

Frequency & Duration of Chiropractic Care for Headaches, Neck and Upper Back Pain

John K. Maltby, DC¹ Donald D. Harrison, PhD, DC, MSE² Deed E. Harrison, DC³
Joseph W. Betz, BS, DC⁴ Joseph R. Ferrantelli, BS, DC⁵ Gerard W. Clum, DC⁶

ABSTRACT

Objective: To determine the validity of claims that headaches, neck pain, and upper back pain should resolve in 6 to 12 visits with Spinal Manipulative Therapy (SMT) or Mobilization and to derive an evidence-based Frequency and Duration program for these conditions.

Methods: Searches were performed in PubMed, CINAHL, Mantis, and the Index of Chiropractic Literature (ICL) for Randomized Clinical Trials (RCTs) on headaches, neck pain, and upper back pain for which the treatment was SMT and/or Mobilization. From these headaches, neck pain, and upper back pain RCTs, pain data, the number of subjects and the number of visits were analyzed.

Results: Fifty-four RCTs with SMT and/or Mobilization as the treatment for headaches, neck pain, cervicobrachial pain and/or upper back pain were located. Seven of these were follow-up studies, which resulted in 47 RCTs to be analyzed. The total NRS data indicated only a 46.5% improvement in 7.7 average

visits. Using a constant linear extrapolation of dose response in these studies, a mean of 17 visits was needed to resolve headaches, neck pain and upper back pain. Using an initial examination visit, linearly extrapolated visits, once per week stabilization care for 4 weeks, and 2 follow-up examination visits, a provided 24 visits were needed to document, stabilize, and resolve the average headache, neck pain, cervicobrachial pain, and/or upper back pain case.

Conclusions: Pain data from RCTs did not support claims of restricting Chiropractic care to 6-12 visits for headaches, neck pain, cervicobrachial pain, and/or upper back pain. In fact, assuming a constant linear dosage response, the data indicated a minimum of 24 visits on average would be needed to document, resolve, and stabilize these conditions.

Key Words: *Chiropractic, headaches, neck pain, upper back pain, spinal manipulation, spinal manipulative therapy, mobilization, randomized clinical trials, frequency, duration*

Introduction

The economic burden due to neck disorders is second only to low back pain in workers' compensation costs in the United States and other developed countries.¹ It has been reported that neck disorders are rising and that 54% of the population has experienced neck pain within the past six months.^{2,4}

In the past 20 years, Osteopaths, Physical Therapists, and Medical Manual Therapists have utilized Chiropractic type manual methods to treat neck pain patients. These manual methods are described as "high-velocity low-amplitude" spinal manipulation therapy (SMT).

However, there is also the technique of "mobilization manipulation," which composes a multitude of passive movements to the spinal joints and soft tissues utilized by PTs and DCs.⁵

The risks for serious complications from SMT and Mobilization applied to the cervical spine such as vertebrobasilar arterial insufficiency (VBAI) has been reported to be extremely low at about 6 in 10 million or 0.00006%.⁶ In fact, in a 2008 report of 818 strokes in Ontario hospitals from 1993 to 2002, Cassidy et al.⁷ stated that they found "no evidence of excess risk of vertebrobasilar artery stroke associated with chiropractic care compared to primary care."

It has been suggested that uncomplicated "Mechanical Neck Pain" might be the safest situation in which SMT and

1. Private Practice, Blyth CA
President, International Chiropractors Association
2. President Chiropractic Biophysics Nonprofit
3. Private Practice, Elko NV
4. Private Practice, Boise ID
5. Private Practice, New Port Richey FL
6. President, Life Chiropractic College West

Mobilization techniques can be applied to the cervical spine. Mechanical Neck Pain has been defined as nonspecific pain in the cervicothoracic region that is exacerbated by neck movement.⁸

Since 1978, there have been numerous published clinical controlled trials utilizing spinal SMT and Mobilization for the treatment of headaches, neck pain and upper back pain.⁹⁻⁶² Despite numerous claims concerning resolution of the symptoms of headache, neck pain and upper back pain utilizing SMT or Mobilization as the treatment, during randomized clinical trials (RCTs) there have been no published data on the percentage of improvement in these clinical trials.

Even though there are no reports of percentage of improvements in headaches, neck pain and upper back pain RCTs, there are several reports which claim that these conditions should resolve in 6 to 12 chiropractic spinal manipulation treatments.⁶³⁻⁷⁰

Since cervical spine SMT and Mobilization have been used in the treatment of headaches, neck pain, cervicobrachial pain, and upper back pain and there are claims that these conditions should resolve in 6 to 12 applications or visits, it was hypothesized that pain data from RCTs with cervical spine SMT or Mobilization treatment would show resolution of these conditions within 6 to 12 visits. To determine if our hypothesis was true, we searched for and analyzed pain data in RCTs on these conditions.

Methods

During November and December 2007, searches were performed in PubMed, CINAHL, Mantis and the Index of Chiropractic Literature. Key words used were spinal manipulative therapy, spinal manipulation, manipulation, mobilization, chiropractic technique, randomized clinical trials (RCTs), headaches, acute or chronic neck pain, cervicobrachial pain, mechanical neck pain and upper back pain. Only RCTs utilizing the English language were considered.

Of the RCTs, systematic reviews, and meta-analysis located, only those RCTs with the condition of headaches, neck pain, cervicogenic pain, cervicobrachial pain, and/or upper back pain were included. There were 54 RCTs retrieved with headaches, neck pain, cervicogenic pain, cervicobrachial pain, and/or upper back pain,⁹⁻⁶² but 7 of these were follow-up publications on a previous study and thus only 47 RCTs were analyzed. These 47 RCTs were read and the data were entered into a table format (see Table 1 at end of article).

The readers were to determine: (a) lead author and year of publication, (b) duration of headache or pain (*acute* is defined as less than 4 weeks, *sub-acute* is between 4 weeks and 3 months, and *chronic* is 3 months or longer or more than one re-occurrence), (c) number of subjects treated with SMT/mobilization, (d) treatment given (if extra modalities were added to SMT), (e) number of visits, (f) pain scores (Numerical Rating Score = NRS and VAS/10 = Visual Analogue Scale divided by 10) and (g) what professionals provided the treatment.

After completion of a table with items (a)-(g), the data were analyzed by determining the total number of subjects in these 47 RCTs, the average number of visits, the total initial pain score, the total follow-up pain score (*follow-up* was determined to be the first date of follow-up after treatment ended) and the percent improvement.

To determine a reasonable theoretical average number of visits/treatments needed to completely resolve headaches, neck pain and/or upper back pain using the RCT data on the number of visits and improvement in pain scores, a constant linear extrapolation was used:

Equation 1

Estimated Care (EC) = (average visit x 100%)/(% average improvement)

Healthcare providers have an obligation to examine, diagnose and document treatment and clinical response to care, to stabilize and bring suffering subjects to maximum medical improvement (MMI). While equation (1) provides an estimated number of chiropractic visits to arrive at MMI for headaches, neck pain and cervicobrachial pain, it does not include stabilization care at 1 visit per week for 4 weeks, initial examinations and follow-up examinations. All RCTs have an initial examination visit before randomization and have multiple follow-up examinations. If utilizing only the minimum number of follow-up examinations after intensive care program and after 4 weeks of stabilization care, then a reasonable total number of visits for documentation, resolution, and stabilization of headaches, neck pain, and/or upper back pain is found in equation (2).

Equation 2

Total Visits = Estimated Care (EC) + 1 examination visit + stabilization care + 2 follow-up visits.

Results

There were 54 RCTs located on headaches, neck pain, cervico-brachial pain and upper back pain with SMT and/or mobilization as the treatment for at least one group in these RCTs. Seven of these 54 RCTs were follow-ups of previously published RCTs, and thus, there were 47 original RCTs to be analyzed in Table 1. Of these 47 RCTs, there were 6 RCTs that did not report VAS/NRS pain data, leaving 41 RCTs with pain data.

There were 2,069 subjects in the 47 RCTs and there were an average of 7.7 visits provided in the research designs. In the 41 RCTs with VAS/NRS pain data, only a 46.5% improvement (252.39 initial VAS - 135.12 post VAS = 117.27 improvement or 117.27/252.39 = 46.46% improved) was evidenced. Using the linear extrapolation in Equation 1, we yield 17 average visits to resolve the symptoms of headaches, neck pain, cervico-brachial pain or upper back pain:

Estimated Care (EC) = (average visit x 100%)/(% of average improvement)
= (7.7)(100%)/(46.5%)
≈ 17 visits

Using the initial examination visit, 4 once per week stabilization visits, and two follow-up visits substituted into Equation 2, there are found to be 24 visits needed to examine, treat, stabilize, document and follow-up on patients with headaches, neck pain, cervico-brachial pain or upper back pain:

$$\begin{aligned} \text{Total Visits} &= \text{EC} + 1 \text{ examination visit} + \text{stabilization care} + 2 \text{ follow-up visits} \\ &= 17 + 1 + 4 + 2 \\ &= 24 \text{ visits} \end{aligned}$$

If only the RCTs with Chiropractors as the treating doctors are taken from Table 1, a new Table 2 is obtained (see Table 2 at end of article). If equation 2 is then calculated for Table 2, we obtain:

$$\begin{aligned} \text{Total Visits} &= (8.85 \times 100\%)/(44.5\%) + 1 + 4 + 2 \text{ follow-up visits.} \\ &= 20 + 1 + 4 + 2 \\ &= 27 \text{ visits} \end{aligned}$$

Discussion

We located and analyzed 54 RCTs, of which 7 were follow-up studies of previously published projects, with SMT and/or mobilization as the treatment for subjects with headaches, neck pain, cervico-brachial pain and/or upper back pain.

We had hypothesized that VAS/NRS pain data from Randomized Clinical Trials (RCTs) with cervical spine SMT and/or Mobilization treatment would show resolution of these conditions in 6 to 12 visits.

Since the data from 47 RCTs provided a 7.7 visit average in their research designs with an average improvement of only 46.5% in VAS/NRS pain data, we must reject our hypothesis of resolution of these symptoms in 6 to 12 visits of SMT and/or mobilization.

In fact, utilizing a linear extrapolation of visits (Equation 1), and necessary examinations, stabilization and follow-up visits (Equation 2), there was a need for 24 visits on average to examine, document, resolve and stabilize headaches, neck pain, cervico-brachial pain or upper back pain in 2,069 patients receiving cervical spine SMT or mobilization treatment.

Limitations

We do not believe that any element of Equation 2 is a limitation, because health care providers have an obligation to (a) examine each individual patient, (b) provide a working diagnosis, (c) provide care until the patient reaches MMI, (d) document treatment, care and the patient's response, (e) provide stabilization care to insure that the patient remains at MMI for at least one month and (f) provide at least two follow-up visits.

Problematically, some might believe that not providing additional care after 7.7 visits for those individuals who are only 46.5% improved is justified when compared to the increased cost of giving 24 Chiropractic visits (16 additional visits).

However, with 49 entries for NRS/VAS pain scores in Table 1, the average incoming pain was NRS = 5.2 and the average post-treatment pain score was NRS = 2.8, nearly 3.0. The definition of NRS = 3.0 is defined as "constant slight pain, starting to interfere with daily living tasks." Thus, these patients have not improved sufficiently enough to be released from care and should be provided further care until MMI is reached.

The goal is to help the individual patient achieve a return to normal, defined as (a) NRS < 1.0, (b) range of motion within normal limits and (c) activities of daily living within the normal range. Therefore, in our estimation pain scores are not considered sufficient to document a patient's response to SMT treatment. It is suggested that range of motion examinations and at least one relevant health questionnaire would be administered at the initial examination and all follow-up examinations. Health questionnaires such as Neck Disability Index, Short Form 36, Oswestry, Roland-Morris, McGill Pain document the level of disability in the patient's activities of daily living.

Nevertheless, it might be thought that a constant linear extrapolation such as Equation 1 might be a limitation. To evaluate this possibility, we created Table 2 by deleting all the RCTs in Table 1, in which the treatment was not provided by Chiropractors. Table 3 was next created by deleting all RCTs in Table 1 for which the treatment was not provided by Physical Therapists. With this data, it was noted that a nearly constant linear extrapolation was obtained: (a) 46.5% improvement with 7.7 average visits in Table 1, 44.5% improvement with 8.85 average visits in Table 2, and 50.8% improvement with 8 average visits in Table 3.

Using the average improvements in NRS pain data in each Table, a ratio of mean percent improvement per visit was calculated: (b) 46.5%/7.7 = 6% improvement per visit in Table 1, 44.5%/8.85 = 5% improvement per visit in Table 2, and 50.8%/8 = 6.4% improvement per visit in Table 3.

It was noted that there is a nearly constant percent improvement in these three Tables. Figure 1 illustrates this nearly constant linear calculation compared to a constant linear extrapolation.

Percent Improvement

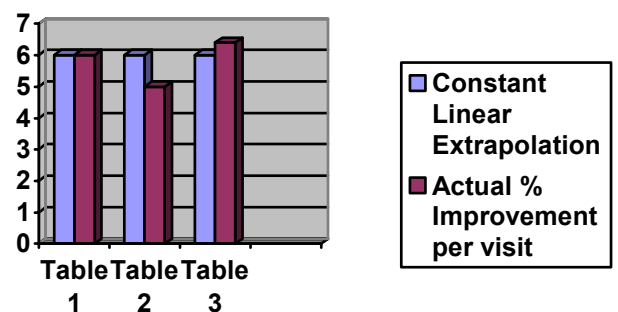


Figure 1-A constant linear extrapolation was used in Equation 1. The actual percent improvement per visit from Tables 1-3 is nearly linear, which would indicate that a constant linear extrapolation is sufficiently accurate.

Derivation of a Frequency and Duration Program

A program of care, frequency and duration, for the average patient, who receives cervical SMT, does not account for the individual. For example, from Table 2, the 27 visits derived from Equation 2 is an average. While there will be patients who have their symptoms remit faster than the average, there will also be those patients who recover more slowly than the average.

Considering the estimated initial care of 20 visits derived from RCTs with SMT provided by chiropractors in Table 2 from Equation 1, these 20 visits of intensive care could be completed in either (a) 4 weeks at 5 visits per week, (b) 5 weeks at 4 visits per week or (c) 7 weeks at 3 visits per week.

Using possibility (c) including the 4 weeks of stabilization care at one visit per week to monitor the patient to insure that regression or exacerbations do not occur, one arrives at a care program of 11 weeks duration with initial examination and two follow up examinations. One follow up examination expected at 7 weeks and one follow up examination performed at 11 weeks.

One might ask two relevant questions:

- 1) What if the patient had complete resolution of symptoms in less than 27 visits?
- 2) What if there were no resolution of pain in 27 visits?

In the former example, if the patient achieved complete resolution of pain in 3 SMT visits, then he or she would be placed on stabilization care for 4 weeks and released from care after follow-up examinations to include 1 examination + 3 SMT visits + 4 stabilization visits in 4 weeks + 2 follow-up examinations = 10 visits.

In the latter, if either the patient were not yet normal, the patient would be provided an extra session of three visits per week for 4 additional weeks yielding 21 visits + 12 visits = 33 treatment visits. To determine MMI the follow-up data for pain, range of motion, and activities of daily living would again be collected. If no improvement is documented then MMI has been reached and stabilization care would be provided for 4 weeks with one more follow-up examination, thus yielding a total of 33 + 4 + 1 = 38 visits. If improvement were noted in pain, range of motion, and activities of daily living, but if one or more of these tests for normalcy has not reached MMI, then another block of 3 visits per week for 4 weeks could be provided.

The pain scores, ranges of motion and health questionnaires are repeated after each additional block of 4 weeks of intensive care at 3 visits per week. When the pain scores indicate normalcy (NRS < 1.0), ranges of motion normalized, the SF36 questionnaire normalized or the patient reached MMI as determined by no improvement after 2 extra blocks of 4 weeks of intensive care, the patient then enters the 4 weeks of stabilization care at 1 visit per week for the next 4 weeks.

Therefore, using Table 2 data depending solely on the patient's objective improvements, the frequency and duration of care could be: (a) 27 visits in 11 weeks, (b) 38 visits in 15 weeks, or (c) 50 visits in 19 weeks.

Conclusion

Pain data from RCTs did not support a limit of 6 to 12 SMT and/or mobilization visits for patients with headaches, neck pain, cervicobrachial pain or upper back pain. In fact in an average of 7.7 visits from 54 RCTs, only a 46.5% improvement in pain scores was noted. Using a conservative linear extrapolation equation, the number of visits estimated to resolve, stabilize and document the treatment for patients with headaches, neck pain, cervicobrachial pain or upper back pain from these 54 RCTs was 24-27 visits, depending on the individual's response to care.

A program of frequency and duration of SMT treatment was suggested based on an individual patient's response to care.

References

1. Wright A, Mayer T, Gatchel R. Outcomes of disabling cervical spine disorders in compensation injuries. A prospective comparison to tertiary rehabilitation response for chronic lumbar spinal disorders. *Spine* 1999;24(2):178-183.
2. Nygren A, Bergland A, von Koch M. Neck-and-shoulder pain, an increasing problem. Strategies for using insurance material to follow trends. *Scand J Rehabil Med* 1995;32:107-112.
3. Cote P, Cassidy J, Carroll L. The Saskatchewan health and back Pain Survey: the prevalence of neck pain and related disability in Saskatchewan. *Spine* 1998;23(15):689-698.
4. Cote P, Cassidy J, Carroll L. The factors associated with neck pain and its related disability in the Saskatchewan population.. *Spine* 2000;25(9):1109-1117.
5. American Physical Therapy Association (APTA). Guide to physical therapist practice. 2nd Edition, Alexandria, VA: APTA, 2001.
6. Hurwitz E, Aker P, Adams A, Meeker W, Shekelle P. Manipulation and mobilization of the cervical spine. A systematic review of the literature. *Spine* 1996;21(15):1746-1759.
7. Cassidy J, Bayle E, Côté P, He Y, Hogg-Johnson S, Silver F, et al. Risk of vertebralbasilar stroke and chiropractic care: Results of a population-based case-control and case-crossover study. *Spine* 2008; 33(4S):S176-S183.
8. Childs J, Lopes A, Yong-Hing K. Physical therapy of the cervical spine and temporomandibular joint. Lacrosse, WI: Orthopedic Section, American Physical Therapy Association, 2003.
9. Allison G, Nagy B, Hall T. A randomized clinical trial of manual therapy for cervico-brachial pain syndrome: A pilot study. *Manual Ther* 2002;7:95-102.
10. Bolin P, Kassak K, Bronfort G, Nelson C, Anderson A. Spinal manipulation vs. amitriptyline for the treatment of chronic tension-type headaches: a randomized clinical trial. *J Manipulative Physiol Ther.* 1995;18:148-154.
11. Bove G, Nilsson N. Spinal manipulation in the treatment of episodic tension-type headache: a randomized controlled trial. *JAMA.* 1998;280:1576-1579.
12. Brodin H. Cervical pain and mobilization. *Manuelle Medizin.* 1982;20:90-4.

13. Bronfort G, Evans R, Nelson B, Aker P, Goldsmith C, Vernon H. A randomized clinical trial of exercise and spinal manipulation for patients with chronic neck pain. *Spine* 2001;26:788-99.
14. Cassidy J, Lopes A, Yong-Hing K. The immediate effect of manipulation versus mobilization on pain and range of motion in the cervical spine: a randomized controlled trial. *J Manipulative Physiol Ther* 1992;15:570-5.
15. Cleland J, Childs J, McRae M, Palmer J, Stowell T. Immediate effects of thoracic manipulation in patients with neck pain: a randomized clinical trial. *Man Ther* 2005 May;10(2):127-35.
16. Cleland J, Glynn P, Whitman J, Eberhart S, MacDonald C, Childs J. Short-term effects of thrust versus nonthrust mobilization/manipulation directed at the thoracic spine in patients with neck pain: a randomized clinical trial. *Phys Ther*. 2007 Apr;87(4):431-40. Epub 2007 Mar 6
17. Coppieters M, Stappaerts K. The immediate effects of manual therapy in patients with cervicobrachial pain on neural origin: A pilot study. In: Singer KP, eds. *IFOMT 2000: International Federation of Orthopaedic Manipulative Therapists in conjunction with the 11th biennial conference of the manipulative physiotherapists association of Australia*. Perth: The University of Western Australia; 2000: Poster 7.
18. Coppieters M, Stappaerts K, Wouters L, et al. Aberrant protective force generation during neural provocation testing and the effect of treatment in patients with neurogenic cervicogenic pain. *J Manipulative Physiol Ther* 2003; 26:99-106.
19. Coppieters M, Stappaerts K, Wouters L, et al. Immediate effect of a cervical lateral glide treatment technique in patients with neurogenic cervicobrachial pain. *JOSPT* 2003;33:369-378.
20. Donkin R, Parkin-Smith G, Gomes A. Possible effect of chiropractic manipulation and combined manual traction and manipulation on tension-type headache: a pilot study. *J Neuromusculoskeletal Syst*. 2002;10:89-97.
21. Evans R, Bronfort G, Nelson B, Goldsmith C. Two-year follow-up of a randomized clinical trial of spinal manipulation and two types of exercise for patients with chronic neck pain. *Spine* 2002;27(21):2383-9
22. Giles L, Muller R. Chronic spinal pain syndromes : a clinical pilot trial comparing acupuncture, a nonsteroidal anti-inflammatory drug, and spinal manipulation. *J Manipulative Physiol Ther* 1999;22:376-81.
23. Giles L, Muller R. Chronic spinal pain: a randomized clinical trial comparing medication, acupuncture, and spinal manipulation. *Spine* 2003;28(14):1490-502; discussion 1502-3.
24. Haas M, Haas M, Group E, Aickin M, Fairweather A, Ganger B, et al. Dose response for chiropractic care of chronic cervicogenic headache and associated neck pain: a randomized pilot study. *J Manipulative Physiol Ther* 2004;27:547-55
25. Hemmila H. Bone setting for prolonged neck pain: a randomized clinical trial. *J Manipulative Physiol Ther* 2005;28(7):508-15.
26. Hoving J, Koes B, de Vet H, van der Windt D, Assendelft W, van Mameren H, et al. Manual therapy, physical therapy, or continued care by a general practitioner for patients with neck pain. A randomized, controlled trial. *Ann Intern Med* 2002;21;136(10):713-22.
27. Hoving J, de Vet H, Koes B, Mameren H, Devillé W, van der Windt D, et al. Manual therapy, physical therapy, or continued care by the general practitioner for patients with neck pain: long-term results from a pragmatic randomized clinical trial. *Clin J Pain* 2006;22(4):370-7.
28. Howe D, Newcombe R, Wade M. Manipulation of the cervical spine. A pilot study. *J R Coll Gen Pract* 1983; 33:574-79.
29. Hoyt W, Shaffer F, Bard D, Benesler J, Blankenhorn G, Gray J, et al. Osteopathic manipulation in the treatment of muscle-contraction headache. *J Am Osteopath Assoc*. 1979;78:322-5.
30. Hurwitz E, Morgenstern H, Harber P, Kominski G, Yu F, Adams A. A randomized trial of chiropractic manipulation and mobilization for patients with neck pain: clinical outcomes from the UCLA neck-pain study. *Am J Public Health* 2002; 92:1634-41.
31. Hurwitz E, Morgenstern H, Vassilaki M, Chiang L. Adverse reactions to chiropractic treatment and their effects on satisfaction and clinical outcomes among patients enrolled in the UCLA Neck Pain Study. *J Manipulative Physiol Ther* 2004;27:16-25.
32. Jensen O, Nielsen F, Vosmar L. An open study comparing manual therapy with the use of cold packs in the treatment of post-traumatic headache. *Cephalalgia* 1990;10:241-50.
33. Jordan A, Bendix T, Nielsen H, Hansen F, Høst D, Winkel A. Intensive training, physiotherapy, or manipulation for patients with chronic neck pain. A prospective, single-blinded, randomized clinical trial. *Spine* 1998;23:311-8; discussion 319.
34. Jull G, Trott P, Potter H, et al. A randomized controlled trial of exercise and manipulative therapy for cervicogenic headache. *Spine* 2002;27:1835-1843; discussion 1843.
35. Karlberg M, Magnusson M, Eva-Maj M, et al. Postural and symptomatic improvement after physiotherapy in patients with dizziness of suspected cervical origin. *Arch Phys Med Rehabil* 1996;77:874-882.
36. Koes B, Bouter L, van Mameren H, Essers AH, Verstegen GM, Hofhuizen DM, et al. The effectiveness of manual therapy, physiotherapy, and treatment by the general practitioner for nonspecific back and neck complaints. A randomized clinical trial. *Spine* 1992;17:28-35.
37. Koes B, Bouter L, van Mameren H, Essers A, Verstegen G, Hofhuizen D, et al. A randomized clinical trial of manual therapy and physiotherapy for persistent back and neck complaints: subgroup analysis and relationship between outcome measures. *J Manipulative Physiol Ther* 1993;16:211-9.
38. McKinney L. Early mobilisation and outcome in acute sprains of the neck. *BMJ*. 1989;299:1006-8.
39. McReynolds T, Sheridan B. Intramuscular ketorolac versus osteopathic manipulative treatment in the management of acute neck pain in the emergency department: a randomized clinical trial. *J Am Osteopath Assoc* 2005 February;105(2):57-68.
40. Mealy K, Brennan H, Fenelon G. Early mobilization of acute whiplash injuries. *Br Med J (Clin Res Ed)*. 1986;292:656-7.

41. Nelson C, Bronfort G, Evans R, Boline P, Goldsmith C, Anderson A. The efficacy of spinal manipulation, amitriptyline and the combination of both therapies for the prophylaxis of migraine headache. *J Manipulative Physiol Ther* 1998;21:511-9.
42. Nilsson N. A randomized controlled trial of the effect of spinal manipulation in the treatment of cervicogenic headache. *J Manipulative Physiol Ther* 1995;18:435-440.
43. Nilsson N, Christensen H, Hartvigsen J. Lasting changes in passive range of motion after spinal manipulation: A randomized, blind, control trial. *J Manipulative Physiol Ther* 1996;19:165-168.
44. Nilsson N, Christensen H, Hartvigsen J. The effect of spinal manipulation in the treatment of cervicogenic headache. *J Manipulative Physiol Ther* 1997;20:326-330.
45. Nordemar R, Thorner C. Treatment of acute cervical pain: a comparative group study. *Pain* 1981;10:93-101.
46. Palmgren P, Sandström P, Lundqvist F, Heikkilä H. Improvement after chiropractic care in cervicocephalic kinesthetic sensibility and subjective pain intensity in patients with nontraumatic chronic neck pain. *J Manipulative Physiol Ther*. 2006 Feb;29(2):100-6
47. Parkin-Smith G, Penter C. A clinical trial investigating the possible effect of two manipulative approaches in the treatment of mechanical neck pain: a pilot study. *J Neuromusculoskel System* 1998;6:6-10.
48. Parker G, Tupling H, Pryor D. A controlled trial of cervical manipulation of migraine. *Aust N Z J Med*. 1978;8:589-93.
49. Savolainen A, Ahlberg J, Nummala H, Nissinen M. Active or passive treatment for neck-shoulder pain in occupational health care? A randomized controlled trial. *Occup Med (Lond)* 2004;54(6):422-4.
50. Skargren E, Oberg B, Carlsson P, Gade M. Cost and effectiveness analysis of chiropractic and physiotherapy treatment for low back and neck pain. Six-month follow-up. *Spine* 1997;22:2167-77.
51. Skargren E, Carlsson P, Oberg B. One-year follow-up comparison of the cost and effectiveness of chiropractic and physiotherapy as primary management for back pain. Subgroup analysis, recurrence, and additional health care utilization. *Spine* 1998;23: 1875-83; discussion 1884.
52. Skillgate E, Vingård E, Alfredsson L. Naprapathic manual therapy or evidence-based care for back and neck pain: a randomized, controlled trial. *Clin J Pain*. 2007 Jun;23(5):431-9
53. Sloop P, Smith D, Goldenberg E, Dore C. Manipulation for chronic neck pain. A double-blind controlled study. *Spine* 1982;7:532-5.
54. Tuchin P, Pollard H, Bonello R. A randomized controlled trial of chiropractic spinal manipulative therapy for migraine. *J Manipulative Physiol Ther* 2000;23:91-95.
55. van Schalkwyk R, Parkin-Smith G. A clinical trial investigating the possible effect of the supine cervical rotary manipulation and the supine lateral break manipulation in the treatment of mechanical neck pain: a pilot study. *J Manipulative Physiol Ther* 2000; 23:24-31.
56. Vernon H, Aker P, Burns S, Viljakaanen S, Short L. Pressure pain threshold evaluation of the effect of spinal manipulation in the treatment of chronic neck pain: a pilot study. *J Manipulative Physiol Ther* 1990;13:13-6.
57. Whittingham W, Nilsson N. Active range of motion in the cervical spine increases after spinal manipulation (toggle recoil). *J Manipulative Physiol Ther* 2001;24(9):552-5.
58. Williams N, Wilkinson C, Russell I, Edwards R, Hibbs R, Linck P, et al. Randomized osteopathic manipulation study (ROMANS): Pragmatic trial for spinal pain in primary care. *Family Practice* 2003;20(6):662-669.
59. Wood T, Colloca C, Matthews R. A pilot randomized clinical trial on the relative effects of instrument (MFMA) versus manual (HVLA) manipulation in the treatment of cervical spine dysfunction. *J Manipulative Physiol Ther* 2001; 24:260-271.
60. Ylinen J, Kautiainen H, Wirén K, Häkkinen A. Stretching exercises vs manual therapy in treatment of chronic neck pain: a randomized, controlled cross-over trial. *J Rehabil Med* 2007 Mar;39(2):126-32.
61. Yurkiw D, Mior S. Comparison of two chiropractic techniques on pain and lateral flexion in neck pain patients: a pilot study. *Chiropractic Techniques* 1996; 8(4):155-162.
62. Zaproudina N, Hanninen O, Airaksinen O. Effectiveness of traditional bone setting in chronic neck pain: randomized clinical trial. *J Manipulative Physiol Ther* 2007;30(6):432-437.
63. Financial Services Commission of Ontario. Pre-approved framework guideline for whiplash associated disorder grade 1 injuries with or without complaint of back symptoms. Superintendent's Guideline No. 01/03, July 2003: 9-10
64. Haldeman S. The Bone and Joint Decade Task Force and its Recommendations Redefining State-of-the-Art Management of Cervical Spine Syndromes. Proceedings of the 9th Biennial Congress of the World Federation of Chiropractic Annual Research Conference, Vilamoura, Portugal, May 13-19, 2007.
65. Lewkovich G, Haneline M, Mumbauer E, Sackett M. The ACOEM Occupational Medicine Practice Guidelines: Biased Against Chiropractic Care. *Dynamic Chiropractic* 2005, Volume 23, Issue 01. (<http://www.chiroweb.com/archives/23/01/14.html>).
66. Work Loss Data Institute (WLDI). Official Disability Guidelines. ODG –TWC: *ODG Integrated Treatment/Disability Duration Guidelines*, Occupational Disorders of the Neck and Upper Back. Encinitas, CA.
67. Haas M, Spegman A, Peterson D, Aickin M, Ganger B. Does-response of spinal manipulation for cervicogenic headache: short-term outcomes from randomized trial. Proceedings of the 9th Biennial Congress of the World Federation of Chiropractic Annual Research Conference, Vilamoura, Portugal, May 13-19, 2007.
68. Glass L. Occupational Medicine Practice Guidelines: Evaluation and Management of Common Health Problems and Functional Recovery of Workers, 2nd Edition. Beverly Farms: OEM Press, 2004, Chapter 12. (see also www.acoem.org)
69. Milliman Care Guidelines. Chiropractic manipulation. In *Ambulatory Care*, 8th Edition. Milliman, Inc., Nov. 1, 2002.
70. Council on Chiropractic Guidelines and Practice Parameters (CCGPP). <http://www.ccgpp.org/index.htm>, accessed November 2007.

Table 1

Analysis of SMT RCTs for Neck Pain (NP), Upper Back Pain (UBP), and Headaches (HA)

Neck Pain , Upper Back Pain, & Headaches RCTs	Type HA, NP, UBP	# Treated patients	# visits	Pain: NRS VAS/10 Pre/pos t	Treatment by DC, MD, DO, PT?	SMT or Other
Allison et al, 2002 ⁹	Cervico- brachial	10,10	12	4.8/2.7	PT	Mobilisation
Boline et al, 1995 ¹⁰	Tension HA	70	12	2.8/2.15 ratio	DC	SMT/heat/ massage
Bove, Nilsson, 1998 ¹¹	Tension HA	36	8	3.7/3.8	DC	SMT/soft tissue
Brodin, 1982 ¹²	Chronic NP	23	9	NR	PT	Mobilis/advice
Bronfort et al, 2001 ¹³	Chronic NP	64	24	5.7 / 3.7	DC	SMT
Cassidy et al, 1992 ¹⁴	Mechanic al NP	52,48	1	3.4/2.1	DC	SMT/Mobilisa
Cleland et al, 2005 ¹⁵	Mechanic al NP	19	3.7	4.16/2.56	PT	SMT/Mobiliza
Cleland et al, 2007 ¹⁶	Mechanic al NP	30	1	5.3/2.7	PT	SMT/exercise
Coppieters, 2003 ¹⁷⁻¹⁹	Cervico- brachial	10	1	7.3/5.8	PT	Lateral Glide MOB
Donkin et al, 2002 ²⁰	Tension HA	15,15	9	4.03/1.47 & 4.5/2.39	DC	SMT vrs SMT/Traction
Evans et al, 2002 ²¹	Chronic NP	50, 51	20	5.6/2.9 5.6/2.4	DC	SMT vrs SMT& exercise
Giles & Muller, 1999 ²²	Chronic Spinal pain	23 NP Table 3C	6	4.5 / 1.5	DC	SMT
Giles & Muller, 2003 ²³	Chronic pain	25 NP+LB P	18	NP : 6.0/3.0	DC	SMT
Haas et al, 2004 ²⁴	HA, Neck Pain	7, 8, 8	3, 9, 12	HA :5.14/4. 05 NP: 6.6/4.19 HA: 6.12/3.13 NP: 5.87/2.96 HA: 4.5/1.87 NP: 4.96/2.25	DC	SMT
Hemmilia et al, 2005 ²⁵	HA,NP,U BP	22	5	5.06/1.85	Bone Setter	SMT
Hoving et al, 2002 ^{26,27}	Neck Pain	60	6	5.9/3.5	PT	Mobilisation
Howe et al, 1983 ²⁸	HA,NP, radicular	26	1-3	NR	MD	SMT

Hoyt et al, 1979 ²⁹	Tension HA	10	1	5.4/2.9 ratio	DO	Osteopath SMT
Hurwitz et al, 2002 ^{30,31}	Neck Pain	171	1	4.8 / 2.6	DC	SMT/advice/ exercise
Jensen et al, 1990 ³²	Post-traumatic HA	10	2	2.1/1.6	MD	SMT
Jordan et al, 1998 ³³	Chronic NP	33	12	4.3 / 2.0	DC	SMT/drugs
Jull et al, 2002 ³⁴	Cervicogenic HA	49,51, 51	8-12	5.1/1.8	PT	SMT/Maitland/ Exercise/drugs
Karlberg et al, 1996 ³⁵	NP & Dizziness	17	13	5.6/3.3	PT	Mobilization/exercise/s oft tissue
Koes et al, 1993 ^{36,37}	NP & LBP	20 NP	5.4	7.0/3.0	Manual Ther	SMT/Mobiliza
McKinney, 1989 ³⁸	Acute NP	71	10	5.3/NR	PT	Mobilization/traction/di athermy
McReynolds, 2005 ³⁹	Acute NP	29	1	6.1/3.3	DO	Osteopath SMT
Mealy et al, 1986 ⁴⁰	Acute NP	31	16	5.7/1.7	PT	Mobilization/ exercises
Nelson et al, 1998 ⁴¹	Migraine	56,50	14	4.7/4.2	DC	SMT/massage/ Amitriptyline
Nilsson, 1995 ⁴²	Chronic HA	20	6	4.7/2.7	DC	SMT/Diversif
Nilsson, 1996-97 ^{43,44}	HA	28	6	4.4/2.8	DC	Toggle/Divers
Nordemar 1981 ⁴⁵	Acute NP	10	6	9.7/1.8	PT	Mobilization/analgesics /softcollar
Palmgren et al, 2006 ⁴⁶	Chronic NP	18	3-5	5.12/2.22	DC	SMT/advice/ exercise
Parkin-Smith, 1998 ⁴⁷	Mechanical NP	13, 17	6	3.39/1.72 3.3/1.32	DC	SMT: NK vrs NK & THOR
Parker et al, 1978 ⁴⁸	Migraine HA	30	7.5	4.9/2.8	DC	SMT
Savolainen, 2004 ⁴⁹	NP, UBP	24	4	4.4/3.6	MD	Thoracic SMT
Skargren, 1997-98 ^{50,51}	NP & LBP	41 NP, 138 LBP	7	5.6 / 2.0 Combined	DC	SMT
Skillgate et al, 2007 ⁵²	NP & LBP	131N P + 75LB P	6	5.5/3.2 combined	Naprapa th	SMT/Mobiliz/ stretching
Sloop et al, 1982 ⁵³	Chronic NP	21	1	Improved 1.8	MD	SMT

Tuchin et al, 2000 ⁵⁴	Migraine HA	83	16	7.96/6.9	DC	SMT
van Schalkwyk 2000 ⁵⁵	Mechanical NP	15, 15	10	3.58/1.35	DC	Diversified
Vernon et al, 1990 ⁵⁶	Chronic NP	5	1	NR	DC	Diversified
Whittingham et al, 2001 ⁵⁷	Cervicogenic HA	49 55	9 9	NR	DC	Toggle = SMT
Williams et al, 2003 ⁵⁸	Neck pain, LBP, Upper back pain	23 NP	3-4	4.21/2.82	DO	Osteopath SMT
Wood et al, 2001 ⁵⁹	Neck Pain	15, 15	8	5.25/2.35 4.8/1.87	DC	AM vrs SMT
Ylinen et al, 2007 ⁶⁰	Chronic NP	61	8	5.0/2.4	Massage Therapist	Mobil/massage/stretching
Yurkiw et al, 1996 ⁶¹	Subacute NP	14	1	3.29/2.11	DC	Activator v SMT
Zaproudina, 2007 ⁶²	Chronic NP	35	5	4.95/1.79	Bone Setter	SMT
Totals (# Patients, Mean Pre- & Post Pain & Mean Visits)		2,069	314.1/41 = 7.7 mean	252.39/135.12 is 46.5% improved in 49 entries	DCs: 24 RCTs PTs: 11 RCTs	

NR = Not Reported.

Table 2
24 RCTs from Table 1 with Chiropractors (DC) providing the Treatment

Neck Pain , Upper Back pain, & Headaches RCTs	Type HA, NP, UBP	# Treated patients	# visits	Pain: NRS VAS/10 Pre/post	Treatment by DC, MD, DO, PT?	SMT or Other
Boline et al, 1995	Tension HA	70	12	2.8/2.15 ratio	DC	SMT/heat/ massage
Bove, Nilsson, 1998	Tension HA	36	8	3.7/3.8	DC	SMT/soft tissue
Bronfort et al, 2001	Chronic NP	64	24	5.7 / 3.7	DC	SMT
Cassidy et al, 1992	Mechanic al NP	52,48	1	3.4/2.1	DC	SMT/Mobilisa
Donkin et al, 2002	Tension HA	15,15	9	4.03/1.47 & 4.5/2.39	DC	SMT vrs SMT/Traction
Evans et al, 2002	Chronic NP	50, 51	20	5.6/2.9 5.6/2.4	DC	SMT vrs SMT& exercise
Giles & Muller, 1999	Chronic Spinal pain	23 NP Table 3C	6	4.5 / 1.5	DC	SMT
Giles & Muller, 2003	Chronic pain	25 NP+LB P	18	NP : 6.0/3.0	DC	SMT
Haas et al, 2004	HA, Neck Pain	7, 8, 8	3, 9, 12	HA :5.14/4.05 NP: 6.6/4.19 HA: 6.12/3.13 NP: 5.87/2.96 HA: 4.5/1.87 NP: 4.96/2.25	DC	SMT
Hurwitz et al, 2002	Neck Pain	171	1	4.8 / 2.6	DC	SMT/advice/ exercise
Jordan et al, 1998	Chronic NP	33	12	4.3 / 2.0	DC	SMT/drugs
Nelson et al, 1998	Migraine	56,50	14	4.7/4.2	DC	SMT/massage/ Amitriptyline
Nilsson, 1995	Chronic HA	20	6	4.7/2.7	DC	SMT/Diversif
Nilsson, 1996- 97	HA	28	6	4.4/2.8	DC	Toggle/Divers
Palmgren et al, 2006	Chronic NP	18	3-5	5.12/2.22	DC	SMT/advice/ exercise

Parkin-Smith, 1998	Mechanical NP	13, 17	6	3.39/1.72 3.3/1.32	DC	SMT: NK vrs NK & THOR
Parker et al, 1978	Migraine HA	30	7.5	4.9/2.8	DC	SMT
Skargren, 1997-98	NP & LBP	41 NP, 138 LBP	7	5.6 / 2.0 Combined	DC	SMT
Tuchin et al, 2000	Migraine HA	83	16	7.96/6.9	DC	SMT
van Schalkwyk 2000	Mechanical NP	15,15	10	3.58/1.35	DC	Diversified
Vernon et al, 1990	Chronic NP	5	1	NR	DC	Diversified
Whittingham et al, 2001	Cervicogenic HA	49 55	9 9	NR	DC	Toggle = SMT
Wood et al, 2001	Neck Pain	15, 15	8	5.25/2.35 4.8/1.87	DC	AM vrs SMT
Yurkiw et al, 1996	Subacute NP	14	1	3.29/2.11	DC	Activator v SMT
Totals (# Patients, Mean Pre- & Post Pain & Mean Visits)		1,215	212.5 /24 = 8.85 mean	149.11/82.8 Mean= 44.5% improved	24 RCTs by DCs	

Table 3
RCTs from Table 1 that had Physical Therapists (PT) Providing the Treatment

Neck Pain , Upper Back pain, & Headaches RCTs	Type HA, NP, UBP	# Treat ed patie nts	# visits	Pain: NRS VAS/10 Pre/post	Treatm ent by DC, MD, DO, PT?	SMT or Other
Allison et al, 2002 ⁹	Cervico- brachial	10,10	12	4.8/2.7	PT	Mobilisation
Brodin, 1982 ¹²	Chronic NP	23	9	NR	PT	Mobilis/advice
Cleland et al, 2005 ¹⁵	Mechanical NP	19	3.7	4.16/2.56	PT	SMT/Mobiliza
Cleland et al, 2007 ¹⁶	Mechanical NP	30	1	5.3/2.7	PT	SMT/exercise
Coppieters, 2003 ¹⁷⁻¹⁹	Cervico- brachial	10	1	7.3/5.8	PT	Lateral Glide MOB
Hoving et al, 2002 ^{26,27}	Neck Pain	60	6	5.9/3.5	PT	Mobilisation
Jull et al, 2002 ³⁴	Cervico- genic HA	49,51, 51	8-12	5.1/1.8	PT	SMT/Maitland/ Exercise/drugs
Karlberg et al, 1996 ³⁵	NP & Dizziness	17	13	5.6/3.3	PT	Mobilization/exercise/s oft tissue
McKinney, 1989 ³⁸	Acute NP	71	10	5.3/NR	PT	Mobilization/traction/di athermy
Mealy et al, 1986 ⁴⁰	Acute NP	31	16	5.7/1.7	PT	Mobilization/ exercises
Nordemar 1981 ⁴⁵	Acute NP	10	6	9.7/1.8	PT	Mobilization/analgesics /softcollar
Totals (# Patients, Mean Pre- & Post Pain & Mean Visits)		442	87.7/ 11 = 8	53.56/25.86 is 50.8% improved in 9 entries	PTs: 11 RCTs	