

## EVIDENCE-BASED GUIDELINES FOR THE CHIROPRACTIC TREATMENT OF ADULTS WITH HEADACHE

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### ABSTRACT

**Objective:** The purpose of this manuscript is to provide evidence-informed practice recommendations for the chiropractic treatment of headache in adults.

**Methods:** Systematic literature searches of controlled clinical trials published through August 2009 relevant to chiropractic practice were conducted using the databases MEDLINE; EMBASE; Allied and Complementary Medicine; the Cumulative Index to Nursing and Allied Health Literature; Manual, Alternative, and Natural Therapy Index System; Alt HealthWatch; Index to Chiropractic Literature; and the Cochrane Library. The number, quality, and consistency of findings were considered to assign an overall strength of evidence (strong, moderate, limited, or conflicting) and to formulate practice recommendations.

**Results:** Twenty-one articles met inclusion criteria and were used to develop recommendations. Evidence did not exceed a moderate level. For migraine, spinal manipulation and multimodal multidisciplinary interventions including massage are recommended for management of patients with episodic or chronic migraine. For tension-type headache, spinal manipulation cannot be recommended for the management of episodic tension-type headache. A recommendation cannot be made for or against the use of spinal manipulation for patients with chronic tension-type headache. Low-load craniocervical mobilization may be beneficial for longer term management of patients with episodic or chronic tension-type headaches. For cervicogenic headache, spinal manipulation is recommended. Joint mobilization or deep neck flexor exercises may improve symptoms. There is no consistently additive benefit of combining joint mobilization and deep neck flexor exercises for patients with cervicogenic headache. Adverse events were not addressed in most clinical trials; and if they were, there were none or they were minor.

**Conclusions:** Evidence suggests that chiropractic care, including spinal manipulation, improves migraine and cervicogenic headaches. The type, frequency, dosage, and duration of treatment(s) should be based on guideline recommendations, clinical experience, and findings. Evidence for the use of spinal manipulation as an isolated intervention for patients with tension-type headache remains equivocal. (*J Manipulative Physiol Ther* 2011;34:274-289)

**Key Indexing Terms:** *Spinal Manipulation; Migraine Disorders; Tension-Type Headache; Post-traumatic Headache; Practice Guideline; Chiropractic*

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**H**eadache is a common experience in adults. Recurring headaches negatively impact family life, social activity, and work capacity.<sup>1,2</sup> Worldwide, according to the World Health Organization, migraine alone is 19th among all causes of years lived with disability. Headache is third among reasons for seeking chiropractic care in North America.<sup>3</sup>

Accurate diagnosis is key to management and treatment, and a wide range of headache types are described in the International Classification of Headache Disorders 2 (International Headache Society [IHS]).<sup>4</sup> The categories are intended for clinical as well as research use. The most common headaches, tension-type and migraine, are considered primary headaches that are episodic or chronic in nature. Episodic migraine or tension-type headaches occur fewer than 15 days per month, whereas chronic headaches occur more than 15 days per month for at least 3 (migraine) or 6 months (tension-type headache).<sup>4</sup> Secondary headaches are attributed to underlying clinical problems in the head or neck that may also be episodic or chronic. Cervicogenic headaches are secondary headaches commonly treated by chiropractors and involve pain referred from a source in the neck and perceived in 1 or more regions of the head. The IHS recognizes cervicogenic headache as a distinct disorder,<sup>4</sup> and evidence that headache can be attributed to a neck disorder or lesion based on history and clinical features (history of neck trauma, mechanical exacerbation of pain, reduced cervical range of motion, and focal neck tenderness, excluding myofascial pain alone) is relevant to diagnosis but is not without controversy in the literature.<sup>4,5</sup> When myofascial pain alone is the cause, the patient should be managed as having tension-type headaches.<sup>4</sup>

Treatment modalities typically used by chiropractors to care for patients with headaches include spinal manipulation, mobilization, device-assisted spinal manipulation, education about modifiable lifestyle factors, physical therapy modalities, heat/ice, massage, advanced soft tissue therapies such as trigger point therapy, and strengthening and stretching exercises. There is a growing expectation for health professions, including chiropractic, to adopt and use research-based knowledge, taking sufficient account of the quality of available research evidence to inform clinical practice. As a result, the purpose of the Canadian Chiropractic Association (CCA) and the Canadian Federation of Chiropractic Regulatory and Educational Accrediting Boards (Federation) Clinical Practice Guidelines Project is to develop guidelines for practice based on available evidence. The purpose of this manuscript is to provide evidence-informed practice recommendations for the chiropractic treatment of headache in adults.

## METHODS

The Guidelines Development Committee (GDC) planned for and adapted systematic processes for literature

searching, screening, review, analysis, and interpretation. Methods are consistent with criteria proposed by the “Appraisal of Guidelines Research and Evaluation” collaboration (<http://www.agreecollaboration.org>). This guideline is a supportive tool for practitioners. It is not intended as a standard of care. The guideline links available published evidence to clinical practice and is only 1 component of an evidence-informed approach to patient care.

## Data Sources and Searches

Systematic search and evaluation of the treatment literature were conducted using methods recommended by The Cochrane Collaboration Back Review Group<sup>6</sup> and Oxman and Guyatt.<sup>7</sup> The search strategy was developed in MEDLINE by exploring MeSH terms related to chiropractic and specific interventions and later modified for other databases. The literature search strategy was intentionally broad. *Chiropractic treatment* was defined as including the most common therapies used by practitioners and was not restricted to treatment modalities delivered only by chiropractors. A wide net was cast to include treatments that may be administered in chiropractic care as well as those that could also be delivered in the context of care by other health care professionals in a specific research study ([Appendix A](#)). *Spinal manipulation* was defined as a high-velocity low-amplitude thrust delivered to the spine. Excluded therapies included invasive analgesic or neurostimulation procedures, pharmacotherapy, injections of botulinum toxin, cognitive or behavioral therapies, and acupuncture.

Literature searches were completed from April to May 2006, updated in 2007 (phase 1), and updated again in August 2009 (phase 2). Databases searched included MEDLINE; EMBASE; Allied and Complementary Medicine; the Cumulative Index to Nursing and Allied Health Literature; Manual, Alternative, and Natural Therapy Index System; Alt HealthWatch; Index to Chiropractic Literature; and the Cochrane Library ([Appendix A](#)). Searches included articles published in English or with English abstracts. The search strategy was limited to adults ( $\geq 18$  years); although research studies with subject inclusion criteria encompassing a broad range of ages, such as adults and adolescents, were retrieved using the search strategy. Reference lists provided in systematic reviews (SRs) were also reviewed by the GDC to minimize relevant articles from being missed.

## Evidence Selection Criteria

Search results were screened electronically, and multi-stage screening was applied ([Appendix B](#)): stage 1A (title), 1B (abstract); stage 2A (full text), 2B (full text-methodology, relevance); and stage 3 (full text-final GDC screening as clinical content experts). Duplicate citations were removed, and relevant articles were retrieved as electronic

**Table 1.** Qualitative ratings of controlled trials of physical treatments for the management of headache disorders

Citation	A	B	C	D	E	F	G	H	I	J	K	Total score	L	M
Boline et al <sup>11</sup>	1	1	1	0	0	0	1	1	0	1	1	7	Yes	Yes
Bove and Nilsson <sup>12</sup>	1	1	1	0	0	1	1	1	1	1	1	9	Yes	Yes
Demiturk et al <sup>31</sup>	0	0	0	0	0	0	1	0	1	1	0	3	Yes	No
Dittrich et al <sup>13</sup>	0	0	0	0	0	0	1	0	1	1	0	3	Yes	No
Donkin et al <sup>14</sup>	1	0	1	0	0	0	0	0	0	1	0	3	Yes	No
Jull et al <sup>15</sup>	1	1	1	0	0	1	1	1	1	1	1	9	Yes	Yes
Lawler and Cameron <sup>16</sup>	1	0	1	0	0	0	1	1	1	1	0	6	Yes	No
Lemstra et al <sup>32</sup>	1	1	1	0	0	1	1	1	1	1	1	9	Yes	Yes
Marcus et al <sup>33</sup>	0	0	1	0	0	0	0	0	1	1	0	3	Yes	No
Nelson et al <sup>17</sup>	1	1	1	0	0	0	0	0	0	1	1	5	Yes	No
Nilsson et al <sup>18</sup>	1	1	1	1	0	1	0	0	1	1	1	8	Yes	No
Narin et al <sup>34</sup>	0	0	0	0	0	0	0	1	1	1	1	4	Yes	No
Soderberg et al <sup>19</sup>	1	0	1	0	0	0	0	1	0	1	1	5	Yes	No
Torelli et al <sup>35</sup>	0	0	0	0	0	0	1	0	1	1	0	3	Yes	No
Tuchin et al <sup>20</sup>	1	1	1	1	1	0	0	0	1	1	0	7	Yes	Yes
van Eetkoven and Lucas <sup>36</sup>	1	0	1	0	0	1	0	0	1	1	1	6	Yes	Yes

Assessment rating scale from van Tulder et al.<sup>6</sup> Yes response scores, 1; no/do not know scores, 0. A. Was the method of randomization adequate? B. Was the treatment allocation concealed? C. Were the study groups similar at baseline regarding important baseline characteristics? D. Was the patient blinded to the intervention? E. Was the care provider (investigator) blinded to the intervention? F. Was the outcome assessor blinded to the intervention? G. Were cointerventions avoided or similar? H. Was the compliance acceptable in all groups? I. Was the drop-out rate described and acceptable? J. Was the timing of the outcome assessment in all groups similar? K. Did the analysis include an intent-to-treat design? GDC's descriptive criteria L. Was subject inclusion criteria based on IHS<sup>4</sup> or Cervicogenic Headache International Study Group<sup>9</sup> diagnostic criteria? M. Were harms or unintended events (eg, side effects) adequately assessed or reported?

and/or hard copies for detailed analysis. Different assessors, using the same criteria, completed the literature screens in 2007 and 2009 due to the time span between searches.

Only controlled clinical trials (CCTs); randomized, controlled trials (RCTs); and systematic reviews (SRs) were selected as the evidence base for this guideline consistent with current standards for interpreting clinical findings. The GDC did not rate observational studies, case series, or case reports because of their uncontrolled nature and probable low methodological quality vs CCTs. This approach is consistent with updated methods for SRs published by the Cochrane Back Review Group.<sup>8</sup> If multiple SRs were published by the same authors on a given topic, only the most recent publication was counted and used for evidence synthesis. Systematic reviews of SRs were also excluded to avoid double counting of research results.

**Literature Assessment and Interpretation**

Quality ratings of CCTs or RCTs included 11 criteria answered by “yes (score 1)” or “no (score 0)/do not know (score 0)” (Table 1). The GDC documented 2 additional criteria of interest: (1) researchers’ use of IHS diagnostic criteria for subject enrollment and (2) evaluation of side effects (Table 1, columns L and M). Use of IHS criteria<sup>4</sup> was relevant to this Clinical Practice Guideline (CPG) process to confirm diagnostic specificity within and across research studies. Studies were excluded if IHS diagnostic criteria were not applied by the researchers for subject inclusion into a study (Appendix C); and if before 2004, before cervicogenic headache was included in the IHS

classification, the diagnostic criteria of the Cervicogenic Headache International Study Group<sup>9</sup> were not used. Side effects were reviewed as a proxy for potential risk(s) with treatment. No weighting factor(s) was applied to individual criteria, and possible quality ratings ranged from 0 to 11. Both blinding of subjects and care providers were rated in the research articles by the GDC, since these items are listed in the quality rating tool.<sup>6</sup> The GDC’s methods did not adapt or alter the rating tool. The rationale for this approach was that certain treatment modalities (eg, transcutaneous electrical nerve stimulation [TENS], ultrasound) and trial designs may achieve patient and/or practitioner blinding.<sup>10</sup> The GDC did not limit the evaluation of these benchmarks of quality if indeed they were reported in clinical studies for the treatment of headache disorders. The GDC also considered it outside their scope of expertise to modify, without validation, a widely used rating tool used to assess the clinical literature.<sup>6</sup> New research tools for the analysis and rating of the manual therapy literature, however, are urgently needed and are noted as an area for future research in the discussion section below.

Literature assessors were project contributors separate from the GDC and were unblinded as to study authors, institutions, and source journals. Three members of the GDC (MD, RR, and LS) corroborated quality rating methods by completing quality assessments on a random subset of 10 articles.<sup>11-20</sup> A high level of agreement was confirmed across quality ratings. Complete agreement on all items was achieved for 5 studies: in 10 of 11 items for 4 studies and 8 of 11 items for the 1 remaining study. All discrepancies were easily resolved through discussion and

**Table 2.** Qualitative ratings of systematic reviews (SRs) of physical treatments for the management of headache disorders

Citation	A	B	C	D	E	F	G	H	I	J	Total score
Astin and Ernst <sup>22</sup>	1	1	1	0	1	0*	0	0	1	Major flaws	5
Biondi <sup>23</sup>	1	0*	0	0	0	0	0	0	0*	Major flaws	1
Bronfort et al <sup>24</sup>	1	1	1	1	1	1	1	1	1	No flaws	9
Fernandez-de-Las-Penas et al <sup>25</sup>	1	1	1	1	1	1	1	1	1	No flaws	9
Fernandez-de-Las-Penas et al <sup>29</sup>	1	1	1	0*	1	1	0*	0*	1	Minor flaws	6
Hurwitz et al <sup>26</sup>	1	1	1	1	1	1	1	1	1	No flaws	9
Lenzinck et al <sup>27</sup>	1	1	1	1	1	1	1	1	1	No flaws	9
Maltby et al <sup>30</sup>	1	1	1	0*	0	0	1	0*	0*	Major flaws	4
Vernon et al <sup>28</sup>	1	1	1	1	1	0	1	0*	0*	Major flaws	6

Studies receiving a quality rating 4 or less and/or rated with major flaws were excluded from the evidence base.

Assessment rating scale from Oxman and Guyatt.<sup>7,21</sup> Yes response scores, 1; no/do not know scores, 0. A. Were the search methods reported? B. Was the search comprehensive? C. Were the inclusion criteria reported? D. Was selection bias avoided? E. Were the validity criteria reported? F. Was validity assessed appropriately? G. Were the methods used to combine studies reported? H. Were the findings combined appropriately? I. Were the conclusions supported by the reported data? J. What was the overall scientific quality of the overview?

The determination of overall quality of SRs with major flaws, minor flaws, or no flaws, as listed in Column J, is based on the literature raters' interpretation and answers to the previous 9 items. The following parameters were used to derive the summary score: if no or do not know response was used 1 or more times, a SR was likely to have minor flaws at best. If "no" option was answered on items B, D, F, or H<sup>21</sup> and/or the rating was less than half of the possible total score (eg, score ≤4), the SR was likely to have major flaws.

\* Denotes do-not-know responses.

consensus by the GDC (Table 1). Due to heterogeneity of research methods across trials, no meta-analysis or statistical pooling of trial results was done. Trials scoring more than half of the total possible rating (ie, ≥6) were considered high quality. Trials scoring 0 through 5 were considered low quality. Studies with major methodological flaws or investigating specialized treatment techniques were excluded (eg, treatment not considered relevant by the GDC for the chiropractic care of patients with headache; Appendix Table 3).

Quality rating of SRs included 9 criteria answered by yes (score 1) or no (score 0)/do not know (score 0) and a qualitative response for item J "no flaws," "minor flaws," or "major flaws" (Table 2). Possible ratings ranged from 0 to 9. The determination of overall scientific quality of SRs with major flaws, minor flaws, or no flaws, as listed in column J (Table 2), was based on the literature raters' answers to the previous 9 items. The following parameters were used to derive the overall scientific quality of a SR: if the no/do not know response was used, an SR was likely to have minor flaws at best. However, if "No" was used on items B, D, F, or H, the review was likely to have major flaws.<sup>21</sup> Systematic reviews scoring more than half of the total possible rating (ie, ≥5) with no or minor flaws were rated as high quality. Systematic reviews scoring 4 or less and/or with major flaws were excluded.

Reviews were defined as systematic if they included an explicit and repeatable method for searching and analyzing the literature and if inclusion and exclusion criteria for studies were described. Methods, inclusion criteria, methods for rating study quality, characteristics of included studies, methods for synthesizing data, and results were evaluated. Raters achieved complete agreement for all rating items for 7 SRs<sup>22-28</sup> and for 7 of 9 items for the 2

**Table 3.** Strength of evidence

Strength of evidence	Grade of recommendation
Consistent findings among ≥2 high-quality controlled trials	Strong
Consistent findings among ≥2 low-quality controlled trials and/or 1 high-quality controlled trial	Moderate
One low-quality controlled trial	Limited
Inconsistent findings among multiple controlled trials	Conflicting

additional SRs.<sup>29,30</sup> The discrepancies were deemed minor and easily resolved through GDC review and consensus (Table 2).

### Developing Recommendations for Practice

The GDC interpreted the evidence relevant to chiropractic treatment of headache patients. A detailed summary of the relevant articles will be posted to the CCA/Federation Clinical Practice Guidelines Project web site.

Randomized, controlled trials and their findings were appraised to inform treatment recommendations. To assign an overall strength of evidence (strong, moderate, limited, conflicting, or no evidence),<sup>6</sup> the GDC considered the number, quality, and consistency of research results (Table 3). Strong evidence was considered only when multiple high-quality RCTs corroborated the findings of other researchers in other settings. Only high-quality SRs were appraised in relation to the body of evidence and to inform treatment recommendations. The GDC considered treatment modalities to have proven benefit(s) when supported by a minimum of moderate level of evidence.

**Table 4.** Literature summary and quality ratings of the evidence for interventions for migraine headache with or without aura

Study	Episodic or chronic	Experimental treatment(s)	Control treatment(s)	Health care provider	Headache and health outcome(s)	Quality rating	GDC understanding of experimental treatment effect(s) on health outcomes
Tuchin <sup>20</sup>	E, C; included subjects aged 10-70 y (average age was approximately 40 y)	Spinal manipulation (n = 83 study completers) 2× per wk for 8 wk	Detuned interferential therapy (n = 40 study completers)	Chiropractor	Frequency (Y) Intensity (not reported) Duration (Y) Disability (Y) Associated symptoms (not reported) Reduction in OTC medicine use (Y)	7	Positive
Nelson et al <sup>17</sup>	E, C	Spinal manipulation; n = 77; 14 treatments as 1-2× per wk for 8 wk	Daily amitriptyline 25-100 mg; 3 study visits; n = 70 HVLA manipulation; (14 treatments as 1-2× per wk for 8 wk) plus daily amitriptyline 25-100 mg; n = 71	Chiropractor	Headache index (comparable decrease across groups) Reduction in OTC medicine use and SF-36 (comparable decrease across groups) Trend reported for HVLA group to maintain effect 1 month posttreatment	5	Positive
Lemstra <sup>32</sup>	E, C	Multimodal (exercise, relaxation, stress and nutritional counseling, massage therapy); n = 44	Standard medical care with family physician (medical specialist referral, referral to treatment, medication, no treatment); n = 36	Multidisciplinary (neurologist, physical therapist, exercise therapist, psychologist, dietician, massage therapist)	Frequency (Y) Intensity (Y) Duration (Y) Disability (Y) Functional status (Y) QoL (Y) Health status (Y) Depression (Y) Reduction in medicine use (Y) Work status (NS)	9	Positive
Narin et al <sup>34</sup>	E, C	Supervised aerobic exercise (1 h 3× weekly) added to usual medical care for 8 wk; n = 20	Treatment as usual/unspecified medication use; n = 20	Physiotherapist	Intensity (Y) QoL (Y) Other outcomes were included in this study with no statistics reported	4	Inconclusive
Marcus et al <sup>33</sup>	Episodic; also some TTH Phase 1 of study was assessed only	Multimodal physical therapy (posture adjustment cROM and whole body stretches and exercises; heat, ice, trigger point); n = 30	Relaxation thermal biofeedback 4 weekly 1-h training sessions, then 2× 30 min daily for either treatment; n = 39	Physiotherapist	Headache index (Y for control group) CES-D (Y for control group) Multidimensional pain inventory (Y for control group)	3	Negative study for physical therapy group
Dittrich et al <sup>13</sup>	Unspecified	Supervised aerobic exercise (45 min 2× weekly) plus 15 min progressive muscle relaxation; n = 15	Received study information about potential effects of physical activity; n = 15	Not reported	Frequency (NS) Intensity (Y) Psychological dimensions (NS)	3	Inconclusive
Lawler and Cameron <sup>16</sup>	Unspecified	Massage; neuromuscular and trigger point framework of the back, shoulders neck, and head; n = 23 study completers	No treatment; information on maintaining a headache diary; n = 21 study completers	Massage therapists in training	Frequency (Y) Intensity (NS) Reduced medicine use (NS) Sleep quality (Y) Stress (NS) Coping (NS)	6	Positive

Positive (beneficial experimental treatment), negative (not beneficial experimental treatment), or inconclusive (imprecise estimates, unclear evidence, or inconsistent results when comparing experimental treatment with control treatment[s]). Y indicates statistically significant finding; NS, nonsignificant difference between experimental and control treatment.  
CES-D, Center for Epidemiological Studies Depression scale; OTC, Over-the-counter; TTH, tension-type headache; QoL, Quality of Life.

**Table 5.** Literature summary and quality ratings of the evidence for interventions for tension-type headache

Study	Episodic or chronic	Experimental treatment(s)	Control treatment(s)	Health care provider	Headache and health outcome(s)	Quality rating	GDC understanding of experimental treatment effect(s) on health outcomes
Boline et al <sup>11</sup>	C	Spinal manipulation, moist heat, massage (2× per wk for 6 wk); n = 70 study completers	Amitriptyline 10-30 mg per day; 2 visits; n = 56 study completers	Chiropractor for spinal manipulation Medical doctor for medication	Outcomes 4 wk after the end of treatment Frequency (Y) Intensity (Y) Reduced medicine use (Y) SF-36 (Y)	7	Inconclusive; this trial is inadequately controlled with imbalances in the number of subject-clinician encounters between study groups. In addition, effect of spinal manipulation is difficult to interpret in isolation due to premanipulative soft tissue therapy.
Bove and Nilsson <sup>12</sup>	E	Spinal manipulation, deep friction massage; n = 38; (2× per wk for 4 wk)	Deep friction massage, low-power laser to upper cervical region; n = 37; (2× per wk for 4 wk)	Chiropractor	Duration (NS) Intensity (NS) Reduced medicine use (NS)	9	Negative; no separation from control group for duration, intensity, medication use. Both groups improved over time.
Donkin et al <sup>14</sup>	E, C	Manual traction + Spinal manipulation (2-3× per wk for 4 wk); n = 15	Spinal manipulation (2-3× per wk for 4 wk); n = 15	Chiropractor	Frequency (Y for control) Intensity (Y for control) Duration (NS) NRS (Y for control) McGill Pain (NS) Neck disability index (NS) cROM (NS)	3	Negative; manual cervical traction added to spinal manipulation offers no benefit for headache outcomes when compared with spinal manipulation alone.
Demirturk et al <sup>31</sup>	C	Connective tissue manipulation added to heat, massage; n = 15 (5× per wk for 4 wk) or Cyriax's mobilization added to heat, massage; n = 15 (3× per wk for 4 wk)	N/A	Physiotherapist	Weeks 4 and 8 Headache index (NS) cROM (NS) Pain thresholds (NS)	3	Inconclusive; study is inadequately controlled; nonspecific effects of treatments confound comparisons and interpretation.
van Eettekoven <sup>36</sup>	E, C	Multimodal, physical therapies (unsupervised low-load cranial-cervical exercises PT frequency unknown for 6 wk plus conventional massage, spinal mobilization based on Maitland, instruction on postural correction); n = 38 study completers	No Thera-band, conventional massage, spinal mobilization based on Maitland, instruction on postural correction (PT frequency unknown for 6 wk); n = 40 study completers	Physiotherapist and self-administered cranial-cervical exercises	Wk 6 Frequency (NS) Intensity (NS) Duration (NS) QoL SF-36 (NS) Reduced medicine use (not reported between groups) MHLC (NS) Month 6 Frequency (Y) Intensity (Y) Duration (Y) QoL SF-36 (Y) Reduced med. use (not reported) MHLC (NS)	6	Positive for low-load resistance exercise and health benefits during the longer term.
Soderberg et al <sup>19</sup>	C	Physical therapy; n = 30 (supervised and unsupervised exercises, 25 sessions for 10 wk)	Relaxation session (1× per wk for 10 wk); n = 30 Acupuncture (1× week for 10-12 wk); n = 30	Physiotherapists	Intensity (NS) Headache-free d/periods (Y; in favor of relaxation group)	5	Inconclusive; study is inadequately controlled; positive results for relaxation only in immediate posttreatment period.
Torelli et al <sup>55</sup>	E, C	Physiotherapy, multimodal; n = 24 (Individual treatment 2× per wk for 4 wk, then exercise 2× per wk for 4 wk in small groups. Subjects received initial massage, basic relaxation techniques (autogenic training and cognitive-behavioral therapy) and smooth stretching, and a daily program to be done at home acting on the shoulder, neck, and pericranial muscles.)	8-wk observation period followed by identical course of physiotherapy; n = 24	Physiotherapists	Headache days (between-group statistics not reported) Severity (NS) Duration (NS) Medicine use (NS)	3	Inconclusive; significantly greater number of responders among female patients and patients with CTTH.

Positive (beneficial experimental treatment), negative (not beneficial experimental treatment), or inconclusive (imprecise estimates, unclear evidence, or inconsistent results when comparing experimental treatment with control treatment[s]). Y indicates statistically significant finding; NS, nonsignificant difference between experimental and control treatment.

MHLC, Multidimensional Health Locus of Control; NRS, Numerical Pain Rating Scale; PT, physiotherapy.

**Table 6.** Literature summary and quality ratings of the evidence for interventions for cervicogenic headache

Study	Episodic or chronic	Experimental treatment(s)	Control treatment(s)	Healthcare provider	Headache and health outcome(s)	Quality rating	GDC understanding of experimental treatment effect(s) on health outcomes
Nilsson <sup>18</sup>	E	Spinal manipulation (6 sessions for 3 wk) and deep friction massage, trigger points, low-level laser; n = 28	Low-level laser, deep friction massage, trigger points (6 sessions for 3 wk); n = 25	Chiropractor	Frequency (not reported) Intensity(Y) Duration (Y) Medicine use (NS)	8	Positive
Jull et al <sup>15</sup>	E, C	Maitland (MT) joint mobilization 8-12 treatments for 6 wk; n = 51	Deep neck flexor exercises (ExT) 2× daily for 6 wk; n = 52 MT + ExT, n = 49 No physical therapy, n = 48	Physiotherapist	Frequency (Y) Intensity (Y) Duration (mixed) Neck Pain (Y) Medicine use (Y) Patient satisfaction (not reported) Physical outcomes (Y/mixed)	9	Positive vs no treatment control for Maitland joint mobilization or deep neck flexor exercises

Positive (beneficial experimental treatment), negative (not beneficial experimental treatment), or inconclusive (imprecise estimates, unclear evidence, or inconsistent results when comparing experimental treatment with control treatment[s]). Y indicates statistically significant finding; NS, nonsignificant difference between experimental and control treatment.

Recommendations for practice were developed in collaborative working group meetings.

## RESULTS

### Literature

From the literature searches, initially 6206 citations were identified. Twenty-one articles met final criteria for inclusion and were considered in developing practice recommendations (16 CCTs/RCTs<sup>11-20,31-36</sup> and 5 SRs<sup>24-27,29</sup>). Quality ratings of the included articles are provided in Tables 1 and 2. Appendix Table 3 lists articles excluded in final screening by the GDC and reason(s) for their exclusion. Absence of subject and practitioner blinding and unsatisfactory descriptions of cointerventions were commonly identified methodological limitations of the controlled trials. Headache types evaluated in these trials included migraine (Table 4), tension-type headache (Table 5), and cervicogenic headache (Table 6). Consequently, only these headache types are represented by the evidence and practice recommendations in this CPG. Evidence summaries of SRs are provided in Table 7.

### Practice Recommendations—Treatment of Migraine

- *Spinal manipulation is recommended for the management of patients with episodic or chronic migraine with or without aura. This recommendation is based on studies that used a treatment frequency 1 to 2 times per week for 8 weeks (evidence level, moderate). One high-quality RCT,<sup>20</sup> 1 low-quality RCT,<sup>17</sup> and 1 high-quality SR<sup>24</sup> support the use of spinal manipulation for*

patients with episodic or chronic migraine (Tables 4 and 7).

- *Weekly massage therapy is recommended for reducing episodic migraine frequency and for improving affective symptoms potentially linked to headache pain (evidence level, moderate). One high-quality RCT<sup>16</sup> supports this practice recommendation (Table 4). Researchers used a 45-minute massage with focus on neuromuscular and trigger point framework of the back, shoulder, neck, and head.*
- *Multimodal multidisciplinary care (exercise, relaxation, stress and nutritional counseling, massage therapy) is recommended for the management of patients with episodic or chronic migraine. Refer as appropriate (evidence level, moderate). One high-quality RCT<sup>32</sup> supports the effectiveness of multimodal multidisciplinary intervention for migraine (Table 4). The intervention prioritizes a general management approach consisting of exercise, education, lifestyle change, and self-management.*
- *There are insufficient clinical data to recommend for or against the use of exercise alone or exercise combined with multimodal physical therapies for the management of patients with episodic or chronic migraine (aerobic exercise, cervical range of motion [cROM], or whole body stretching). Three low-quality CCTs<sup>13,33,34</sup> contribute to this conclusion (Table 4).*

### Practice Recommendations—Tension-Type Headache

- *Low-load craniocervical mobilization (eg, Thera-Band, Resistive Exercise Systems; Hygenic Corporation, Akron, OH) is recommended for longer term (eg, 6 months) management of patients with episodic or*

**Table 7.** Literature summary and quality ratings of systematic reviews of physical treatments for the management of headache disorders

Systematic review	Headache type	Intervention(s)	No. of included studies	Author conclusions	Quality rating
Bronfort et al <sup>24</sup>	Migraine, tension-type, cervicogenic, mixed migraine and tension-type, posttraumatic headache	Therapeutic heat or cold; traction; TENS, interferential therapy, electromagnetic therapy, microcurrent, ultrasound, and laser; exercise; spinal manipulation or mobilization; massage; reflexology; stretching; and trigger-point therapy	22	Migraine: spinal manipulation may be effective. Weak evidence for electrotherapies Episodic tension-type: spinal manipulation is ineffective; Chronic: spinal manipulation maybe effective with short-term efficacy similar to amitriptyline. Weak evidence for therapeutic touch, electrotherapies, massage, and stretching Cervicogenic: spinal manipulation maybe effective; neck exercise (low-intensity endurance training) maybe effective Posttraumatic: weak evidence for spinal mobilization	9
Hurwitz et al <sup>26</sup>	Migraine, tension-type, and posttraumatic headache	Spinal manipulation or spinal mobilization	5 headache studies	Sparsity and quality of data prevent firm conclusions from being reached	9
Fernandez-de-Las-Penas et al <sup>25</sup>	Tension-type headache	Spinal manipulation, classic massage connective tissue manipulation, soft tissue massage, Dr Cyriax's vertebral mobilization, manual traction, and CV-4 craniosacral technique	6	No rigorous evidence that manual therapies offer benefit beyond a placebo effect	9
Lenssinck et al <sup>27</sup>	Episodic or chronic tension-type headaches	Physiotherapy and/or spinal manipulation	8	Insufficient evidence to support or refute effectiveness of treatments	9
Fernandez-de-Las-Penas et al <sup>29</sup>	Cervicogenic headache	Spinal manipulation	2	Spinal manipulation obtained positive (+) results on headache intensity, duration, and medication intake, with limited evidence in reducing headache frequency	6

chronic tension-type headaches (evidence level, moderate). One high-quality RCT<sup>36</sup> showed that low-load mobilization significantly reduced symptoms of tension-type headaches for patients during the longer term (Table 5).

- *Spinal manipulation cannot be recommended for the management of patients with episodic tension-type headache (evidence level, moderate).* There is moderate-level evidence that spinal manipulation after premanipulative soft tissue therapy provides no additional benefit for patients with tension-type headaches. One high-quality RCT<sup>12</sup> (Table 5) and observations reported in 4 SRs<sup>24-27</sup> (Table 7) suggest no benefit of spinal manipulation for patients with episodic tension-type headaches.
- A recommendation cannot be made for or against the use of spinal manipulation (2 times per week for 6 weeks) for patients with chronic tension-type headache. Authors of 1 RCT<sup>11</sup> rated as high quality by the quality assessment tool<sup>6</sup> (Table 1), and summaries of this study in 2 SRs<sup>24,26</sup> suggest that spinal

manipulation may be effective for chronic tension-type headache. However, the GDC considers the RCT<sup>11</sup> difficult to interpret and inconclusive (Table 5). The trial is inadequately controlled with imbalances in the number of subject-clinician encounters between study groups (eg, 12 visits for subjects in the soft tissue therapy plus spinal manipulation group vs 2 visits for subjects in the amitriptyline group). There is no way of knowing whether a comparable level of personal attention for subjects in the amitriptyline group may have impacted the study outcomes. These considerations and interpretations from 2 other SRs<sup>25,27</sup> contribute to this conclusion (Table 7).

- There is insufficient evidence to recommend for or against the use of manual traction, connective tissue manipulation, Cyriax's mobilization, or exercise/physical training for patients with episodic or chronic tension-type headache. Three low-quality inconclusive studies<sup>19,31,35</sup> (Table 5), 1 low-quality negative RCT,<sup>14</sup> and 1 SR<sup>25</sup> contribute to this conclusion (Table 7).



### Practice Recommendations—Cervicogenic Headache

- *Spinal manipulation is recommended for the management of patients with cervicogenic headache. This recommendation is based on 1 study that used a treatment frequency of 2 times per week for 3 weeks (evidence level, moderate).* In a high-quality RCT, Nilsson et al<sup>18</sup> (Table 6) showed a significantly positive effect of high-velocity, low-amplitude spinal manipulation for patients with cervicogenic headache. Evidence synthesis from 2 SRs<sup>24,29</sup> (Table 7) supports this practice recommendation.
- *Joint mobilization is recommended for the management of patients with cervicogenic headache (evidence level, moderate).* Jull et al<sup>15</sup> examined the effects of Maitland joint mobilization 8 to 12 treatments for 6 weeks in a high-quality RCT (Table 6). Mobilization followed typical clinical practice, in which the choice of low-velocity and high-velocity techniques was based on initial and progressive assessments of patients' cervical joint dysfunction. Beneficial effects were reported for headache frequency, intensity, as well as neck pain and disability. Evidence synthesis from 2 SRs<sup>24,29</sup> (Table 7) supports this practice recommendation.
- *Deep neck flexor exercises are recommended for the management of patients with cervicogenic headache (evidence level, moderate).* This recommendation is based on a study of 2 times daily for 6 weeks. There is no consistently additive benefit of combining deep neck flexor exercises and joint mobilization for cervicogenic headache. One high-quality RCT<sup>15</sup> (Table 6) and observations provided in 2 SRs<sup>24,29</sup> (Table 7) support this practice recommendation.

### Safety

Practitioners select treatment modalities in conjunction with all available clinical information for a given patient. Of the 16 CCTs/RCTs<sup>11-20,31-36</sup> included in the body of evidence for this CPG, only 6 studies<sup>11,12,15,20,32,36</sup> adequately assessed or discussed patient side effects or safety parameters (Table 1, column M). Overall, reported risks were low. Three of the trials reported safety information for spinal manipulation.<sup>11,12,20</sup> Boline et al<sup>11</sup> reported that 4.3% of subjects experienced neck stiffness after initial spinal manipulation that disappeared for all cases after the first 2 weeks of treatment. Soreness or increase in headaches after spinal manipulation (n = 2) were reasons for treatment discontinuation cited by Tuchin et al.<sup>20</sup> No side effects were experienced by any subjects studied by Bove et al<sup>12</sup> using spinal manipulation for the treatment of episodic tension-type headache. Treatment trials to evaluate efficacy outcomes may not enroll adequate numbers of subjects to assess the incidence of rare adverse events. Other research methods are required to

develop a full understanding of the balance between benefits and risks.

### DISCUSSION

Spinal manipulation and other manual therapies commonly used in chiropractic have been studied in several CCTs that are heterogeneous in subject enrollment, design, and overall quality. Patient and headache types systematically represented in the evidence base are migraine, tension-type headaches, and cervicogenic headache. The primary health status outcomes reported are typically headache frequency, intensity, duration, and quality-of-life measures. The evidence is no greater than a moderate level at this time.

The evidence supports the use of spinal manipulation for the chiropractic management of patients with migraine or cervicogenic headaches but not tension-type headaches. For migraine, multidisciplinary care using weekly 45-minute massage therapy and multimodal care (exercise, relaxation, and stress and nutritional counseling) may also be effective. Alternatively, joint mobilization or deep neck flexor exercises are recommended for improving symptoms of cervicogenic headache. There appears to be no consistently additive benefit of combining joint mobilization and deep neck flexor exercises for patients with cervicogenic headache. Moderate evidence support the use of low-load craniocervical mobilization for longer term management of tension-type headaches.

### Limitations

Shortcomings for this guideline include the quantity and quality of supporting evidence found during the searches. No recent adequately controlled high-quality research studies with reproducible clinical findings have been published for the chiropractic care of headache patients. Studies are needed to further our understanding of specific manual therapies in isolation or in well-controlled combinations for the treatment of migraine, tension-type headache, cervicogenic headache, or other headache types presenting to clinicians (eg, cluster, posttraumatic headache). Another shortcoming of this literature synthesis is the reliance on published research studies with small sample sizes (Tables 4-6), short-term treatment paradigms, and follow-up periods. Well-designed clinical trials with sufficient numbers of subjects, longer term treatments, and follow-up periods need to be funded to advance chiropractic care, and spinal manipulation in particular, for the management of patients with headache disorders. As with any literature review and clinical practice guideline, foundational information and published literature are evolving. Studies that may have informed this work may have been published after the conclusion of this study.<sup>37-39</sup>

### Considerations for Future Research

The GDC consensus is that there is a need for further chiropractic studies with patients with headache disorders.

- More high-quality clinical research is needed. Future research requires study designs using active comparators and nontreatment and/or placebo group(s) to enhance the evidence base for patient care. Patient blinding to physical interventions to manage expectancy results is needed and has been explored by researchers in chiropractic for other pain conditions.<sup>10</sup> The lack of systematically reported studies presents a practical challenge for generating evidence-based treatment recommendations. All future studies should be structured using systematic validated methods (eg, Consolidated Standards of Reporting Trials [CONSORT] and Transparent Reporting of Evaluations with Non-randomized Designs [TREND]).
- Systematic reporting of safety data is needed in chiropractic research. All clinical trials must collect and report on potential side effects or harms even if none are observed.
- Develop novel quantitative tools for evaluating manual therapy research. Blinding serves to control expectancy effects and nonspecific effects of subject-provider interactions across study groups. It is typically not possible to blind subjects and providers in efficacy studies of manual therapies. Despite inherent limitations, both blinding of subjects and care providers were rated in the research articles by the GDC, since these items are included in high-quality rating instruments.<sup>6</sup> Advanced research tools for analyzing and subsequent rating of the manual therapy literature are urgently needed.
- To advance research on functional outcomes in the chiropractic care of headache. This guideline identified that headache studies use a variable range of measures in evaluating the effect of treatment on health outcomes. Headache frequency, intensity, and duration are the most consistently used outcomes (Tables 4-6). Serious efforts are needed to include validated patient-centered outcome measures in chiropractic research that are congruent with improvements in daily living and resumption of meaningful routines.
- Cost-effectiveness. No research studies were retrieved on cost-effectiveness of spinal manipulation for the treatment of headache disorders. Future clinical trials of spinal manipulation should evaluate cost-effectiveness.

Other research methods are required to develop a full understanding of the balance between benefits and risks. This CPG does not provide a review of all chiropractic treatments. Any omissions reflect gaps in the clinical literature. The type, frequency, dosage, and duration of treatment(s) should be based on guideline recommenda-

tions, clinical experience, and knowledge of the patient until higher levels of evidence are available.

### CONCLUSIONS

There is a baseline of evidence to support chiropractic care, including spinal manipulation, for the management of migraine and cervicogenic headaches. The type, frequency, dosage, and duration of treatment(s) should be based on guideline recommendations, clinical experience, and knowledge of the patient. Evidence for the use of spinal manipulation as an isolated intervention for patients with tension-type headache remains equivocal. More research is needed.

Practice guidelines link the best available evidence to good clinical practice and are only 1 component of an evidence-informed approach to providing good care. This guideline is intended to be a resource for the delivery of chiropractic care for patients with headache. It is a “living document” and subject to revision with the emergence of new data. Furthermore, it is not a substitute for a practitioner’s clinical experience and expertise. This document is not intended to serve as a standard of care. Rather, the guideline attests to the commitment of the profession to advance evidence-based practice through engaging a knowledge exchange and transfer process to support the movement of research knowledge into practice.

### Practical Applications

- This guideline is a resource for the delivery of chiropractic care for patients with headache.
- Spinal manipulation is recommended for the management of patients with migraine or cervicogenic headaches.
- Multimodal multidisciplinary interventions including massage may benefit patients with migraine.
- Joint mobilization or deep neck flexor exercises may improve symptoms of cervicogenic headache.
- Low-load craniocervical mobilization may improve tension-type headaches.

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APPENDIX A

Database search term logic

	No.	MEDLINE, EMBASE, CENTRAL	AMED	CINAHL	MANTIS	Alt HealthWatch	ICL
Condition	1	Headache/	Headache/	Headache/	Headache.mp.	S1 (Headache* or Head ache* or Cephal* or Hemicran* ) Or tension* N2 head* Or cervicogen* N2 head*	headache* or
	2	exp Headache Disorders/	exp Headache/	exp Vascular Headache/	(Headache\$ or Head ache\$ or Cephal\$ or Hemicran\$).mp.	S2 cranial N2 pain* Or head* N2 pain* Or migrain*	headache* or
	3	(Headache\$ or Head ache\$ or Cephal\$ or Hemicran\$).tw.	(Headache\$ or Head ache\$ or Cephal\$ or Hemicran\$).tw.	(Headache\$ or Head ache\$ or Cephal\$ or Hemicran\$).tw.	((tension\$ or cervicogen\$) adj2 head\$).mp.	S3 ( S2 OR S1 )	migrain* or
	4	((tension\$ or cervicogen\$) adj2 head\$).tw.	((tension\$ or cervicogen\$) adj2 head\$).tw.	((tension\$ or cervicogen\$) adj2 head\$).tw.	((cranial or head) adj2 pain\$).mp.		cephal* or
	5	((cranial or head) adj2 pain\$).tw.	((cranial or head) adj2 pain\$).tw.	((cranial or head) adj2 pain\$).tw.	migrain\$.mp.		
	6	exp Migraine Disorders/	Migraine/	Migraine/	or/1-5		
	7	migrain\$.mp.	migraine\$.mp.	migrain\$.mp.			
	8	or/1-7	or/1-7	or/1-7			
Treatment	9	exp physical therapy modalities/	Chiropractic/	exp Manual therapy/	(chiropr\$ or craniochiropracti\$).mp.	S4 ( chiropr* or craniochiropracti* ) Or spin* N2 manipul* Or spin* N2 mobili* S5 musculoskeletal N2 manipul* Or musculoskeletal N2 mobili* Or electromag* N2 therap* S6 pulse* N2 electromag* Or (ultrasound* and therap*) Or (ultrason* and therap*) S7 low N2 laser* Or ( applied kinesiol* or massag* or acupress* or myofunct* or transcutaneous electric* or traction or manual therap* ) Or neuromuscular education S8 postur* N2 counsel* Or postur* N2 educat* S9 ( S8 Or S7 Or S6 Or S5 Or S4 ) And S3	
	10	Chiropractic/	Manipulation, Chiropractic/	exp Chiropractic/	(spin\$ adj2 (manipul\$ or mobili\$)).mp.		
	11	Manipulation, Chiropractic/	Massage/	Manipulation, Chiropractic/	(musculoskeletal adj2 (manipul\$ or mobili\$)).mp.		
	12	Manipulation, Spinal/	Acupressure/	Kinesiology, applied/	(electromag\$ adj2 therap\$).tw.		
	13	Kinesiology, applied/	Myofunctional therapy/	Massage/	(pulse\$ adj2 electromag\$).tw.		
	14	Massage/	Relaxation techniques/	Acupressure/	(pulse\$ adj2 electromag\$).tw.		
	15	Acupressure/	Ultrasonic Therapy/	Relaxation techniques/	(low adj2 laser\$).mp.		
	16	Myofunctional therapy/	Laser Therapy, Low-Level/	Ultrasonic Therapy/	((ultrasound\$ or ultrason\$) and therap\$).mp.		

**Appendix A. (continued)**

No.	MEDLINE, EMBASE, CENTRAL	AMED	CINAHL	MANTIS	Alt HealthWatch	ICL
17	Relaxation techniques/	Ultrasonics/	Ultrasonics/	applied kinesiol\$.mp.		
18	Ultrasonic Therapy/	Transcutaneous Electric Nerve Stimulation/ Traction/	Transcutaneous Electric Nerve Stimulation/ Traction/	massag\$.mp.		
19	Laser Therapy, Low-Level/			acupress\$.mp.		
20	Ultrasonics/	Exercise Therapy/	Exercise Therapy/	myofunct\$.mp.		
21	Transcutaneous Electric Nerve Stimulation/	Acupressure/	Acupressure/	transcutaneous electric\$.mp.		
22	Traction/	exp Musculoskeletal Manipulations/	Braces/	traction.tw.		
23	Exercise Therapy/	Braces/	(chiropr\$ or craniochiropracti\$). mp.	manual therap\$.mp.		
24	Acupressure/	(chiropr\$ or craniochiropracti\$).mp.	(spin\$ adj2 (manipul\$ or mobili\$)).mp.	(postur\$ adj2 (counsel\$ or educat\$)).mp.		
25	exp Musculoskeletal Manipulations/	(spin\$ adj2 (manipul\$ or mobili\$)).mp.	(musculoskeletal adj2 (manipul\$ or mobili\$)).mp.	neuromuscular education.mp.		
26	Braces/	(musculoskeletal adj2 (manipul\$ or mobili\$)). mp.	(electromag\$ adj2 therap\$).tw.	or/9-25		
27	(chiropr\$ or craniochiropracti\$).mp.	(electromag\$ adj2 therap\$).tw.	(pulse\$ adj2 electromag\$).tw.	6 and 24		
28	(spin\$ adj2 (manipul\$ or mobili\$)).mp.	(pulse\$ adj2 electromag\$).tw.	(low adj2 laser\$).mp.			
29	(musculoskeletal adj2 (manipul\$ or mobili\$)).mp.	(low adj2 laser\$).mp.	((ultrasound\$ or ultrason\$) and therap\$).mp.			
30	(electromag\$ adj2 therap\$).tw.	((ultrasound\$ or ultrason\$) and therap\$).mp.	(ultrasound\$ or ultrason\$).mp. and th.fs.			
31	(pulse\$ adj2 electromag\$).tw.	applied kinesiol\$.mp.	applied kinesiol\$.mp.			
32	(low adj2 laser\$).mp.	massag\$.mp.	massag\$.mp.			
33	((ultrasound\$ or ultrason\$) and therap\$).mp.	acupress\$.mp.	acupress\$.mp.			
34	(ultrasound\$ or ultrason\$).mp. and th.fs.	myofunct\$.mp.	myofunct\$.mp.			
35	Applied kinesiol\$.mp.	transcutaneous electric\$.mp. traction.tw.	transcutaneous electric \$.mp. traction.tw.			
36	massag\$.mp.	traction.tw.	traction.tw.			
37	acupress\$.mp.	manual therap\$.mp.	manual therap\$.mp.			
38	myofunct\$.mp.	(postur\$ adj2 (counsel\$ or educat\$)).mp.	(postur\$ adj2 (counsel\$ or educat\$)).mp.			
39	transcutaneous electric\$.mp. traction.tw.	neuromuscular education.mp. or/9-39	neuromuscular education.mp. or/9-39			
40	traction.tw.	8 and 40	8 and 40			
41	Manual therap\$.mp.					
42	(postur\$ adj2 (counsel\$ or educat\$)).mp.					
43	neuromuscular education.mp.					
44	or/9-43					
45	8 and 44					

AMED indicates Allied and Complementary Medicine; CINAHL, Cumulative Index to Nursing and Allied Health Literature; MANTIS, Manual, Alternative, and Natural Therapy Index System; ICL, Index to Chiropractic Literature.

## APPENDIX B

### Literature screening steps

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#### Level 1A screening criteria

##### Inclusion criteria

- Related to headache
- Related to chiropractic treatment (manual therapies such as manipulation and mobilization; rehabilitation exercises including home exercise; physical therapies such as traction, ischemic pressure, massage, cold packs, pillows, and laser; and electrical modalities (pulsed electromagnetic field therapy, ultrasound, transcutaneous electrical nerve stimulation) and/or
- Related to chiropractic diagnosis (history, physical examination, neurological examination)

English or French

##### Exclusion criteria

- Studies with principal aims to assess acupuncture, psychological interventions, and drugs
- Not related to adult humans >18 y
- No original data presented
- Case reports

#### Level 1B screening criteria

##### Inclusion criteria

- Related to headache
- Related to chiropractic treatment (manual therapy, physical therapy, exercise therapy, and lifestyle interventions)
- Related to chiropractic diagnosis (case history, physical examination, and neurological examination)
- English or French

##### Exclusion criteria

- Abstracts not published as full studies
  - Acupressure
  - Adverse events
  - Behavioral interventions
  - Biofeedback
  - Cadaver studies
  - Cognitive interventions
  - Conference proceedings
  - Drug interventions or tests
  - Hypnosis
  - Imaging/electromyogram (EMG)/electroencephalogram (EEG)/advanced testing
  - Internet-based interventions
  - Laboratory tests
  - Laser acupuncture
  - Letters to the editor
  - Nasal or aural or oral interventions
  - Newspaper articles
  - No original data presented
  - Non-SRs
  - Not related to adult humans >18 y
  - Nutritional supplements
  - Percutaneous interventions
  - Press releases
  - Prevalence and epidemiologic studies
  - Psychological interventions
  - Reflexology
  - Relaxation training
  - Self-care not guided by a practitioner
  - Single-case reports
  - Use of intervention surveys
  - Invasive neurostimulation
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### Appendix B. (continued)

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#### Level 2A screening criteria

##### Inclusion criteria

- English or French
- Related to chiropractic treatment
- Related to chiropractic diagnosis
- Does it meet any exclusion criteria (specified below)

##### Exclusion criteria

- Abstracts not published as full studies
- Acupressure
- Adverse events
- Behavioral interventions
- Biofeedback
- Cadaver studies
- Cognitive interventions
- Conference proceedings
- Drug interventions or tests
- Energy healing
- Headache data not reported separately
- Hypnosis
- Imaging/EMG/EEG/advanced testing
- Internet-based interventions
- Laboratory tests
- Laser acupuncture
- Letters to the editor
- Magnetic therapy
- Nasal or aural or oral interventions
- Newspaper articles
- No original data presented
- Non-SRs
- Not related to adult humans >18 y
- Nutritional supplements
- Outcomes reported not clinically relevant
- Percutaneous interventions
- Press releases
- Prevalence and epidemiologic studies
- Psychological interventions
- Reflexology
- Relaxation training
- Self-care not guided by a practitioner
- Single-case reports
- Use of intervention surveys
- Invasive neurostimulation
- Other

#### Level 2B screening criteria

##### Inclusion criterion

- Met eligibility criteria at all previous levels of screening

##### Exclusion criterion

- Methodological quality or relevance to chiropractic so low that it precluded extracting any useful credible information

#### Level 3, entire GDC

##### Inclusion criterion

- Met eligibility criteria at all previous levels of screening
- Study used IHS diagnostic criteria or The Cervicogenic Headache International Study Group criteria for subject identification and enrollment

##### Exclusion criterion

- Methodological quality or relevance to chiropractic so low that it precluded extracting any useful credible information
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## APPENDIX C

### *Articles excluded in final screening*

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#### **Rationale for clinical studies excluded in the final screening by GDC**

Allais et al.<sup>40</sup> Treatment of acupuncture points is a specialized treatment technique; methodology was not considered relevant by the GDC for the chiropractic care of patients with headache.

Annal et al.<sup>42</sup> Lack of diagnostic specificity; IHS criteria were not used for subject enrollment.

Anderson and Seniscal.<sup>44</sup> Cranial osteopathy is a specialized treatment technique; methodology was not considered relevant by the GDC for the chiropractic care of patients with headache.

Fernandez-de-las Penas et al.<sup>46</sup> Headache is not a primary focus of this article. Lack of diagnostic specificity; IHS criteria were not used for subject enrollment.

Foster et al.<sup>49</sup> Lack of diagnostic specificity; IHS criteria were not used for subject enrollment.

Haas et al.<sup>50</sup> Lack of adequate comparator group precludes analyses as a controlled trial.

Hanten et al.<sup>52</sup> Cranial manipulation is a specialized treatment technique; methodology was not considered relevant by the GDC for the chiropractic care of patients with headache.

Hall et al.<sup>54</sup> SNAG is a specialized treatment technique; methodology not considered relevant by the GDC for the chiropractic care of patients with headache.

Hoyt et al.<sup>56</sup> Lack of diagnostic specificity; IHS criteria were not used for subject enrollment. Cranial manipulation is a specialized treatment technique; methodology was not considered relevant by the GDC for the chiropractic care of patients with headache.

Mongini et al.<sup>58</sup> Lack of diagnostic specificity; IHS criteria were not used for subject enrollment.

#### **Rationale for systematic reviews excluded in final screening by GDC**

Fernandez-de-las-Penas et al.<sup>59</sup> Focus of the article was methods, not treatment, outcomes.

Lew et al.<sup>60</sup> Focus of the article was pharmacotherapy and was outside the scope of chiropractic practice.

Nilsson.<sup>41</sup> Nilsson et al<sup>18</sup> is considered the primary publication for this study and is included in the evidence synthesis.

Nilsson et al.<sup>43</sup> Nilsson et al<sup>18</sup> is considered the primary publication for this study. The 1997 article is included in the evidence synthesis.

Ouseley and Parkin-Smith.<sup>45</sup> Lack of methodological rigor precludes analysis as a controlled trial for this guideline.

Parker et al.<sup>47</sup> Parker et al<sup>48</sup> is considered the primary publication for this study.

Parker et al.<sup>48</sup> Diagnostic specificity is uncertain. Study predates systematic use of IHS criteria for subject enrollment.

Sjogren et al.<sup>51</sup> Lack of diagnostic specificity; IHS criteria were not used for subject enrollment.

Solomon et al.<sup>53</sup> Lack of diagnostic specificity; IHS criteria were not used for subject enrollment. Cranial electrotherapy is a specialized treatment technique; methodology was not considered relevant by the GDC for the chiropractic care of patients with headache.

Solomon and Guglielmo.<sup>55</sup> Lack of diagnostic specificity; IHS criteria were not used for subject enrollment. Cranial electrotherapy is a specialized treatment technique; methodology was not considered relevant by the GDC for the chiropractic care of patients with headache.

Vernon et al.<sup>57</sup> Stopped trial. Incomplete study precludes analysis as a controlled trial.

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SNAG indicates self-sustained natural apophyseal glide.