ORIGINAL RESEARCH

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

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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

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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:

Total Visits = EC + 1 examination visit + stabilization care + 2 follow-up visits

= 17 + 1+ 4 + 2

= *24 visits*

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:

Total Visits = (8.85 x 100%)/(44.5%) + 1 + 4 + 2 follow-up visits.

= 20 + 1+ 4 + 2

= *27 visits*

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.

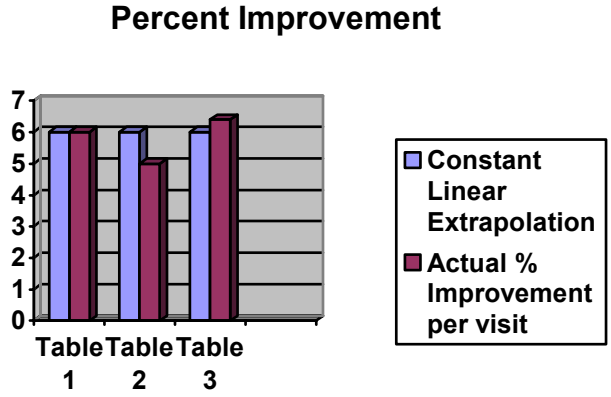

Figure 1-A constant linear extrapolation was used in Equation 1. The actual percent improvement per visit from Tables 1-3 is nearly linear, which would indicate that a constant linear extrapolation is sufficiently accurate.

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.

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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/post	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]	Mechanical NP	52,48	1	3.4/2.1	DC	SMT/Mobilisa
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
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+LBP	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,UBP	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]	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/soft 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/diathermy
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	131NP + 75LBP	6	5.5/3.2 combined	Naprapath	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 Therpist	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+LBP	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	