaluated. Studies were assessed for quality. 7 RCTs were included: 2 massage therapy studies, one physiotherapy study, and 4 chiropractic spinal manipulative therapy studies. No osteopathic studies were identified.	The RCTs included in the review suggest that massage therapy, physiotherapy, relaxation and chiropractic spinal manipulative therapy might be equally effective as propranolol and topiramate in the prophylactic management of migraine. However, these RCTs had many methodological shortcomings.	

van Middelkoop M et al, 2011	van Middelkoop M, Rubinstein SM, Kuijpers T, Verhagen AP, Ostelo R, Koes BW, van Tulder MW. A systematic review on the effectiveness of physical and rehabilitation interventions for chronic non-specific low back pain. <i>Eur Spine J.</i> 2011 Jan;20(1):19-39.	In total 83 RCTs met the inclusion criteria: exercise therapy (n = 37), back school (n = 5), TENS (n = 6), low level laser therapy (n = 3), behavioural treatment (n = 21), patient education (n = 1), traction (n = 1), and multidisciplinary treatment (n = 6). The GRADE approach was used to determine the quality of evidence.	Evidence from RCTs demonstrates that there is low quality evidence for the effectiveness of exercise therapy compared to usual care, there is low evidence for the effectiveness of behavioural therapy compared to no treatment and there is moderate evidence for the effectiveness of a multidisciplinary treatment compared to no treatment and other active treatments at reducing pain at short-term in the treatment of chronic low back pain. Based on the heterogeneity of the populations, interventions, and comparison groups, we conclude that there are insufficient data to draw firm conclusion on the clinical effect of back schools, low-level laser therapy, patient education, massage, traction, superficial heat/cold, and lumbar supports for chronic LBP.	
Brantingham JW et al, 2011	Brantingham JW, Cassa TK, Bonnefin D, Jensen M, Globe G, Hicks M, Korporaal C. Manipulative therapy for shoulder pain and disorders: expansion of a systematic review. <i>Journal of Manipulative and Physiological Therapeutics.</i> 2011;34(5):314-46.	Inclusion criteria were shoulder peripheral diagnosis and manual manipulative therapy. Exclusion criteria were pain referred from spinal sites. The Physiotherapy Evidence Database scale was used to assess the quality of the studies. Evidence grades of A,B,C and I were applied.	The study found a fair level of evidence (B) for manual and manipulative therapy (MMT) of the shoulder, shoulder girdle, and/or full kinetic chain (FKC) combined with multimodal exercise therapy for rotator cuff injuries, disorders and/or diseases. There was also a fair level of evidence for MMT with exercise that included proprioceptive retraining as helpful for frozen shoulder/adhesive capsulitis. There was a fair level of evidence for soft tissue or myofascial treatments for soft tissue disorders of the shoulder. Limited evidence for cervical lateral glide mobilisation and/or high velocity low amplitude manipulation with soft tissue release and exercise in the treatment of minor neurogenic shoulder pain. Insufficient evidence for MMT in the treatment of	1 RCT involving osteopathic technique was included in this review. There is a fair level of evidence for manipulative therapy for the management of rotator cuff disorders and/or diseases, frozen shoulder/adhesive capsulitis and soft tissue disorders of the shoulder. There was limited evidence for the treatment of minor neurogenic shoulder pain and insufficient evidence for OA of the shoulder.

			osteoarthritis (OA) of the shoulder.	
Posadzki P, Ernst E, 2011	Posadzki P, Ernst E. Osteopathy for musculoskeletal pain patients: a systematic review of randomized controlled trials. <i>Clinical Rheumatology</i> . 2011;30(2):285-91	Trials involving osteopathic manipulation/mobilization (OMT) for any musculoskeletal pain in any area of the body were reviewed in this paper, provided that pain was assessed as an outcome measure. 16 RCTs were included, representing 1,314 patients. The studies originated from the US, Germany, Italy, Australia, Spain and the UK. Patient populations were heterogenous. The quality of the studies was assessed using the Jadad scale.	5 of the 16 RCTs showed that OMT is effective for musculoskeletal pain (MSP) and 11 showed no difference between OMT and controls (these included sham ultrasound, placebo sham manipulation, no intervention, drugs, moist heat, chemonucleolysis, sham treatment + standard care, chiropractic techniques, antiphlogisitcs, and cortisone injections, exercises or manipulative physiotherapy, manual mobilization, short-wave diathermy and a placebo, or standard care.). The evidence is therefore inconclusive.	5 RCTs showed that OMT is effective for MSP and 11 showed no difference between controls. Many of the trials did not report information regarding adverse events.
Posadzki P, Ernst E, 2011	Posadzki P, Ernst E. Spinal manipulations for cervicogenic headaches: a systematic review of randomized clinical trials. <i>Headache</i> . 2011;51(7):1132-9.	9 RCTs representing 607 patients with cervicogenic headache (CGH) were included in the study. SM was compared with sham manipulation, light massage, drugs, physical therapy and no intervention.	6 of the 9 studies found spinal manipulation (SM) to be effective and 3 found no difference. 3 of the 4 high quality studies favoured SM. Existing evidence for SM for cervicogenic headaches is positive but due to methodological flaws of the studies the efficacy of SM is inconclusive.	Existing evidence for SM for cervicogenic headaches is positive but due to methodological flaws of the studies the efficacy of SM is inconclusive. Only 4 of the 9 RCTs reported on adverse events. One study had no AEs reported, the other 3 reported some mild reactions following treatment, including headache. The AEs reported in one study were experienced by both the treatment and placebo group and there was no statistically significant difference between the two.

<p>Miller et al, 2010</p>	<p>Miller J, Gross A, D'Sylva J, Burnie SJ, Goldsmith CH, Graham N, Haines T, Bronfort G, Hoving JL. Manual therapy and exercise for neck pain: A systematic review. <i>Manual Therapy</i>. 2010;15(4): 334-354.</p>	<p>The authors examined evidence for effectiveness of manual therapy and exercise for neck pain with or without radicular symptoms or cervicogenic headaches. They examined RCTs and quasi RCTs. The quality of the trials was assessed using the Jadad scale, the Cochrane Back Review Group criteria and an adapted Cochrane 'risk of bias' method. Qualitative analysis of the trials was carried out using GRADE.</p> <p>17 studies of neck pain were found: whiplash associated disorders (WAD) – WAD I and II – acute and mixed duration (n=5), chronic – degenerative changes (n=1), acute, sub-acute, chronic and mixed duration cervicogenic headaches (n=5), neck disorders with radicular signs and symptoms, including WAD III: chronic; mixed duration (n=3).</p>	<p>Manipulation or mobilisation and exercise produces a greater long-term improvement in pain and global perceived effect when compared to no treatment for chronic neck pain, subacute/chronic neck pain with cervicogenic headache and chronic neck pain with or without radicular signs and symptoms.</p> <p>Manual therapy and exercise produce greater short-term pain relief than exercise alone but produces no long-term difference across multiple outcomes for neck pain of chronic and mixed duration with or without cervicogenic headache.</p> <p>Manual therapy combined with exercise produced greater improvements in pain, function, quality of life and patient satisfaction than manual therapy alone for chronic neck pain.</p> <p>Manipulation, mobilisation and exercise are favoured over traditional care for reducing pain at short-term follow-up for acute WAD, but may be no different at long-term follow-up for neck pain of chronic or mixed duration.</p>	<p>There is positive evidence for manipulation or mobilisation and exercise for improving pain and global perceived effect for neck pain.</p> <p>Side effects were reported in 3/17 trials and were benign and transient, including cervical pain, thoracic pain, headache, radicular symptoms and dizziness. The rate of rare but serious adverse events could not be established in this review.</p>
<p>Gross A et al, 2010</p>	<p>Gross A, Miller J, D'Sylva J, Burnie SJ, Goldsmith CH, Graham N, Haines T, Bronfort G, Hoving JL, COG. Manipulation or mobilisation for neck pain: a Cochrane Review. <i>Manual Therapy</i>. 2010;15(4):315-33.</p>	<p>Evidence for manipulation and mobilisation for neck pain were reviewed. Only trials looking at single modal application of the techniques were included. Published and unpublished RCTs and quasi RCTs were included. 27 RCTs were reviewed and assessed using the Cochrane Back Review Group guidelines and the GRADE approach was used for assessing qualitative data.</p>	<p>For acute and chronic neck pain cervical manipulation produced similar pain relief, functional improvements and patient satisfaction to mobilisation. It may provide short-term pain relief. Thoracic manipulation may improve pain and function either when used alone or in combination with individualised physiotherapy or electrothermal treatment.</p> <p>Cervical manipulation is similar to manipulation or acupuncture for pain and function. One mobilisation technique may be more beneficial than another.</p>	<p>Manipulation and mobilisation appear to be similar in achieving pain relief, functional improvements and patient satisfaction.</p> <p>Adverse event information was included in 8 of the 27 trials. 3 trials reported no adverse events and 5 reported benign and transient side effects,</p>

				including headache, neck pain and radicular symptoms.
Williams NH et al, 2010	Williams NH, Amoakwa E, Burton K, Hendry M, Lewis R, Jones J, Bennet P, Neal RD, Andrew G, Wilkinson C. The Hip and Knee Book: developing an active management booklet for hip and knee osteoarthritis. Br J Gen Pract. 2010 Feb;60(571):64-82	<p>A preliminary list of statements was written and search strategies to identify systematic reviews (SRs) and guidelines that addressed these systems were developed.</p> <p>Inclusion criteria: SRs and evidence-based guidelines of adults with osteoarthritis (OA) of the hip or knee. Generalised studies of OA of the hip and knee.</p> <p>Exclusion criteria: OA in other sites, surgical interventions, childhood arthritis, rare or specific cases, animal studies, OA prevention, methodological studies, physiology/biochemistry of normal cartilage, or commentary papers.</p> <p>SRs that met the Database of Abstracts and Reviews (DARE) criteria were included, as were evidence-based guidelines but papers not specific to osteoarthritis, narrative reviews and quick guides for clinicians were excluded.</p> <p>The SR quality checklist was adapted from the DARE inclusion criteria, and the Critical Appraisal Skills Programme (CASP) tool. Guidelines were assessed using the Appraisal of Guidelines for Research and Evaluation (AGREE) instrument.</p>	<p>Evidence-based messages were developed from a systematic review, synthesised into patient-centred messages, and then incorporated into a narrative.</p> <p>The value of exercise and weight loss beliefs was accepted and reinforced.</p> <p>There was a fear of dependency on analgesia and misinterpretation of the message on hyaluronon injections.</p>	

		The findings from SRs and guidelines were matched with the list of preliminary statements. These were subsequently modified, deleted, or added to accordingly. The strength of the evidence for each statement was rated with a star system.		
Hurwitz EL et al, 2009	Hurwitz EL, Carragee EJ, van der Velde G, Carroll LJ, Nordin M, Guzman J, Peloso PM, Holm LW, Côté P, Hogg-Johnson S, Cassidy JD, Haldeman S. TREATMENT OF NECK PAIN: NONINVASIVE INTERVENTIONS Results of the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders. <i>J Manipulative Physiol Ther.</i> 2009 Feb;32(2 Suppl):S141-75.	The reviewers included neck pain resulting from whiplash associated disorder (WAD), work-related injuries and strains and neck pain of unknown etiology. Studies of neck pain associated with serious pathology or systemic disease were excluded.	Our best evidence synthesis suggests that therapies involving manual therapy and exercise are more effective than alternative strategies for patients with neck pain; this was also true of therapies, which include educational interventions addressing self-efficacy. Future efforts should focus on the study of non-invasive interventions for patients with radicular symptoms and on the design and evaluation of neck pain prevention strategies.	
Romano M, Negrini S, 2008	Romano M, Negrini S. Manual therapy as a conservative treatment for adolescent idiopathic scoliosis: a systematic review. <i>Scoliosis.</i> 2008;3:2.	Inclusion criteria: Diagnosis of adolescent idiopathic scoliosis. Chiropractic manipulation, osteopathic technique or massage. Outcome: Cobb degrees. Any type of research. No papers matched the inclusion criteria, however 3 papers were deemed relevant to the study and were subsequently discussed.	2 of the 3 papers were controlled studies with no control group and these had conflicting results. The 3 rd paper was a pilot study and the author's conclusion was that a larger RCT was warranted. The available evidence was inadequate for review, therefore the efficacy of manual therapy in adolescent idiopathic scoliosis is inconclusive.	
Chou R et al, 2007	Chou R, Huffman LH. Nonpharmacologic	A review of studies which reviewed nonpharmacologic treatment of low back	Therapies with good evidence of moderate efficacy for chronic or sub-acute low back	

	Therapies for Acute and Chronic Low Back Pain: A Review of the Evidence for an American Pain Society/American College of Physicians Clinical Practice Guideline Ann Intern Med. 2007 Oct 2;147(7):492-504.	pain. 40 systematic reviews (SR) were included in the review. 69 trials of efficacy of spinal manipulation were included in 12 SRs.	pain are cognitive-behavioural therapy, exercise, spinal manipulation, and interdisciplinary rehabilitation. For acute low back pain, the only therapy with good evidence of efficacy is superficial heat.	
Snelling NJ, 2006	Snelling NJ. Spinal manipulation in patients with disc herniation: A critical review of risk and benefit. International Journal of Osteopathic Medicine. 2006;9(3):77-84	This review attempted to draw together the literature on the evidence for clinical efficacy and aspects of safety in spinal manipulation for the management of disc herniation. There was an emphasis on RCTs of spinal manipulation for disc herniation with sciatica, of which 4 were identified.	There is some suggestion that there may be early benefit of manipulation in the management of disc herniation with sciatica but no differences in the long-term. This is based on relatively poor quality trials or trials with small samples, making it impossible to reach any definitive conclusions. In addition, the trials include mobilisation as well as manipulation, which means that comparing the two is not possible. Assessing adverse effects is also difficult as estimations of rare events require large trials with huge numbers of patients. To conclude, the early benefits of manipulation for the management of disc herniation is based on weak evidence and since the estimate of risk, which is believed to be rare with appropriately trained practitioners, is difficult to ascertain, care should be taken in choosing this approach to treatment and it seems prudent to advise patients of the potential risk.	
Ernst E and Canter PH, 2006	Ernst E, Canter PH. A systematic review of systematic reviews of spinal manipulation. <i>Journal of the Royal</i>	Literature searches were conducted to identify systematic reviews published between 2000 and 2005 on spinal manipulation for any health condition. The definition of spinal manipulation and	16 systematic reviews (SRs) were included for analysis. The following conditions were included in the reviews: back pain, neck pain, headache, any non-spinal pain, primary and secondary dysmenorrhoea, infantile colic,	

	<p><i>Society of Medicine.</i> 2006;99(4):192-6.</p>	<p>inclusion criteria for spinal manipulation were unclear. The method for assessing the quality of the papers was not mentioned.</p>	<p>asthma, allergy, cervicogenic dizziness and any condition.</p> <p>4 SRs were found of spinal manipulation (SM) for low back pain (LBP). 1 of the SRs recommended SM as a treatment for LBP, 2 did not show substantial superiority of SM over other treatments and 1 found no compelling evidence for the effectiveness of SM.</p> <p>3 SRs were found for SM for neck pain. 1 reached a positive conclusion, one found SM to be effective in combination with exercise and 1 found no robust evidence for SM for neck pain.</p>	
<p>Licciardone et al, 2005</p>	<p>Licciardone JC, Brimhall AK, King LN. Osteopathic manipulative treatment for low back pain: a systematic review and meta-analysis of randomized controlled trials. <i>BMC Musculoskeletal Disorders.</i> 2005;6:43.</p>	<p>Six OMT trials were included in the review, conducted between 1973 and 2001 in the US or the UK. Within the 6 trials, 8 OMT vs control group comparisons were made. The methodological quality of 4 of the trials was independently assessed and confirmed, however it was not clear what method was used to assess the quality of the trials by the reviewers. 43 analyses were performed on the extracted data for the review, including the overall meta-analysis, seven stratified meta-analyses, and 35 sensitivity analyses.</p>	<p>OMT significantly reduces low back pain. The level of pain reduction is greater than expected from placebo effects alone and persists for at least three months. Additional research is warranted to elucidate mechanistically how OMT exerts its effects, to determine if OMT benefits are long lasting, and to assess the cost-effectiveness of OMT as a complementary treatment for low back pain.</p>	
<p>Bronfort G et al, 2004</p>	<p>Bronfort G, Nilsson N, Haas M, Evans R, Goldsmith CH, Assendelft WJ, Bouter LM. Non-invasive physical</p>	<p>22 studies (RCTs and quasi RCTs) representing a total of 2628 patient ranging from the ages of 12 to 78 years old. There were 5 types of headache represented in the studies:</p>	<p>For the prophylactic treatment of migraine headache there is evidence that spinal manipulation (SM) may be an effective treatment option with a short-term effect similar to amitriptyline.</p>	

	<p>treatments for chronic/recurrent headache. <i>Cochrane Database of Systematic Reviews</i>. 2004;(3):CD001878.</p>	<p>Migraine, tension type, cervicogenic, mix of migraine and tension type, and post traumatic.</p>	<p>For chronic headache amitriptyline was found to be more effective than SM, however, SM was superior in the short-term following cessation of both treatments. For cervicogenic headache evidence showed that neck exercises (low-intensity endurance training) and spinal manipulation are effective in the short and long-term when compared to no treatment.</p>	
<p>Bronfort G et al, 2001</p>	<p>Bronfort G, Assendelft WJ, Evans R, Haas M, Bouter L. Efficacy of spinal manipulation for chronic headache: a systematic review. <i>Journal of Manipulative and Physiological Therapeutics</i>. 2001;24(7):457-66.</p>	<p>9 RCTs representing 386 participants who received spinal manipulation were included in this review. The number of treatments ranged from 1 -12 (average 6) over 1 day to 8 weeks (average 4 weeks). 5 studies were conducted by chiropractors, 3 by medical doctors, 1 by medical doctor or physical therapist and 1 by osteopaths.</p> <p>Comparison groups included amitriptyline, deep friction massage with placebo, mobilization, palpation and rest, cold packs, azapropazone and waiting list. Outcome measures included pain intensity, frequency of headaches, medication use and general health status.</p>	<p>Spinal manipulation therapy appears to be superior to massage for cervicogenic headaches. Its effect also seems to be comparable to first-line prophylactic prescription medication for tension type headache and migraine headache.</p> <p>Firm conclusions would require further testing.</p>	

Randomised controlled trials

<p>von Heymann WJ et al, 2013</p>	<p>von Heymann WJ, Schloemer P, Timm J, Muehlbauer B. Spinal High-Velocity Low Amplitude Manipulation in Acute Nonspecific Low Back Pain. Spine. 2013;38(7):540-548</p>	<p>Double-blinded, randomized-controlled, clinical trial. The first phase followed a 3-armed design, comparing fixed-dose diclofenac, spinal high-velocity low-amplitude (HVLA) manipulation, and placebo. Treatment was carried out in a double-dummy design, so placebo tablets were given to the manipulation group, sham manipulation was given to the diclofenac group and both were given to the control group, without active treatment. Sham manipulation could only be performed in a single-blind manner so the clinical end points were assessed by a different physician and they were blinded to the treatment allocation. The trial was conducted in 5 orthopedic of general practices in 4 different cities. During the second phase of the trial, the subjects were randomized to one of the active treatments only. Participants were asked to fill in a patient diary. Outcomes measured were Roland-Morris Disability Score (RMS), self assessed pain on a visual analogue scale (VAS), quality of life (SF-12), global clinical impression of initially treating physician and a blinded investigator, the cumulative dose of rescue medication, number of days on which the subject took the rescue medication and off-work time. A 12-week follow-up was performed by phone interview using the questions from the patient diary.</p>	<p>Treatment effect was shown to be greater compared with placebo and spinal HVLA was found to be superior to diclofenac. The safety analysis did not show any unexpected untoward events in either of the groups.</p>	
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<p>Licciardone et al 2013</p>	<p>Licciardone JC, Minotti DE, Gatchel RJ, Kearns CM, Singh KP. Osteopathic manual treatment and ultrasound therapy for chronic low back pain: a randomized controlled trial. <i>Ann Fam Med.</i> 2013 Mar;11(2):122-9</p>	<p>Randomised, double-blind, sham – controlled, 2 x 2 factorial design study used to look at osteopathic manual treatment (OMT) and ultrasound therapy (UST) for short-term relief of nonspecific chronic low back pain (LBP). 455 adults (aged 21 to 69 years) with low back pain for at least 3 months were recruited to the study. Exclusion criteria were: pregnant individuals, red flag conditions (listed in study); low back surgery in the past year; received workers’ compensation benefits in the past 3 months; ongoing litigation involving back problems; angina or congestive heart failure symptoms with minimal activity, history of a stroke, or transient ischemic attack in the past year; implanted biomedical devices (such as cardiac pacemakers or artificial joints); active bleeding or infection in the lower back, or other conditions impeding protocol implementation; use of corticosteroids in the past month, or use of manual treatment or UST in the past 3 months or more than 3 times in the past year. Patients were randomly allocated to OMT + UST, OMT + sham UST, sham OMT + UST, or sham OMT + sham UST using a computer generated pseudorandom number. OMT intervention: Treatments were scheduled at weeks 0, 1, 2, 4, 6, and 8. Techniques included high-velocity, low-amplitude thrusts; moderate velocity, moderate-amplitude thrusts; soft tissue stretching, kneading, and pressure; myofascial stretching and release;</p>	<p>OMT patients were more satisfied with their back treatment and achieved moderate and substantial improvements in LBP at week 12 compared with sham OMT. There was no difference between OMT and sham OMT groups in back-specific functioning, general health, work disability specific to LBP, safety outcomes and treatment adherence. Patients in the OMT group used less prescription drugs during the 12 weeks of treatment than patients in the sham OMT group. UST was not found to be efficacious.</p> <p>OMT met or exceeded the Cochrane Back Review Group criterion for a medium effect size for both moderate and substantial improvements in LBP.</p>	
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		<p>positional treatment of myofascial tender points; and patient's isometric muscle activation against the physician's unyielding and equal counter-force.</p> <p>Outcome measures: <i>Primary:</i> Current level of LBP was measured before each treatment and at week 12 using a 100mm visual analogue scale. Primary outcomes were based on the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) consensus statement recommendations. <i>Secondary:</i> Measured at baseline and at weeks 4, 8, and 12 using Roland Morris Disability Questionnaire, SF-36 GH, number of lost work days in the past 4 weeks due to LBP, and satisfaction with back care on a 5 – point Likert scale.</p>		
Licciardone et al, 2010	<p>Licciardone JC, Buchanan S, Hensel KL, King HH, Fulda KG, Stoll ST. Osteopathic manipulative treatment of back pain and related symptoms during pregnancy: a randomized controlled trial. <i>Am J Obstet Gynecol.</i> 2010 Jan;202(1):43.e1-8.</p>		<p>Osteopathic manipulative treatment slows or halts the deterioration of back-specific functioning during the third trimester of pregnancy.</p>	
Licciardone et al, 2003	<p>Licciardone JC, Stoll ST, Fulda KG, Russo DP, Siu J, Winn W, Swift J. Osteopathic manipulative treatment for chronic low back pain: a randomized controlled trial. <i>Spine (Phila Pa 1976).</i> 2003 Jul 1;28(13):1355-62.</p>		<p>Osteopathic manipulative treatment and sham manipulation both appear to provide some benefits when used in addition to usual care for the treatment of chronic nonspecific low back pain. It remains unclear whether the benefits of osteopathic manipulative treatment can be attributed to the manipulative techniques themselves or whether they are related to other aspects of</p>	

			osteopathic manipulative treatment, such as range of motion activities or time spent interacting with patients, which may represent placebo effects.	
UK BEAM trial team, 2004	United Kingdom back pain exercise and manipulation (UK BEAM) randomised trial: effectiveness of physical treatments for back pain in primary care. <i>BMJ</i> . 2004;329(7479)		Relative to “best care” in general practice, manipulation followed by exercise achieved a moderate benefit at three months and a small benefit at 12 months; spinal manipulation achieved a small to moderate benefit at three months and a small benefit at 12 months; and exercise achieved a small benefit at three months but not 12 months.	
Williams et al, 2003	Williams NH, Wilkinson C, Russell I, Edwards RT, Hibbs R, Linck P, Muntz R. Randomized osteopathic manipulation study (ROMANS): pragmatic trial for spinal pain in primary care. <i>Fam Pract</i> . 2003 Dec;20(6):662-9.		A primary care osteopathy clinic may be a cost-effective addition to usual GP care, but this conclusion was subject to considerable random error. Rigorous multi-centre studies are needed to assess the generalizability of this approach.	
Andersson et al, 1999	Andersson GB, Lucente T, Davis AM, Kappler RE, Lipton JA, Leurgans S. A comparison of osteopathic spinal manipulative treatment with standard care for patients with low back pain. <i>New England Journal of Medicine</i> . 1999;341(19):1426-1431.		Osteopathic manual care and standard medical care have similar clinical results in patients with subacute low back pain. However, the use of medication is greater with standard care.	