

Chiropractic clinical practice guideline: evidence-based treatment of adult neck pain not due to whiplash

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Conflicts of interest:

The contributing individuals declared no conflicts of interest. GDC members Andrea Furlan and Janice Gross Stein received a *per diem* for their participation. The literature search and evidence extraction teams were contracted.

OBJECTIVE: *To provide an evidence-based clinical practice guideline for the chiropractic cervical treatment of adults with acute or chronic neck pain not due to whiplash. This is a considerable health concern considered to be a priority by stakeholders, and about which the scientific information was poorly organized.*

OPTIONS: *Cervical treatments: manipulation, mobilization, ischemic pressure, clinic- and home-based exercise, traction, education, low-power laser, massage, transcutaneous electrical nerve stimulation, pillows, pulsed electromagnetic therapy, and ultrasound.*

OUTCOMES: *The primary outcomes considered were improved (reduced and less intrusive) pain and improved (increased and easier) ranges of motion (ROM) of the adult cervical spine.*

EVIDENCE: *An “extraction” team recorded evidence from articles found by literature search teams using 4 separate literature searches, and rated it using a Table adapted from the Oxford Centre for Evidence-based Medicine. The searches were 1) Treatment; August, 2003, using MEDLINE, CINAHL, AMED, MANTIS, ICL, The Cochrane Library (includes CENTRAL), and EBSCO, identified 182 articles. 2) Risk management (adverse events); October, 2004, identified 230 articles and 2 texts. 3) Risk management (dissection); September, 2003, identified 79 articles. 4) Treatment update; a repeat of the treatment search for articles published between September, 2003 and November, 2004 inclusive identified 121 articles.*

VALUES: *To enable the search of the literature, the authors (Guidelines Development Committee [GDC]) regarded chiropractic treatment as including elements of “conservative” care in the search strategies, but not in the consideration of the range of chiropractic practice. Also, knowledge based only on clinical experience was considered less valid and reliable than good-caliber evidence, but where the caliber of the relevant evidence was low or it was non-existent, unpublished clinical experience was considered to be equivalent to, or better than the published evidence.*

REPORTED BENEFITS, HARMS AND COSTS: *The expected benefits from the recommendations include more rapid recovery from pain, impairment and disability (improved pain and ROM). The GDC identified evidence-based pain benefits from 10 unimodal treatments and*

OBJECTIF : *Donner une ligne directrice de pratique clinique fondée sur des éléments probants pour le traitement chiropratique des douleurs cervicales chez des adultes victimes de cervicalgies chroniques qui ne sont pas dues à un coup de fouet cervical. Il s’agit d’une préoccupation médicale très importante, considérée par les parties prenantes comme une priorité et pour laquelle les informations scientifiques étaient mal organisées.*

OPTIONS : *Traitements des douleurs cervicales : manipulation, mobilisation, pression ischémique, exercice en clinique et à la maison, éducation, laser de faible puissance, massage, neurostimulation transcutanée, oreillers, thérapie par champ électromagnétique pulsé et ultrason.*

RÉSULTATS : *Les critères de jugement principaux pris en compte étaient l’amélioration de la douleur (douleur atténuée et moins intrusive) et l’amélioration de l’amplitude de mouvement (ADM) de la colonne cervicale de l’adulte (meilleure amplitude et mouvements plus faciles).*

ÉLÉMENT PROBANT : *Une équipe d’« extraction » a enregistré des éléments probants provenant d’articles relevés par des équipes de recherche bibliographique ayant fait appel à quatre sources de recherche documentaire différentes. Ces articles ont été classés selon un tableau adapté du Oxford Centre for Evidence-based Medicine. Les recherches ont porté sur : 1) Le traitement; août 2003; sources utilisées : MEDLINE, CINAHL, AMED, MANTIS, ICL, The Cochrane Library (y compris CENTRAL) et EBSCO; 182 articles identifiés; 2) La gestion des risques (événements indésirables); octobre 2004; 230 articles et 2 textes identifiés; 3) La gestion des risques (dissection); septembre 2003; 79 articles identifiés; 4) La mise à jour des traitements; une répétition de la recherche bibliographique d’articles sur les traitements publiés entre septembre 2003 et novembre 2004; 121 articles identifiés en tout.*

ÉCHELLE DE VALEURS : *Pour favoriser la recherche bibliographique, les auteurs (le Comité d’élaboration des lignes directrices [GDC]) a considéré le traitement chiropratique comme un élément faisant partie des soins « traditionnels » dans les stratégies de recherche, mais sans tenir compte des diverses pratiques chiropratiques. De plus, les connaissances fondées uniquement sur l’expérience clinique étaient considérées*

more than 7 multimodal treatments. There were no pain benefits from magnets in necklaces, education or relaxation alone, occipital release alone, or head retraction-extension exercise combinations alone. The specificity of the studied treatments meant few studies could be generalized to more than a minority of patients.

Adverse events were not addressed in most studies, but where they were, there were none or they were minor. The theoretic harm of vertebral artery dissection (VAD) was not reported, but an analysis suggested that 1 VAD may occur subsequent to 1 million cervical manipulations.

Costs were not analyzed in this guideline, but it is the understanding of the GDC that recommendations limiting ineffective care and promoting a more rapid return of patients to full functional capacity will reduce patient costs, as well as increase patient safety and satisfaction.

For simplicity, this version of the guideline includes primarily data synthesized across studies (evidence syntheses), whereas the technical and the interactive versions of this guideline (<http://ccachiro.org/cpg>) also include relevant data from individual studies (evidence extractions).

RECOMMENDATIONS: The GDC developed treatment, risk-management and research recommendations using the available evidence. Treatment recommendations addressing 13 treatment modalities revolved around a decision algorithm comprising diagnosis (or assessment leading to diagnosis), treatment and reassessment. Several specific variations of modalities of treatment were not recommended.

For adverse events not associated with a treatment modality, but that occur in the clinical setting, there was evidence to recommend reconsideration of treatment options or referral to the appropriate health services. For adverse events associated with a treatment modality, but not a known or observable risk factor, there was evidence to recommend heightened vigilance when a relevant treatment is planned or administered. For adverse events associated with a treatment modality and predicted by an observable risk factor, there was evidence to recommend absolute contraindications, and requirements for treatment modality modification or caution to minimize harm and maximize benefit. For managing the theoretic risk of dissection, there was evidence to recommend a

comme moins valables et moins sûres que des éléments probants de bon niveau, mais lorsque la preuve était de faible niveau ou inexistante, on a pris en compte l'expérience clinique non publiée, tenue pour équivalente ou meilleure que la preuve publiée.

BÉNÉFICES, DOMMAGES ET COÛTS DÉCLARÉS : Les bénéfices attendus des recommandations sont une guérison plus rapide de la douleur, du handicap et de l'invalidité (atténuation de la douleur et amélioration de l'ADM). Le GDC a mis en évidence des résultats favorables sur la douleur fondés sur des éléments probants, provenant de 10 traitements à mode unique et plus de 7 traitements à modes multiples. On n'a pas observé de résultats favorables sur la douleur avec l'application d'aimants autour du cou, l'éducation ou la relaxation seules, le relâchement occipital seul, ou bien des exercices combinant tirages et extensions de la tête seuls. La spécificité des traitements étudiés signifiait que peu d'études pouvaient être généralisées à plus qu'une minorité de patients.

Les événements indésirables n'ont pas été abordés dans la plupart des études, mais lorsque c'était le cas, soit on n'en n'observait pas, soit ils étaient mineurs. Le préjudice théorique d'une dissection de l'artère vertébrale (DAV) n'a pas été signalé mais une analyse suggérait qu'une DAV pouvait se produire après un million de manipulations cervicales.

Les coûts n'ont pas été analysés dans cette ligne directrice, mais il appartient au GDC de comprendre que les recommandations limitant les soins de santé inefficaces et encourageant un retour plus rapide des patients à leur pleine capacité fonctionnelle réduiront les coûts liés aux patients mais accroîtront également la sécurité et la satisfaction des patients.

Pour faire simple, cette version de la ligne directrice comprend essentiellement des données synthétisées d'études (synthèses d'éléments probants), attendu que les versions techniques et interactives de cette ligne directrice (<http://ccachiro.org/cpg>) comportent également des données pertinentes provenant d'études individuelles (extractions d'arguments probants).

RECOMMANDATIONS : Le GDC a élaboré des recommandations en matière de traitement, de gestion des risques et de recherche en utilisant les arguments probants disponibles.

Les recommandations sur le traitement abordant

systematic risk-management approach. For managing the theoretic risk of stroke, there was support to recommend minimal rotation in administering any modality of upper-cervical spine treatment, and to recommend caution in treating a patient with hyperhomocysteinemia, although the evidence was especially ambiguous in both of these areas.

Research recommendations addressed the poor caliber of many of the studies; the GDC concluded that the scientific base for chiropractic cervical treatment of neck pain was not of sufficient quality or scope to “cover” current chiropractic practice comprehensively, although this should not suggest other disciplines are more evidence-based.

VALIDATION : This guideline was authored by the 10 members of the GDC (Elizabeth Anderson-Peacock, Jean-Sébastien Blouin, Roland Bryans, Normand Danis, Andrea Furlan, Henri Marcoux, Brock Potter, Rick Ruegg, Janice Gross Stein, Eleanor White) based on the work of 3 literature search teams and an evidence extraction team, and in light of feedback from a commentator (Donald R Murphy), a 5-person review panel (Robert R Burton, Andrea Furlan, Richard Roy, Steven Silk, Roy Till), a 6-person Task Force (Grayden Bridge, H James Duncan, Wanda Lee MacPhee, Bruce Squires, Greg Stewart, Dean Wright), and 2 national profession-wide critiques of complete drafts. Two professional editors with extensive guidelines experience were contracted (Thor Eglington, Bruce P Squires). Key contributors to the guideline included individuals with specialties or expert knowledge in chiropractic, medicine, research processes, literature analysis processes, clinical practice guideline processes, protective association affairs, regulatory affairs, and the public interest. This guideline has been formally peer reviewed.

(JCCA 2005; 49(3):158–209)

13 modes de traitement sont axées sur un algorithme de décision comprenant le diagnostic (ou l'évaluation menant au diagnostic), le traitement et la réévaluation. Plusieurs variantes particulières de modes de traitement n'ont pas été recommandées.

En ce qui concerne les événements indésirables qui ne sont pas associés à une maladie, mais qui surviennent en milieu clinique, rien n'indiquait de recommander une remise en cause des options de traitement ou d'en référer aux services de santé compétents. Pour les événements indésirables associés à un mode de traitement, mais ne constituant pas un facteur de risque connu ou observable, rien n'indiquait de recommander une vigilance accrue au moment de prévoir ou d'administrer un traitement pertinent. Concernant les événements indésirables associés à un mode de traitement et prédits par un facteur de risque observable, rien n'indiquait de recommander une contre-indication formelle et d'exiger une modification du mode de traitement ou bien de mettre en garde en vue de minimiser les dommages et de maximiser les bénéfices. En ce qui concerne la gestion du risque théorique de dissection, rien n'indiquait de recommander une approche systématique de la gestion des risques. En matière de gestion du risque théorique d'accident vasculaire cérébral, rien n'indiquait de recommander un roulement minimal des modes de traitement de la colonne cervicale supérieure et de recommander la prudence dans le traitement d'un patient souffrant d'hyperhomocystéinémie, bien que la preuve soit particulièrement ambiguë dans ces deux domaines.

Les recommandations en matière de recherche ont abordé le faible niveau présenté par de nombreuses études; le GDC a conclu que la base scientifique des traitements chiropratiques destinés à traiter les cervicalgies n'était pas de qualité ou de portée suffisante pour « couvrir » complètement la pratique chiropratique actuelle, même si cela ne veut pas dire que d'autres disciplines sont plus susceptibles de s'appuyer sur des arguments probants.

VALIDATION : Cette ligne directrice a été rédigée par les dix membres du GDC (Elizabeth Anderson-Peacock, Jean-Sébastien Blouin, Roland Bryans, Normand Danis, Andrea Furlan, Henri Marcoux, Brock Potter, Rick Ruegg, Janice Gross Stein, Eleanor White) en s'appuyant sur le travail de trois équipes en charge de la recherche bibliographique et d'une équipe en charge de

l'extraction des éléments probants, et à la lumière des remarques d'un commentateur (Donald R Murphy), d'un comité de révision composé de cinq personnes (Robert R Burton, Andrea Furlan, Richard Roy, Steven Silk, Roy Till), d'une commission d'étude composée de six personnes (Grayden Bridge, H James Duncan, Wanda Lee MacPhee, Bruce Squires, Greg Stewart, Dean Wright) et de deux critiques d'avant-projets complets, menées dans toute la profession, à l'échelon national. Deux rédacteurs professionnels possédant une grande expérience des lignes directrices ont été engagés par contrat (Thor Eglinton, Bruce P Squires). Des collaborateurs essentiels à la directive ont participé à ce travail, notamment des personnes ayant des spécialités ou une connaissance experte dans les domaines de la chiropratique, de la médecine, des procédés de recherche, des procédés d'analyse documentaire, des processus d'orientation de pratique clinique, des associations de protection, des affaires réglementaires et de l'intérêt public. Cette ligne directrice a officiellement fait l'objet d'une révision par des pairs. (JACC 2005; 49(3):158–209)

KEY WORDS: chiropractic, guideline, evidence-based, neck pain.

MOTS CLÉS. Chiropratique, ligne directrice fondée sur des éléments probants, cervicalgie.

1. Introduction (details <http://ccachiro.org/cpg>)

Neck pain is an important cause of reduced quality of life (QoL) and carries a high economic cost.^{1,2} In a recent Toronto (Canada) clinic survey,³ neck problems were the foremost reason for seeking chiropractic care. Overall, 25% of primary complaints among chiropractic patients likely involve neck pain.³

This clinical practice guideline (CPG) reflects evidence extracted from the published scientific literature about effective chiropractic cervical treatments for adult patients suffering from neck pain not due to whiplash. The CPG presents statements and recommendations synthesized from this evidence, and rates the “confidence” (strength) of each. It also identifies treatments for which evidence of ineffectiveness exists. This CPG does not provide a comprehensive overview of chiropractic treatment; any deficiency or omission directly reflects a deficiency or omission in the clinical literature.

This clinical practice guideline focuses on the treatment component of a chiropractic encounter that includes assessment, treatment and reassessment. Also, it does not address other areas of chiropractic care such as prevention.

1.1. Operational definitions

Chiropractic treatment was unanimously defined by the Guidelines Development Committee (GDC) as including the most common treatments employed by chiropractors but excluding: acupuncture; surgical procedures; invasive analgesic procedures, including nerve blocks, neuro-ablative procedures, epidural blocks, and facet and intramuscular injections; injections of botulinum toxin; systematic psychological interventions such as cognitive or behavioral therapies for anxiety or depression; and, prescription of over-the-counter or prescription drugs.

Neck was unanimously defined by the GDC as the vertebral motion segments (vertebral muscles, ligaments, nerves, discs) that constitute the neck; that is, the portion of the spine located between the skull and the rib cage, the vertebrae of which are characterized by their relatively small size and the absence of ribs.⁴

We deem chiropractic care to be of value across several age groups, but this CPG was limited to adults (18 or more years of age). Therefore, we searched and analyzed the literature related to adults only.

This guideline only addresses pain originating in the neck. Also, it does not address pain referred from the neck to the cranium or to the upper extremities (below the acromioclavicular joint). Pain was defined as whichever assessment method a study used to evaluate it, be it of mechanical, non-mechanical, idiopathic, or pathologic origin. However, this CPG does not address pain resulting from whiplash injury, which we consider to be different from other pain (more details <http://ccachiro.org/cpg>); whiplash pain results from a unique, complex, coupled movement of the cervical spine involving simultaneous flexion, extension and axial compression, subjecting the cervical spine to an unnatural double curvature at the time of injury.⁵ Also, this CPG does not address headache, which was considered outside of the practical scope of our work.

2. Methods (more details <http://ccachiro.org/cpg>)

The operational methods to develop and deploy this CPG were articulated in a development, dissemination, implementation, evaluation, and revision plan (DevDIER).⁶ The detailed development methods can be found in the technical version of this CPG (<http://ccachiro.org/cpg>); a summary follows.

The methods involved sequential contributions from literature search teams, an evidence-extraction team and a review panel – under the auspices of The Canadian Chiropractic Association and the Canadian Federation of Chiropractic Regulatory Boards, Clinical Practice Guidelines Development Initiative, GDC. Unanimity (complete agreement) within the relevant contributor groups was achieved at every stage of development. Two development drafts of the guideline were released for profession-wide critiques, the results of which were then incorporated.

2.1. Literature searches

Four electronic literature searches were undertaken: treat-

ment (English and German, up to August, 2003); risk management (managing the risk of non-dissection adverse events, English and French, up to October, 2004); dissection risk management (the theoretic association between manipulation and dissection or stroke, English, up to September, 2003); and treatment update (English and French, for the period between September, 2003 and November, 2004 inclusive).

The results of each search were downloaded into an electronic data set, and duplicates were manually removed. Some additional studies were added manually to each data set. The studies were retrieved and passed to the evidence-extraction team (TE, BPS).

2.2. Evidence extractions (data from individual studies)

Evidence extractors manually applied the operational definitions (Section 1.1) to reject studies or data that clearly did not respect these. Studies that contained both acceptable and unacceptable information were not rejected, but clearly unacceptable data within these studies were rejected. The 2 extractors recorded statistically significant results from the literature (p-value less or equal to 0.05), as well as non-significant findings where deemed appropriate. All relevant numeric data were extracted from studies into an electronic database; the extractors did not rely on study abstracts.

Table 1 adapted from the Oxford Centre for Evidence-based Medicine (OCEBM) levels of evidence⁷ was used to categorize results into rated *evidence extractions*. For treatment evidence, the extractors together used the OCEBM levels of evidence to rate the quality of each extraction, and then reached unanimity about all aspects of each extraction. For the evidence related to dissection, the 2 extractors reached unanimity about all aspects of each extraction. For evidence related to other risk-management concerns, because of the poor caliber of evidence, the 2 extractors were able to independently complete extraction work that was later amalgamated by one (TE).

For treatment evidence, the extractors accepted all Level 1 to 4 evidence, but Level 5 evidence only if it arose from a Level 1 to 4 study; e.g., if it was the study authors' extrapolation from the study data (Table 1). For risk-management evidence, all Levels were accepted. Where applicable, the rating of extractions are cited in parentheses (e.g., {L-4}). Where relevant, the GDC's interpretations of

Table 1: The meaning of the OCEBM levels of evidence

The interpretation (below) of the meaning of levels of evidence (left column) is the opinion of the GDC, based on the OCEBM recommendation grading system.			
Evidence level	Study results are ...	You interpret results ...	Clinical meaning
1a	almost certain	objectively	Recommendations directly supported by evidence are very likely reliable and valid.
1b			
1c			
2a	strongly suggestive	objectively	Recommendations directly supported by evidence are likely reliable and valid.
2b			
2c			
3a			
3b			
4	suggestive	objectively	Recommendations directly supported by evidence may be reliable and valid.
5	inconclusive	objectively	Reliability and validity of recommendations uncertain.
subjective	extrapolation	from Levels 1–5	

Adapted from the OCEBM levels of evidence (May 2001).⁷ Documents at the referenced web-site were used to discriminate between good and poor quality studies of the same design.

study results are included as Level 5 evidence extractions and cited as such (i.e., {L-5} or {L-5}^{GDC}).

Evidence extractions were ultimately verified by the GDC in the course of recommendation-development workgroups (Section 2.4).

2.3. Evidence Syntheses

In this CPG, unless otherwise noted: *pain* means neck pain not due to whiplash; *ranges of motion* (ROM) means cervical ROM; *disability* means neck disability; *manipulation* and *mobilization* designate interventions localized to the cervical spine; *exercise* designates clinic-based, supervised exercise programs; and *home exercise* designates home-based, monitored or unmonitored exercise programs. Also, International system of units (SI) abbreviations are used.

The caliber of the studies precluded quantitative synthe-

ses (e.g., statistical pooling). Therefore, topic related evidence extractions from individual studies were qualitatively summarized in *evidence syntheses* for ease of reading, by amalgamating related findings. The best quality evidence we could find in the extractions was used to make each pertinent point in the syntheses, and the quality of this evidence is cited.

For simplicity, this version of the CPG focuses on evidence syntheses, whereas the technical and the interactive versions of this CPG (<http://ccachiro.org/cpg>) also include all evidence extractions from individual studies. The extractions in those versions report all relevant study outcomes, but the syntheses included here focus on pain and ROM, because these two outcomes were the most consistently reported.

One extractor (TE) developed the treatment syntheses, and then the 2 extractors together examined them all to reach unanimity. One extractor (TE) completed all the risk-management syntheses.

Evidence syntheses were ultimately verified by the GDC in the course of recommendation-development

workgroups (Section 2.4).

2.4. Formulating recommendations

The 10 members of the GDC qualitatively interpreted the clinical relevance of the evidence extractions and syntheses. Therefore, all recommendations should be considered to be a subjective extrapolation, “equivalent” to an OCEBM Level 5 rating.

Extractions and syntheses were used to formulate *treatment*, *risk-management* or *research* recommendations during collaborative work sessions. Risk-management and research recommendations incorporated a substantial amount of the GDC’s (unpublished) expertise, whereas treatment recommendations purposefully incorporated little.

The work-groups considered outcomes, the caliber of evidence, and an assessment of clinical relevance to reach unanimity about each recommendation. Clinical relevance included the deemed importance of the practice in chiropractic, the deemed over- or under-use of the practice in chiropractic, and the deemed importance of reported outcomes (calculated effect sizes were unavailable).

A 5-member panel reviewed a draft set of the treatment evidence syntheses and the treatment recommendations, and advised the GDC about these. The GDC determined with unanimity how to incorporate this advice into the CPG.

3. Results: general (details <http://ccachiro.org/cpg>)

Where applicable, the rating of an evidence extraction or synthesis is cited in parentheses (e.g., {L-4}). Where relevant, the GDC’s interpretations of study results are included as Level 5 (i.e., subjective extrapolation) and cited as such (i.e., {L-5} or {L-5}^{GDC}).

For simplicity, this version of the CPG focuses on evidence syntheses, whereas the technical and the interactive versions of this CPG (<http://ccachiro.org/cpg>) also include all evidence extractions from individual studies. The extractions in those versions report all relevant study outcomes, but the syntheses included here focus on pain and ROM, because these two outcomes were the most consistently reported.

3.1. Treatment evidence

The GDC concluded that this CPG reflects almost all the published, scientific clinical evidence directly addressing the chiropractic cervical treatment of neck pain not due to whiplash. The GDC also concluded that this evidence was not of sufficient scientific quality or scope to “cover” current chiropractic practice comprehensively, although this should not suggest other disciplines are more evidence-based.

No treatment data were drawn from the reviews or the CPGs we found because of a confounding mix of outcome or treatment data from back and neck pain patients, or confounding mix of outcome or treatment data from whiplash and non-whiplash patients. Also, single study results were excluded if they appeared to confound these data. Ultimately, treatment evidence was extracted from 90 studies for the development of treatment syntheses and recommendations (Section 4).

Studies were generally of medium quality, and many abstracts suggested the studies were of much higher quality than their methods illustrated. In general, considerable effort was required to extract pertinent results from needlessly ambiguous articles.

We agreed with others⁸ that a treatment effect size less than 0.5 was clinically unimportant {L-4}, and that an effect size from 0.5 to 0.79 was moderately important, and 0.8 or more, important {L-5}.⁹ The effect size of treatments in the literature was infrequently reported, and where it was, it was usually unimportant or moderately important. Section 7.1 addresses the practical issue¹⁰ of what percentage of improvement in pain on numeric scales is clinically important.

Also, where clearly defined, individual modalities generally differed between studies (e.g., Tables 1 and 2 in the technical version [<http://ccachiro.org/cpg>]) and dramatically reduced our ability to synthesize results across studies into definitive, clinically applicable recommendations.

Thirteen studies^{9–21} reported whether adverse events occurred (Table 2) and 7 studies^{10,17,18,21–24} included placebo comparison groups. Twelve studies^{22,25–35} included a no-treatment comparison group; only for studies in

Table 2: Reported unforeseen-Tx-AEs

Modality*		Treatment combinations																			
Modality used in treatment	Manipulation	yes					yes		yes							yes		yes			
	Mobilization		yes	yes										yes		yes				yes	
	Exercise							yes			yes				yes			yes	yes		
	Home exercise				yes					yes								yes	yes	yes	
	Traction			yes			yes						yes	yes	yes				yes		
	Ischemic pressure																				
	Massage			yes									yes		yes						
	Pillows																				
	Laser								yes				yes								
	TENS										yes										
	Pulsed electromagnetic field					yes															
	Ultrasound			yes																	
	Other		yes	yes			yes		yes	yes				yes	yes		yes			yes	yes
	Unforeseen-Tx-AEs reported	None (references 10–13, 16, 18, 20, 21)																			
Headache (reference 13)																					
Local paresthesia on removal (reference 17)																					
Discomfort (reference 19)																					
Pain or headache or distal paresthesia or dizziness (reference 15)																					
Neck or headache pain (reference 9)																					
Neck pain, headache, pain or paresthesia of arms, dizziness (reference 14)																					
* Where used, education not included in listing.																					

which across-group comparisons were clear^{22,25–30} were we able to conclude that treatments were or were not better than no treatment.

3.2. Risk-management evidence

We were unable to extract useful information from many articles because the results were inconclusive, the conclusions were not self-evident, or the topic was considered outside of the scope of common chiropractic (e.g., interpreting blood assay or bone densitometry results).

We determined that 79 studies or reports were relevant to the hypothetical association between manipulation and dissection. Rated evidence extracted from these supported the development of syntheses and recommendations (Appendix 1).

The well-established predisposing risks for cardiovascular disease, atherosclerosis or stroke were summarized by extracting information from Wolf,³⁶ and those about the well-established physiologic parameters governing exercise treatments were summarized by extracting infor-

mation from Kisner and Colby.³⁷ Of 230 articles about adverse events that did not deal with these 2 topics or dissection, evidence was extracted from 56 and rated, to support the development of syntheses and recommendations (Section 5, Appendix 2).

4. Results: treatment (details <http://ccachiro.org/cpg>)

Studies of *adjustment* were neither excluded nor overlooked. We concluded that studies of adjustment would have been identified in association with the search terms “chiropractic” or “neck pain” if they existed in the literature sources we searched. However, none of the treatment studies reported the outcomes of adjustments per se. All results likely related to this treatment modality were reported as outcomes of *manipulation* or *mobilization*; therefore, this nomenclature has been maintained in this CPG.

The extreme specificity of the studied treatments meant few studies could be generalized to more than a few patients, and, thus, recommendations required our interpretation of the evidence. Therefore, all recommendations should be considered to be our subjective extrapolation, “equivalent” to Level 5 evidence.

The limitations of this CPG reflect the limitations of current published evidence and the deliberate limitation of many recommendations to conclusions that studies directly supported, to the detriment of clinical scope.

Unless otherwise noted:

- The term *effect* does not imply improvement. Many studies compared the effect of treatments across groups, but did not report whether any group showed improvement with treatment; a treatment may have a greater effect than another, but cause no significant improvement in patients.
- The evidence did not clarify if the treatment was better than no treatment, which means that we do not know from the evidence whether a treatment is better than no treatment at all.

This CPG focuses on treatment, and does not explore fully the available systems of assessment, such as those listed in the 2003 summary of pre-manipulative assessment procedures by Hing et al.³⁸ The recommendations in this CPG were made with the caveat that it is each chiropractor’s responsibility to implement the appropriate risk-management procedures when implementing the treatment recommendations.

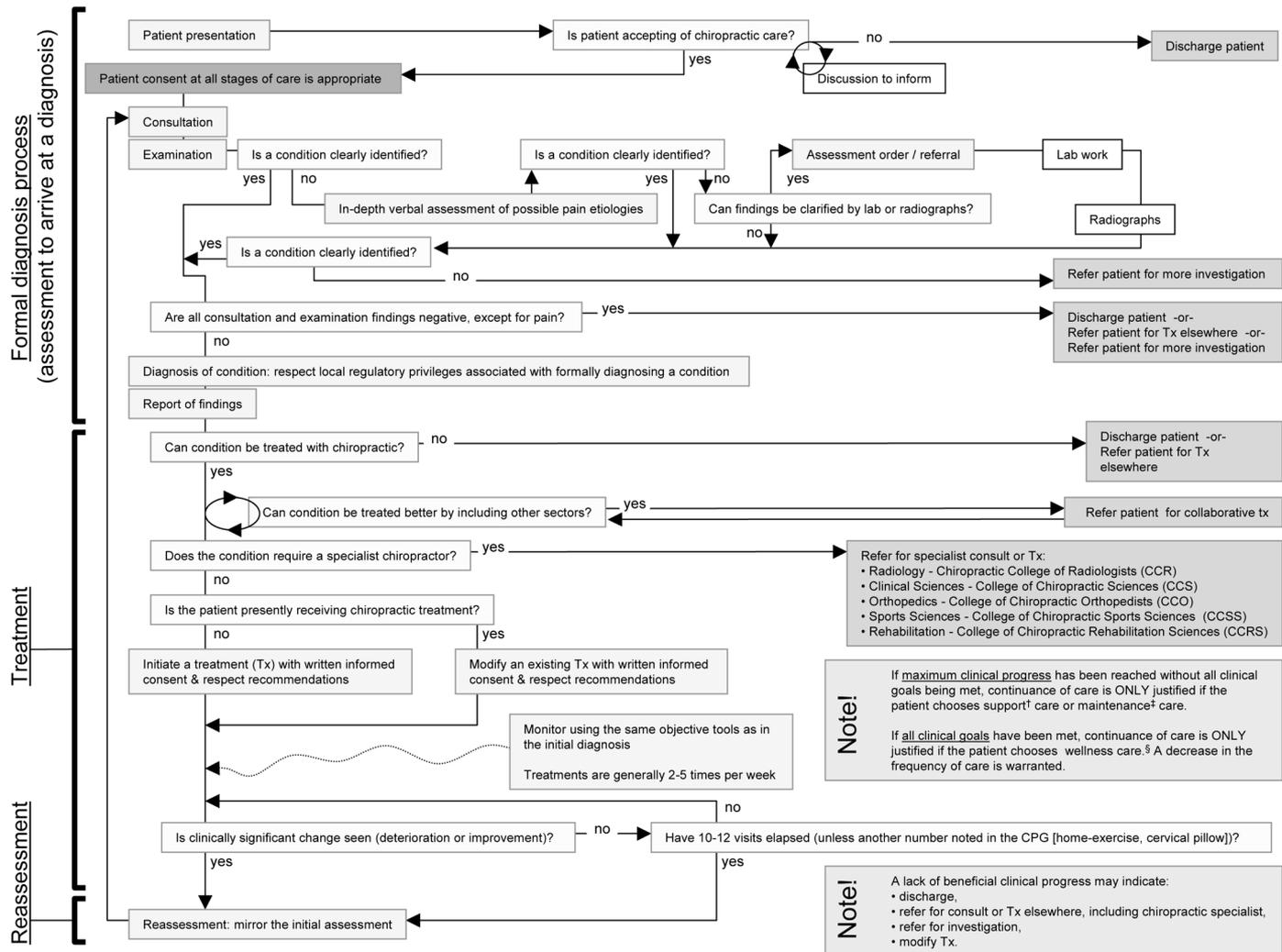
Where relevant, the statements below indicate the modality used and the approximate time effects were measured: immediate (less than a 1 day); short term (1 day to 3 weeks); medium term (3 weeks to 6 months); or long term (more than 6 months). Table 3 in the technical version (<http://ccachiro.org/cpg>) provides details of studies’ specific manipulation techniques, and Table 4 in the technical version (<http://ccachiro.org/cpg>), exercise.

Treatment recommendation 1. Based on all the evidence below, we *recommend* the 3 sequential steps in the decision algorithm (Figure 1) – diagnosis (or assessment leading to diagnosis), treatment, reassessment – to treat patients with acute pain, an acute exacerbation of a recurrent pain, or chronic pain. Similarly, we *recommend* the 3 sequential steps to treat patients with idiopathic pain or pain with an identified cause. The selection and dosages of treatment modalities will differentiate best practices for each unique combination of pain condition and patient. The selection and dosage of treatment modalities should respect recommendation 2.

Treatment recommendation 2. Based on all the evidence below, we also *recommend* manipulation, mobilization, ischemic pressure, clinic- and home-based exercise, traction, education, low-power laser, massage, transcutaneous electrical nerve stimulation (TENS), pillows, pulsed electromagnetic therapy, or ultrasound – for patients with acute or chronic pain, where the origin of pain is known or unknown, to improve pain and some ROM – in dosages and methods based on the practitioner’s experience and the patient’s specific situation, as there is insufficient published evidence to support or refute narrow generalizations about the use of these treatment modalities.

Treatment recommendation 3. Based on all the evi-

Figure 1: Clinical decision algorithm (enlarged version at <http://ccachiro.org/cpg>)



† Support Care: necessary care for patients who have reached maximum therapeutic benefit, and for whom periodic trials of therapeutic withdrawal have led to deterioration and failure to sustain previous therapeutic gains. This form of care is initiated when the clinical problem recurs.⁸²

‡Maintenance Care: elective care given at regular intervals designed to maintain maximum health and promote optimal function. It may incorporate screening procedures designed to identify a risk of developing problems pertaining to the patient’s health status and giving advice about this.⁸²

§Wellness Care: elective care given at regular intervals designed to maintain maximum health and promote optimal function.

dence below, in the absence of objective findings with neck pain not due to whiplash (e.g., ROM, muscle hypertonicity), we *do not recommend* that treatment be initiated. If, after a complete examination, all findings except for pain are normal, we *recommend* discharge of the patient from chiropractic care and, possibly, referral based on the practitioner's experience.

Treatment recommendation 4. Based on all the evidence below, in addition to the details of the 3-step sequence in recommendation #1, if home exercise is prescribed, we *recommend* frequent monitoring of its quality and a reassessment of the quality and effect of the home exercise after 2 to 4 weeks.

Immediate benefit from manipulation. Manipulation immediately improves pain and some ROM {L-4},^{11,39-42} and a single manipulation ipsilateral to the location of pain is immediately better than a contralateral manipulation {L-2b}.⁴¹ See Section 4.2 for the clinical importance of treatments with an immediate effect.

Short- and medium-term benefit from manipulation. Multiple manipulations improve pain in the short {L-4}⁴³⁻⁴⁶ and medium {L-4}^{43,46-48} term, and some ROM in the short {L-4}^{43,44,46,48} and medium {L-4}^{12,43,45-48} term. Manipulations in and opposite the direction of restriction may achieve greater ROM benefit than manipulation only in the direction of restriction {L-2b}.⁴⁴ Also, thoracic manipulations do not enhance the benefits from cervical manipulations in the short term {L-2b}.⁴⁸

Treatment recommendation 5. Based on the short- and medium-term benefit from manipulation, we *do not recommend* crossed bilateral transverse pisiform or anterior thoracic manipulations to be added to a course of cervical manipulations to improve pain and some ROM, unless where required for non-cervical benefits.

Short- and medium-term benefit from manipulation with stretching. Multiple manipulations, each preceded or followed by stretching of neck muscles, improve pain in the short and medium term {L-4};²⁰ stretching either causes the relief or merely adds benefit to manipulation {L-5}.^{GDC} Multiple manipulations with or without {L-2b} stretching improve ROM in the medium term {L-4}.²⁰

Additionally, multiple manipulations may be better than unsupervised stretching {L-4}.⁴⁹

Medium- and long-term benefit from manipulation with 3-point traction. Multiple manipulations with 3-point traction improve pain in the medium and long term {L-4},^{25,26} and are better than no treatment {L-2b}²⁶ {L-4},²⁵ but should be preceded by a detailed disclosure of the risks of the 3-point traction {L-5}.^{GDC}

Immediate benefit from mobilization. A single treatment of short mobilization sessions immediately improves pain {L-4},²² and is better than no treatment for an immediate effect {L-2b} (see Section 4.2).

Immediate benefit from ischemic pressure. Ischemic pressure applied to myofascial trigger points (TrgP) for 90 s immediately improves pain and some ROM {L-4}⁵⁰ (see Section 4.2).

Medium- and long-term benefit from exercise. Ongoing exercise improves: pain in the medium and long term {L-4};¹⁰ pain in the medium term for patients with unidentified conditions {L-4},^{32,51-53} with strength exercise being the most consistently beneficial {L-1b};⁵¹ and pain and some ROM in the medium term for patients with cervical strain, herniated disc, degenerated discs {L-4},⁵⁴ osteoarthritis, or "outset" resulting from minor injuries {L-4}.³¹ The evidence^{27,31,32} is ambiguous about the advantage of exercise over no treatment, but suggests exercise is better than a placebo of clinical contact {L-1b}.¹⁰ It is possible that subjectively perceived benefits such as pain reduction continue well beyond the treatment period, whereas objectively measured benefits do not {L-5}.^{GDC}

Medium- and long-term benefit from intensive or light exercise. Ongoing intensive or light exercise equally {L-2b} improve {L-4} pain in the long term, and intensive exercise is better than light exercise for objective outcomes in the medium term {L-2b}.⁵⁵

Medium- and long-term benefit from exercise with education. Ongoing exercise with education improves pain in the long term {L-4}, but may be less beneficial than more passive treatment that includes medications for patients with cervical spondylopathy, soft tissue rheumatism,

humeral tendinitis, tension neck, cervical syndrome, or rhizopathy {L-5}.⁵⁶ Also, for patients without defined conditions, exercise-education combinations improve worst pain in the medium term {L-4} and have significantly greater effect than education alone {L-2b};⁵⁷ this suggests the critical ingredient in exercise-education combinations is the exercise {L-5}.^{GDC}

Medium- and long-term benefit from exercise with education and home exercise. Ongoing exercise with home exercise and education improves pain and some ROM in the medium^{13,33,34} and long¹³ term {L-4}, and is better than extensive multi-modal treatments without exercise {L-2b}.³⁴

Medium- and long-term benefit from exercise with multi-modal treatments. Ongoing exercise with extensive multi-modal combinations improves pain and some ROM for patients with unspecified conditions in the medium^{35, 58, 59} and long⁵⁸ term {L-4}. It also improves pain and some ROM in the medium term for patients with osteoarthritis, cervical spondylopathy, strain, or cervical disc disease {L-4}.⁶⁰ In an exercise combination, exercise is likely most effective at improving objective outcomes, whereas the other modalities address subjective outcomes {L-5}.^{GDC} There is conflicting evidence whether exercise is better than general medical care for pain in the medium {L-5}^{GDC} and long {L-2b}³³ term. Finally, the addition of more exercise to an exercise combination improves satisfaction and maintained benefit {L-5},^{GDC} but is not as good as extending the scope of the multi-modal treatment {L-4}.⁵⁹ The evidence³⁵ is ambiguous about exercise's advantage over no treatment {L-5}.^{GDC}

Summary exercise benefit statement. Multiple multi-modal treatments are the most effective and exercise, especially intensive exercise, is a critical element {L-5}.^{GDC} Overall, in addition to pain and ROM outcomes, ongoing strength exercise increases strength, ongoing endurance exercise increases endurance, but the outcome of coordination exercise is ambiguous {L-5}.^{GDC} In addition, where it was reported,^{28,31,32,58} exercise was not consistently better than placebo or no-treatment groups {L-5};^{GDC} the propensity for neck pain to resolve on its own may be a confounding factor (see Section 4.1).

Short-, medium- and long-term benefit from home exercise

with or without education or ultrasound. Home exercise may improve pain and some ROM in the medium and long term {L-4},^{29,61} but extensive tailoring of the home exercise to each patient is required {L-5}.^{GDC} Some evidence {L-2b}²⁹ suggests that home exercise may be no better than no treatment for pain or ROM {L-5}.^{GDC}

Home exercise with education or monitoring improves pain and some ROM in the medium term {L-4}.¹⁶

Home exercise with ultrasound improves pain in the short and medium term {L-4}; ultrasound enhances the effect of home exercise alone {L-2b},⁶² but not home exercise with massage {L-5}.^{GDC} However, home exercise with ultrasound is no better than no treatment for pain {L-2b}.²⁸

Treatment recommendation 6. Based on the summary exercise benefit statement and the short-, medium- and long-term benefit from home exercise with or without education or ultrasound, we *do not recommend* generic home exercise designed to improve pain or ROM that is not tailored to the individual patient. We *recommend* tailored home exercise treatment, as rigorous as the patient can tolerate, if a loss of ROM, strength or endurance is found. It can be as frequent as once daily, with its rigor adjusted progressively.

Short- and medium-term benefit from ultrasound. Multiple ultrasound treatments improve pain and some ROM in the short and medium term {L-4}.⁴⁵

Short- and medium-term benefit from low-power laser treatments. Multiple low-power laser treatments improve pain in the short and medium term {L-4},^{21,23} and pain and some ROM in the short term for cervical osteoarthritis patients {L-4}.⁶³ The laser beam shows better results than placebo {L-1b}²¹ {L-2b},²³ which suggests that it causes the improvement {L-5}.^{GDC}

Medium-term benefit from pillows. Use of a cervical pillow during sleep improves pain in the medium term {L-4}.⁶⁴

Treatment recommendation 7. Based on the medium-term benefit from pillows, in addition to the details of the 3-step sequence in recommendation #1, we *recommend* a cervical pillow as a secondary treatment that

should be initiated only after at least one cycle of diagnosis (or assessment leading to diagnosis), treatment and reassessment – and if prescribed, the pillow should be used nightly.

Short- and medium-term benefit from pulsed electromagnetic field therapy. Multiple pulsed electromagnetic field treatments improve pain and some ROM in the short and medium term {L-4}.^{17,18,24} The pulsed electromagnetic field quality of the various vectors used (collar, electrode-points) shows better results than placebo {L-1b}²⁴ {L-2b},^{17,18} which suggests that it is causal {L-5}.^{GDC}

Treatment recommendation 8. Based on the short- and medium-term benefit from pulsed electromagnetic field therapy, in addition to the details of the 3-step sequence in recommendation #1, we *recommend* pulsed electromagnetic field treatment as an adjunctive, secondary treatment that should be initiated only after at least one cycle of diagnosis (or assessment leading to diagnosis), treatment and reassessment.

Immediate, medium- and long-term benefit from multi-modal treatments. Multi-modal treatments improve pain and some ROM in the medium and long term {L-4};^{13,15,19,34,65} there is no discernable difference between combinations as long as they include home exercise, education, traction, 1 other secondary modality, and either manipulation, mobilization or clinic-based exercise {L-2b}.¹³

A single multi-modal treatment improves pain or pain and some ROM immediately {L-4}.⁵⁰ For example, one treatment of a 20-min hot-pack, active ROM, interferential current, and myofascial release (role of ischemic pressure undefined) is the first choice of 6 options of multi-modal treatments using secondary modalities to improve immediately: pain intensity, pain pressure tolerance, and pressure point thresholds (PPT) {L-5}^{GDC} (see Section 4.2). The 6 treatments, from most effective to least, are:

- 20-min hot-pack, active ROM treatment, interferential current, myofascial release;
- 20-min hot-pack, active ROM treatment, stretch-and-spray, TENS;
- 20-min hot-pack, active ROM treatment, stretch-and-spray;

- 20-min hot-pack, active ROM treatment, ischemic pressure, TENS;
- 20-min hot-pack, active ROM treatment, ischemic pressure;
- 20 min hot-pack, active ROM treatment.

No additional benefit from magnets in necklaces. It is nearly certain that magnetic necklaces are no better than non-magnetic necklaces to improve pain in the short term {L-1b}, although improvement in pain follows the wearing of both {L-4}.⁶⁶

Treatment recommendation 9. Based on no additional benefit from magnets in necklaces, we *do not recommend* permanent magnet necklaces to improve pain, specifically because the monetary and lifestyle costs of a magnetic necklace do not appear to be counter-balanced by a clinical benefit.

No benefit from education or relaxation alone. Education alone does not improve pain^{51,57} or ROM⁵⁷ in the medium term {L-4}. Relaxation treatments are equal {L-2b} to advice to be active, in not improving pain or ROM in the medium or long term {L-4}.²⁷

Treatment recommendation 10. Based on no benefit from education or relaxation alone, we *do not recommend* education or relaxation alone to improve pain or ROM.

No immediate benefit from head retraction-extension exercise combinations alone. Head retraction-extension exercise combinations do not immediately improve pain {L-4}.³⁰

Treatment recommendation 11. Based on no immediate benefit from head retraction-extension exercise combinations alone, we *do not recommend* head retraction-extension exercise combinations to improve pain.

No immediate benefit from occipital release treatments alone. Occipital-release treatments do not immediately improve pain {L-4}.³⁰

Treatment recommendation 12. Based on no immediate benefit from occipital release treatments alone, we

do not recommend occipital release treatments to improve pain.

4.1. Natural history of neck pain

Men and women may experience neck pain differently. More men have acute pain, whereas more women have chronic pain.⁶⁷ Men also gain more pain relief from chiropractic treatment.⁶⁸ We agree with at least five reports^{69–73} that pain is consistently associated with functional loss (e.g., altered patterns of neck muscle activation, reduction in strength and endurance) {L-5}, which may be without outwardly obvious structural change such as degenerative disease {L-2c}.⁷⁴

Acute neck pain in adults is generally regarded to be self-resolving. One report⁷⁵ on patients with acute and chronic back disorder suggested that 90% of neck or back pain cases had self-resolved at 6 weeks {L-5}, corroborating another report.³⁴ Also, a review⁷⁶ on patients with neck pain suggested that more than 50% of patients experience a decrease in pain 2 to 4 weeks after onset and 80% will be asymptomatic in 2 to 3 months {L-5}. Another study suggested that patients (defined as chronic) who spent 16 weeks on a waiting list for physiotherapy experienced improved pain, cortical control, and 6 of 22 elements on an examination and physiologic test index {L-4}.³³

We caution that there can be a structural or functional detriment associated with some patients' pain, and we agree with at least one author⁶⁹ that the resolution of the pain may not signal a complete resolution of the detriment {L-5}. Specifically for these patients, even if treatment does not result in a faster or greater improvement in pain, good treatment will also address non-pain problems, which left untreated, may have permanent sequelae {L-5}.^{GDC} This justifies treatments that are expected to show less or slower improvement than the expected natural history of the treated pain in these patients {L-5}.^{GDC}

Authors of a Saskatchewan study⁷⁷ suggested that complete resolution of pain or disability is difficult to achieve (treatment status undefined) {L-2c}, and other authors reported that half of patients treated with primary care did not experience complete resolution after 1 year⁷⁸ or 5 years⁷⁹ (specific treatment type or consistency over the period undefined) {L-2c}. For patients whose pain is not self-resolving, we agree with at least 3 reports^{68,80,81} that there may be a treatment opportunity to halt the evolution

of acute pain to a chronic condition {L-5}, perhaps specifically for patients predisposed to chronic pain for non-pathologic reasons (low self-rated health and high levels of psychological stress) {L-5}.⁸⁰ Therefore, we concluded that good practice does not universally mean waiting to find out whose pain resolves, and whose does not, before proceeding with treatment {L-5}.

We therefore recommend:

Treatment recommendation 13. We do not recommend treatments that are expected to show less or slower improvement than the expected natural history of the treated pain in a particular patient, unless: a) the treatment also addresses non-pain problems that, left untreated, may have permanent sequelae, or b) it is deemed that treatment will halt the evolution of acute pain to a chronic condition.

Treatment recommendation 14. If maximum clinical progress has been reached without all clinical goals being met, we *recommend* continuing care only if the patient chooses support or maintenance care. If all clinical goals have been met, we *recommend* continuing care only if the patient chooses "wellness" care.

In the recommendation above; Support Care means the necessary care for patients who have reached maximum therapeutic benefit, and for whom periodic trials of therapeutic withdrawal have led to deterioration and failure to sustain previous therapeutic gains. This form of care is initiated when the clinical problem recurs.⁸² Maintenance Care means elective care given at regular intervals designed to maintain maximum health and promote optimal function. It may incorporate screening procedures designed to identify a risk of developing problems pertaining to the patient's health status and giving advice about this.⁸² Wellness Care means elective care given at regular intervals designed to maintain maximum health and promote optimal function.

4.2. The role of focusing on immediate clinical outcomes

Seven treatment studies^{11,22,39–42,50} focused on improved pain or ROM immediately after a single treatment. These treatments do not reflect a typical treatment plan. However, it is our understanding that an immediate post-treatment reduction in pain or increase in ROM suggests

that the particular patient's pain or ROM responds to the treatment and that subsequent treatments will reap further short-, medium- or long-term benefits {L-5}.

In addition, we consider that a legitimate role for a single treatment that provides an immediate relief of pain, if administered without temporarily increasing pain, is to permit another intervention that would otherwise be too painful for the patient to bear {L-5}.

Treatment recommendation 15. We recommend the planned one-time use of a treatment specifically and only to determine the utility of further treatments or to permit the immediate use of an otherwise painful intervention, both purposes therefore requiring an immediately-subsequent patient assessment. Thus, we do not recommend the planned one-time use of a treatment to merely achieve an immediate clinical effect.

4.3. Multi-sectoral care

A key to successful chiropractic treatment appears to be integrated care that accommodates clinical sectors that may fall outside of some chiropractors' practice. For example, unimodal and multimodal treatments that incorporate behavior modification^{16,29,83} or pharmacologic interventions^{12,19,56,62,75,83-92} have shown benefit. It is our understanding that integrated care means the integration of all modalities of treatment into an optimal care plan for a particular patient, including those chiropractic modalities supported by the evidence that is the foundation of this CPG {L-5}.

Treatment recommendation 16. We recommend a concerted effort to mesh chiropractic care into that of other health disciplines to maximize patients' gains from their chiropractic treatments (recovery from pain, impairment and disability, reduced costs, increased patient safety, increased satisfaction among patients and health care payers).

5. Results: managing the risk of adverse events (details <http://ccachiro.org/cpg>)

The caliber of most studies in Section 5 was Level 5 (subjective extrapolation or observation, frequently based on a case study) and only a very few being Level 3 or better. Also, in general, the statistical significance of adverse event data was not reported. The results in Section 5 are of Level 5 caliber unless otherwise noted.

The treatment section (Section 4) of this CPG was based almost exclusively on evidence from the literature; recommendations did not extrapolate beyond what the evidence clearly supported (except for the algorithms). To accommodate the caliber of research in Section 5, we relied on a greater level of the GDC's (unpublished) practice expertise and cited it accordingly ({L-5}^{GDC}).

Chiropractic regards the objective and subjective balance of benefits and the risk of adverse events to be especially important. The direct benefits of the treatment recommendations are expected to include those reported in the studies cited in Section 4, and reduced sick days and increased strength, endurance, flexibility, QoL, and ease of activities of daily living (ADL) – see technical version at <http://ccachiro.org/cpg> for details. Counter-balancing these benefits is the risk of adverse events.

For clarity, adverse events can be considered to be of 3 types:

- adverse events (AE) not associated with a treatment modality, but that occur in the clinical setting (non-Tx-AE);
- adverse events associated with a treatment modality, but not a known or observable risk factor (unforeseen-Tx-AE);
- adverse events associated with a treatment modality and predicted by an observable risk factor (foreseen-Tx-AE).

These delineations are not static; for example, an adverse event that is associated with a treatment modality,

but not predicted by a risk factor, may progress to being so (predicted by a factor) once this has been identified.

We deem that it is a chiropractor's responsibility to understand and address all three types of adverse events (non-Tx-AE, unforeseen-Tx-AE, foreseen-Tx-AE) {L-5}.

Determination of the appropriate clinical response to an adverse event associated with a treatment, or to the relevant risk factor, is complicated by the manual nature of many chiropractic therapies. The risk of harm following treatment depends directly on the skill of the chiropractor {L-5}.^{GDC} Jagbandhansingh⁹³ echoed this conclusion in a 1997 review of USA malpractice claims: "Chiropractic care in itself may not pose a clinical risk. However, treatment in association with lack of good professional judgement [or] failure to properly assess a patient's condition may" (p. 64).

Risk-management, recommendation 17: To manage the risk of adverse events associated with a treatment modality, if a chiropractor is uncertain about the caliber of any aspect of his or her technique with a particular patient, we *very strongly recommend* discontinuance of care and referral to colleagues until this is addressed.

5.1. Managing the risk of adverse events not associated with a treatment modality, but that occur in the clinical setting (non-Tx-AE)

Chiropractors receive patients from all sectors of the population and may encounter any of the health problems that afflict everyone. Indeed, chiropractic patients are likely disproportionately ill compared with the general population. Côté et al.⁹⁴ reported that Saskatchewan patients seeking chiropractic care frequently presented with a wide array of serious comorbidities {L-2c}, such as heart disease.

When undiagnosed, these health problems may precipitate a non-Tx-AE before, during or after a treatment. Reports have described patients seeking care for symptoms treatable with chiropractic, but who have undiagnosed ailments outside of the scope of practice. For example: the symptoms of various pathologies, such as systemic lupus erythematosus, Bornholm disease,⁹⁵ neoplasms^{95,96} (osteoblastoma),⁹⁷ cervical fracture,⁹⁸ or internal carotid artery dissection⁹⁹ (ICAD) can mimic mechanical neck pain; the symptoms of myocardial infarct (MI) can masquerade as neck pain¹⁰⁰ (and vice versa);¹⁰¹ seizures or

transient ischemic attacks (TIA) can mimic migraines;¹⁰² neck and jaw pain can result from Marfan syndrome without spinal involvement;¹⁰³ undetected septic arthritis can be harbored in patients complaining of joint pain while taking glucocorticosteroid therapy;¹⁰⁴ and pain coincident with trauma can be paralleled by undetected cervical fractures,¹⁰⁵ or (later) acute respiratory distress syndrome (ARDS) leading to death.¹⁰⁶ Comorbidities can also be missed when overt signs are present, as when surface lesions in acute scalp lymphangitis indicated an untreated infection masquerading as cervical pain in at least one case.¹⁰⁷

Attempts to systematically address the identification of serious comorbidities in advance of care may include using a 15-item self-report tool developed by Côté et al.⁹⁴ It is our understanding that a set of 15 presenting symptoms (adapted from McMillin)¹⁰⁸ should raise suspicion that the presenting cervical pain is not of mechanical origin {L-5}:

1. Trunk or lower extremity neurologic symptoms, especially long-tract signs.
2. Bilateral upper extremity pain.
3. Remote symptoms with neck movements (lower extremity).
4. Signs of sphincter dysfunction, bowel or bladder dysfunction or incontinence.
5. Fever, unrelenting nocturnal pain, weight loss, chronic fatigue.
6. Recent infection or surgery.
7. Polyarthralgia.
8. Dysphagia.
9. Nuchal flexion or extension rigidity, especially in the absence of trauma.
10. Cranial neurologic deficit or central nervous system symptoms.
11. Cervical pain related to general exertion (i.e., after climbing stairs).
12. Symptoms unchanged or progressive, despite previous functional management.
13. Onset of cervical pain associated with direct head trauma, loss of consciousness.
14. Sudden onset of cervical pain without trauma or incident.
15. Neck or occipital pain with a sharp quality and severe intensity, or severe and persistent headache,

which is sudden and unlike any previously experienced pain or headache (see Section 5.3.1).

When a relevant comorbidity or a non-Tx-AE is noted, chiropractors have a responsibility to act in the best interest of their patients by immediate consideration of the situation, and referral to the appropriate healthcare resource as necessary.

Risk-management, recommendation 18: Before, during or after treatment, we *recommend* immediate, in-depth consideration of possible explanations, and reconsideration of treatment options or referral to the appropriate health services when an adverse event (not known to be associated with a treatment) is noted; i.e., when a patient demonstrates signs or symptoms of an undiagnosed condition, or signs or symptoms not known to be associated with a treatment.

5.2. Managing the risk of adverse events associated with a treatment modality, but not a known or observable risk factor (unforeseen-Tx-AE)

Managing the risk of unforeseen-Tx-AEs involves reacting appropriately if an event is noted. By definition, an unforeseen-Tx-AE follows the administration of a particular treatment, but there are no known factors differentiating patients at greater risk from others.

Thirteen⁹⁻²¹ of the treatment studies reported about unforeseen-Tx-AEs (Table 2). Reports ranged from none^{10-13,16,18,20,21} to those considered minor and self-resolving among a small fraction of study subjects,^{14,15,16} or minor.^{9,19} The worsening of symptoms with treatment was also reported,^{9,10,14,64} but it was not possible to determine if this was as a result of treatment failure or an unforeseen-Tx-AE.

Richardson et al.¹⁰⁹ reported that about half of 98 patients had “some discomfort” following a 4-week trial of TENS {L-4}. About one-fifth had “unpleasant sensations” at or away from the TENS site, and a smaller number had headaches, muscle aches, nausea, bad temper, or dizziness. A systematic review¹¹⁰ {L-1a} concluded that in a minority of patients, high-frequency (HF) TENS could cause skin rash whereas low-frequency (LF) TENS could cause a burning sensation over the area of electrodes, and HF-TENS or LF “train TENS” could cause skin irritation {L-5}.

Regarding manipulation; benign and transient unforeseen-Tx-AEs, or none, have been reported in a recent systematic review,¹¹¹ a comprehensive study¹¹² of more than 250 subjects, a prospective survey of 1, 058 patients,¹¹³ a prospective survey of 465 patients,¹¹⁴ and 2 extensive literature reviews.^{115,116} In their 2003 study, Hurwitz et al.¹¹² reported that “No serious complications from spinal manipulation or manual treatment have been reported ... [in] any of the published clinical trials involving [spinal] manipulation or mobilization” (p. 21).

Hurwitz et al.¹¹² suggested that manipulation conferred a greater risk than mobilization for benign, transient unforeseen-Tx-AEs that usually occur within 24 hours of treatment {L-5}.

Indeed, about 5 of every 100 patients treated with manipulation will feel “very noticeable” discomforts, whereas about 20 will feel moderate discomfort, and about 15 will feel slight discomfort {L-4}.¹¹⁷ This total of affected patients (40 of 100) approximates the 34% to 55% estimate by Cagnie et al.¹¹⁴ In more than 80% of these cases, discomforts disappeared within 24 hrs, and in more than 85%, discomforts occurred on the day of the manipulation {L-4}.¹¹⁷

Rare, unforeseen-Tx-AEs include spinal cord compression, facet edema, disk herniation,¹¹⁶ long thoracic nerve palsy,¹¹⁸ ruptured cervical discs,¹¹⁹ and diaphragm paralysis related to phrenic nerve trauma.¹²⁰ In addition, women and younger patients (27 to 46 years) have reported more complaints {L-2c}.¹¹³

Risk-management, recommendation 19: During or after treatment, we *recommend* heightened vigilance for adverse events associated with a treatment modality, but not a known or observable risk factor (unforeseen-Tx-AE) when a relevant treatment is planned or administered – and immediate, in-depth consideration of possible explanations, and reconsideration of treatment options or referral to the appropriate health services when an event is noted.

Without considering the issue of dissection, patient differences in susceptibility to adverse events related to manipulation are apparent (being female, being older, smoking, regular medication use, history of migraine) {L-4}.¹¹⁴ However, we agree with the conclusion suggested by the results of Cagnie et al.¹¹⁴ that these risk fac-

tors have not been consistently predictive, and we question their clinical utility {L-5}.

5.3. Managing the risk of adverse events associated with a treatment modality and predicted by an observable risk factor (foreseen-Tx-AE)

Managing the risk of foreseen-Tx-AEs involves respecting risk factors and reacting appropriately if an adverse event is noted.

We extracted a list of factors from the risk management literature we found (more than 6,774 citations, more than 309 relevant articles), which likely constituted all reported foreseen-Tx-AEs. This list reflected our understanding of each relevant study's determination of whether, strictly within the context of the study, the factor was a contraindication to the studied treatment modality, or merely indicated a requirement for caution {L-5}.^{GDC}

We concluded that most of the contraindications we had listed were likely not contraindications outside of the specific study context or with patients other than the studied cases {L-5}.^{GDC} Many of the comorbidities Côté et al.⁹⁴ reported in their survey of 1,131 Saskatchewan patients seeking chiropractic care {L-2c} were considered contraindications in this list. These included arthritis (26.8% of patients seeking a chiropractor only, 50% of patients seeking a chiropractor and medical physician), cardiovascular disease (12.2%, 25%) and significant depressive symptoms (22.5%, 38.5%). Most of the ailments that mimic mechanical pain for which patients may seek chiropractic treatment (Section 5.1) were also considered contraindications in this list: systemic lupus arthymetous, Bornholm disease⁹⁵ or neoplasms^{95,96} (osteoblastoma),⁹⁷ seizures, TIAs,¹⁰² Marfan syndrome,¹⁰³ undetected septic arthritis,¹⁰⁴ and cervical fractures.¹⁰⁵

With most patients presenting with one or more of the factors we listed as a contraindication or caution, we deem that best practice rests on differentiating these factors into *absolute contraindications* (Section 5.3.1), *factors requiring modification of a desired treatment modality* (Section 5.3.2), or *factors suggesting caution* (Section 5.3.3).

Risk-management, recommendation 20: We recommend respecting the absolute contraindications listed in Tables 3a to 3h, and the best-practice patterns of absolute contraindications, treatment modality modifica-

tion and caution described in Sections 5.3.1, 5.3.2 and 5.3.3 of this CPG.

5.3.1. Risk factors that are absolute contraindications

Where a risk factor signals a contraindication to an effective treatment modality, we deem that best practice comprises discontinuing care and immediate referral to emergency health services, or merely discontinuing the modality and an in-depth consideration of alternative modalities or referral.

Barring obvious medical emergencies (e.g., onset of myocardial infarct), we identified only 3 risk factors that are absolute contraindications that require immediate discontinuance of care and referral to emergency health services in the course of care: 1) at least 1 of 4 signs or symptoms of neurovascular impairment (unilateral facial paresthesia, objective cerebellar signs, lateral medullary signs, visual field defects), or other signs or symptoms of neurovascular impairment with unknown cause; 2) neck or occipital pain with a sharp quality and severe intensity that is sudden and unlike any previously experienced pain (even when it is suspected the pain is of a musculoskeletal or neuralgic origin); and 3) severe and persistent headache that is sudden and unlike any previously experienced headache (even when it is suspected the pain is of a musculoskeletal or neuralgic origin) {L-5}.^{GDC} These are absolute contraindications to all treatment modalities {L-5}.^{GDC}

All other risk factors we identified as absolute contraindications require merely discontinuing a specific treatment modality, and considering alternative modalities or referral.

Tables 3a to 3h list absolute contraindications based on evidence extracted from the articles we found. Tables 3a to 3h extensively incorporate the GDC's (unpublished) practice expertise, and the Tables are thus of a Level 5 caliber.

In Tables 3a to 3h, conditions or syndromes are not expected to be diagnosed within the scope of chiropractic practice, unless otherwise noted. All other definitions cited in this CPG apply.

5.3.1.1. Risk factors that are absolute contraindications to an HVLA manipulation can also be absolute contraindications to a manipulation that is not HVLA or mobilization

Tables 3b and 3c list risk factors that are absolute con-

traindications to manipulation when defined as a high velocity, low amplitude (HVLA) thrust. The principle behind these absolute contraindications is that aspects of administering the manipulation (e.g., force, direction, amplitude, velocity, patient position, frequency, duration, location of treatment) may exacerbate the risk factor or other adverse events made possible by the factor (e.g., thrombi “resting” in a cervical aneurysm may be dislodged by an HVLA thrust and ascend to the brain, osteoporosis in the cervical vertebrae may weaken bone to the point where an HVLA thrust will cause fracture).

Manipulation that is not HVLA or mobilization are generally considered by the profession to be potential options where an HVLA thrust is contraindicated {L-5}.^{GDC} However, we deem that where it is the mere movement of neck tissues that causes a risk factor to be an absolute contraindication to an HVLA thrust, manipulation that is not HVLA or mobilization are equally contraindicated by this factor {L-5}. We consider that it is a practitioner’s responsibility to acquire the practice experience and expertise to identify which factors are risks because of the mere movement of neck tissues {L-5}.

5.3.2. Risk factors that require treatment modality modifications

Compiling a list of all risk factors requiring modification of a desired treatment modality was beyond the scope of this CPG. Essentially every characteristic of a patient constitutes a factor; chiropractic uses treatment modalities specifically tailored in innumerable ways to each patient’s needs. This flexibility of treatment greatly expands

treatment possibilities, allowing, for example, forceful or non-forceful maneuvers, or tangential or direct segment application.

Where a risk factor does not signal a contraindication to a treatment modality, but does signal a specific tailoring of the desired modality, we deem that best practice comprises a systematic approach to modifying the administration of the modality; the risk factor signals a “modality modification.”

Table 4 lists the aspects of core treatment modalities that we concluded should be considered by practitioners when faced with a modality-modifying risk factor, in the context of their practice experience and expertise {L-5}. Our literature search did not reveal any evidence supporting or refuting this list, and thus Table 4 incorporates solely the GDC’s (unpublished) practice expertise.

5.3.3. Risk factors that require treatment caution

Compiling a list of all risk factors requiring caution in treatment was beyond the scope of this CPG. Essentially, caution should always be exercised as part of good practice {L-5}.^{GDC} Thus, this CPG specifically identifies factors where we concluded there was a lack of clarity between these factors and those that indicate modality modifications or absolute contraindications {L-5}. Table 5 summarizes these “caution-indicating” risk factors.

We define caution as proceeding with a particular treatment modality only after an assessment that is as thorough as possible indicates the risk with administering this modality is not exacerbated.

Table 3a: Risk factors that are absolute contraindications to all chiropractic cervical treatment

Risk factor in area of neck unless otherwise noted or not relevant...	Adapted from reference #
Obvious medical emergencies (e.g., onset of myocardial infarct)	–
In the course of care – 1 of 4 listed (see text) signs or symptoms of neurovascular impairment or any other signs or symptoms of neurovascular impairment with unknown cause – Neck or occipital pain with a sharp quality and severe intensity that is sudden and unlike any previously experienced pain (even when it is suspected the pain is of a musculoskeletal or neuralgic origin) – Severe and persistent headache that is sudden and unlike any previously experienced headache (even when it is suspected the pain is of a musculoskeletal or neuralgic origin)	Appendix 1

Table 3b: Risk factors that are absolute contraindications to cervical manipulation (and possibly mobilization)

Risk factor (occurs or has its effect in the neck unless otherwise noted) <i>READ TEXT SECTION 5.3.1.1 TO INTERPRET PROPERLY</i>	Contraindicates manipulation in area of...	Adapted from reference #
History of cervical artery dissection	neck	Appendix 1
Active or existing VAD or CAD	neck	
Active cervical spine cord injury	neck	Appendix 2
Symptomatic, significant, extracranial carotid stenosis	neck	
Acute cardiac disease (e.g., unstable angina, atrial fibrillation, stages 3 or 4 congestive heart failure [both atria involved], acute MI, atrial fibrillation)	neck	
Cardiac abnormalities that predispose to thrombus formation, because of potential for thrombi to be present in cervical arteries	neck	
Contact with integumentary lesions	region*	107
Active inflammatory arthritides	region	95, 135, 195–197
Mediolytic arteriopathy with widespread mucoid degeneration and cystic transformation of the vascular wall (caused by segmental degeneration of smooth muscle cells of the tunica media)	neck	198
Patient positioning cannot be achieved because of pain or resistance	neck	95, 135
Known malingering	neck	196
Somatoform disorder with no physical involvement	neck	196
Hypochondriasis without a legitimate complaint	neck	196
Neurologic difficulties or symptoms	neck	135, 198
Evidence of involvement of spinal nerve root caused by space occupying lesions	neck	135
Cervical myelopathy	neck	135
Pathology resulting in bone/joint/ligament weakening/malformation (e.g., osteogenesis imperfecta), including iatrogenic syndromes (e.g., those caused by prolonged corticoid use) ^{95,135}	region	39, 93, 95, 135, 195, 196, 199–202
Moderate or severe (involves rupture/tears of ligaments/muscles/tendons) sprains and strains	region	196
Acute or unhealed cervical spine fracture	neck	98, 119, 195, 203, 204
Infection (e.g., discitis, osteomyelitis, tuberculosis) localized to the neck	neck	95, 135, 195, 196
Congenital disorders leading to instability of the involved area (e.g., dysplasia, unstable os odontoideum)	region	135, 205
Obvious misalignment of greater than 3 mm of translation	region	195
Ossification of the posterior longitudinal ligament	region	195

Miscellaneous		
Malignant thyroid tumors (to avoid metastases)	neck	196
Malignancy involving the cervical spine	neck	95
Hereditary disorders of connective tissue (Ehlers-Danlos Type III, Marfan syndromes)	neck	103, 206, 207
Chronic calcium deposit in the cervical musculature	neck	208
Gout	region	95
Failed back surgery syndrome (FBSS) related segment fusion or instability	region	209
* Area of involvement of the factor, as estimated by the practitioner based on practice experience and expertise.		

Table 3c: Risk factors that can be absolute contraindications to cervical manipulation in specific circumstances (and possibly to mobilization), or may merely require modality modification based on a learned practitioner’s practice experience and expertise

Risk factor (occurs or has its effect in the neck unless otherwise noted)	Adapted from reference #
<i>READ TEXT SECTION 5.3.1.1 TO INTERPRET PROPERLY</i>	
Anticoagulant use	95, 135, 201
Neurologic symptoms in a lower limb	95
Spinal cord compression	135
Nerve root compression with increasing neurological deficit	95, 135
Vascular difficulties	95, 135, 180, 196, 201, 207, 210–212
Clotting disorders	196
Anatomical variations from the norm of the vertebral arteries	212
Prior trauma to the vertebral arteries	180
Atherosclerosis (e.g., atherosclerotic plaque in carotid artery)	196, 213
Adverse reactions to previous manual therapy (e.g., pain)	115
Inability of patient to relax	95
Presence of spasm “protecting” target segment	95
Poor psychological well-being without referral to psychology	214
Pain intolerance	196
Cervical spine trauma	99, 135, 196, 215
Anteroposterior spinal canal stenosis of 11 mm or less	195

Table 3d: Risk factors that are absolute contraindications to cervical exercise

Risk factor (occurs or has its effect in the neck unless otherwise noted)	Adapted from reference #
<p>With ROM exercise</p> <ul style="list-style-type: none"> – inflammation resulting from motion <p>With resistance exercise (static/dynamic, weight-bearing/non-weight-bearing, manual/non-manual not differentiated [see original text])</p> <ul style="list-style-type: none"> – unstable joint involved in movement – unhealed fracture proximal to exercise site <p>With Aquatic exercise</p> <ul style="list-style-type: none"> – incipient cardiac failure, unstable angina, respiratory vital capacity less than 1 liter, severe peripheral vascular disease, danger of bleeding or hemorrhage, severe kidney disease, larger open wounds (e.g., colostomy), skin infection (e.g., ringworm), incontinence, water or air vector infectious disease (e.g., influenza, poliomyelitis), uncontrolled seizures 	37

Table 3e: Risk factors that can be absolute contraindications to cervical exercise in specific circumstances, or may merely require modality modification based on a learned practitioner’s experience and expertise

Risk factor (occurs or has its effect in the neck unless otherwise noted)	Adapted from reference #
<p>With ROM exercise- pain on motion</p> <p>With resistance exercise (static/dynamic, weight-bearing/non-weight-bearing, manual/non-manual not differentiated [see original text])</p> <ul style="list-style-type: none"> – joint or muscle pain during un-resisted movement – muscle pain during resisted isometric contraction – pain that is not eliminated by resistance exercise – inflammatory neuromuscular disease – inflammation of an involved joint – severe cardiopulmonary disease – dizziness, “unusual or precipitous” shortness of breath during exercise – deficits undermining exercises (e.g., impaired mobility, balance, coordination) 	37

Table 3f: Risk factors that are absolute contraindications to cervical traction

Risk factor (occurs or has its effect in the neck unless otherwise noted)	Adapted from reference #
Marked ligament insufficiency or segmental instability	95
Dizziness, nausea or feeling “sick” after traction	95
Spondylotic cervical myelopathy	95
Acute and active inflammatory arthritides	216
Pathology causing thrombi in the cervical vasculature at points compressed by the traction apparatus, which may thereafter be released	217

Table 3g: Risk factors that can be absolute contraindications to cervical traction in specific circumstances, or may merely require modality modification based on a learned practitioner’s experience and expertise

Risk factor (occurs or has its effect in the neck unless otherwise noted)	Adapted from reference #
Herniated cervical discs	218
Patient cannot relax	95

Table 3h: Risk factors that are absolute contraindications to cervical low-level laser therapy

Risk factor (occurs or has its effect in the neck unless otherwise noted)	Adapted from reference #
Cardiovascular disease, hypertension, coagulopathy, ulcer, recent severe hemorrhage, renal insufficiency, severe hepatic disease, neoplasia, epilepsy, cutaneous pathology, pain of “central” origin, pregnancy	21

Table 4: Aspects of treatment modalities that should be considered to tailor treatment in response to modality-modifying risk factors

Aspects of modality that may reduce risk from risk factors		Aspects of modality that may reduce risk from risk factors	
Manipulation (HVLA)		Exercise	
	Force		Repetition
	Direction		Intensity
	Amplitude		Frequency
	Velocity		Duration
	Patient position		Weight
	Frequency		Exertion
	Duration		Type
	Location of treatment	Traction	
Mobilization			Direction of force
	Force		Harness
	Direction		Weight
	Amplitude		Frequency
	Velocity		Duration
	Patient position		Manual vs mechanical
	Frequency		Intermittent vs continuous
	Duration	Electro-therapies	
	Location of treatment		Intensity
Ultrasound			Duration
	Intensity		Frequency of care
	Duration		Type of current or wave
	Wave frequency		
	Frequency of care		
	Duty cycle		

Table 5: Risk factors requiring treatment caution

<p>Conditions or syndromes noted below are not expected to be diagnosed within the scope of chiropractic practice.</p> <p>An exhaustive list of cautions is beyond the scope of this CPG, and practitioners are expected to apply their expertise to ensure that other factors known to require caution are respected (e.g., stroke risk factor of hormonal birth control).</p>
<p>Dissection-related risk factors (details Appendix 1)</p> <ul style="list-style-type: none"> – Presentation of trauma, a smoking habit, or known arterial tissue abnormalities. – Presentation of signs or symptoms of VBI (nystagmus, nausea, numbness, diplopia, drop attacks, dysphagia, dysarthria, and ataxia), differentiated from BPPV based on symptom assessment. – Report of a recent (but not ongoing) neck or occipital pain with a sharp quality and severe intensity, or a severe and persistent headache, which was sudden and unlike any previously experienced pain or headache (even when it is suspected the pain was of a musculoskeletal or neuralgic origin).
<p>Stroke risk factors (details Appendix 2)</p> <ul style="list-style-type: none"> – Cannot be changed <ul style="list-style-type: none"> – advanced age – sex (male) – ethnicity (African American) – diabetes mellitus – family history of stroke – increased plasma fibrinogen level – migraines – Can be directly addressed <ul style="list-style-type: none"> – cigarette smoking – sedentary lifestyle – hyperhomocysteinemia (details, Section 2.1 of Appendix 2) – increased serum total cholesterol or low high-density lipoprotein (not consistently) – central or abdominal obesity – supra-moderate alcohol consumption

Table 6: Risk factors for stroke requiring modification of manipulation or mobilization

<p>Higher than optimal blood pressure (120/80 mm Hg [systolic/diastolic], particularly > 140/90 mm Hg)</p> <p>History of stroke or TIA</p> <p>Being medically treated for lupus</p>
--

In the context of good practice always involving caution, the clinical importance of the above is that in some cases this assessment will lead to the conclusion that a risk factor initially indicating caution is, in truth, an indicator for modality modification (Section 5.3.2) or a contraindication (Section 5.3.1). For example, with thorough assessment, multiple caution-indicating risk factors presenting in a patient may (together) indicate modification of, or a contraindication to the desired treatment modality.

6. Results: research recommendations (details <http://ccachiro.org/cpg>)

6.1. Compared groups

The GDC embarked on creating this CPG believing there was a large base of scientific studies available. The GDC has concluded from its work translating the results of these studies into a set of concise recommendations, and agrees with others' conclusions,^{120,121} that the scientific base for chiropractic cervical treatment of neck pain is not of sufficient quality or scope to "cover" current chiropractic practice comprehensively, although this should not suggest other disciplines are more evidence based. In addition, the specificity of the studied treatments meant few studies could be directly generalized to more than a minority of patients.

We concluded that the result was an imbalance in the quantity and quality of our treatment evidence; that is, some infrequently used treatments have greater prominence than their use in practice warrants (e.g., 3-point traction, pulsed electromagnetic fields), and some frequently used modalities are not dealt with clearly and directly. Ultimately, this likely means that the clinical usefulness of the evidence and recommendations may be lower than we would like.

Research, recommendation 21. We very strongly recommend the study of frequently used modalities or multi-modal treatments in studies of chiropractic treatments, to create a solid evidence base for future chiropractic.

As mentioned in Section 3, individual modalities of treatment generally differed between studies (see Tables 1 and 2). In addition, treatments were often vaguely defined (e.g., "manual therapy"). These factors dramatically

reduced our ability to synthesize results across studies, and undermined the usefulness of these studies for practitioners.

Research, recommendation 22. We very strongly recommend the inclusion of exact, reproducible descriptions of treatments in chiropractic studies, to ensure these are relevant and useful to the practicing chiropractor.

6.2. No-treatment comparison groups

Only 12 of the studies^{22,25-35} that supported the treatment recommendations (Section 4) included a no-treatment comparison group. The evidence that showed chiropractic treatment to be clearly better than no treatment was for very specific examples of manipulation with traction or mobilization, where the primary clinical goal was to reduce pain.

In light of the potential for self-resolution of pain complaints (Section 4.1), this weakness in a study is fatal to the utility of the study's results in treating pain.

Research, recommendation 23. Where ethical, we strongly recommend the inclusion of a no-treatment group in comparative studies of chiropractic treatments, to ensure these are useful to the front-line chiropractor.

6.3. Placebo comparison groups

In research, a placebo is generally considered an intervention that is used in across-group comparisons, to separate the direct benefits of the studied treatment from the effects of personal contact, the clinical milieu and patients' belief in these benefits – thereby isolating the critical element of the studied treatment. Only 7^{10,17,18,21-24} of the treatment studies (Section 4) included what their authors considered to be placebo groups. Of these 7 studies, we consider only 3 studies^{21,22,24} to have used effective placebos. The others used placebos that included more than the factors defined above (palpation,²³ physical contact with treatment device,^{17,18} infrared irradiation¹⁰).

This merely reflects how difficult it is to design valid placebos in a chiropractic practice laden with physical contact modalities that are, by design, tailored to each patient's unique needs.¹²² In addition, research is susceptible to including placebos that are an incremental part of

the studied treatment (e.g., palpation compared with palpation plus acupuncture)¹²³ or an independent treatment modality (e.g., "manual contact" with no segmental movement compared with mobilization).²²

Pain is subjective^{124,125} and strongly influenced by psychologic,^{80,124,126} cultural,¹²⁶ physiologic,^{80,124,127} family, and work¹²⁷ factors, and the patient's belief in the effectiveness of a treatment.¹²⁸ Pain is likely very susceptible to personal contact, the clinical milieu and belief in the benefits of a treatment. Several studies bear this out:

- Pain intensity, pain frequency, disability, sick-leave taken, general health, distress, and risk improved after 8 weeks of placebo (twice-weekly, "lowest level" ultrasound), and remained so at 6 and 12 months {L-4}.⁵⁸
- After 3 to 5 weeks of placebo (eighteen 30-min de-activated pulsed electromagnetic field [PEMF] "MT System" treatments, 3 to 5 per week) osteoarthritic patients experienced improved: pain, limitation of rotation and ease of ADL midway through treatment, at the end of treatment and 1 month later; tenderness midway through treatment and at the end of treatment; and pain on passive motion at the end of treatment {L-4}.¹⁸
- Pain-related disability improved after 6 weeks of placebo (twice-weekly infrared irradiation), and remained so 6 months later {L-4}, equal to the same regimen with exercise at each treatment {L-1b}.¹⁰
- The beneficial effect of placebo is likely illustrated in a study⁶⁶ of 3 weeks of continuous wearing of a magnetic or a non-magnetic (placebo) necklace. Both groups experienced significant improvement {L-4} on subjective evaluations of pain intensity and frequency, with no difference between the groups {L-1b}.

The above, plus our understanding of the holistic approach of chiropractic and the nature of chiropractic modalities, has led us to conclude that what is generally termed *placebo effect* (effect of contact, milieu, belief) is a valid and integral part of chiropractic treatment of neck pain. This suggests that best practice includes considering contact, milieu and belief as an active treatment modality that can be refined. One repercussion is that future chiropractic research should consistently and specifically examine this.

Research, recommendation 24. We very strongly recommend the inclusion of well-delineated treatment groups that isolate placebo effects (effect of personal contact, the clinical milieu and patients' belief in the benefits of a treatment) in comparative studies of chiropractic treatments, to create a solid evidence base for future chiropractic.

7. Implementing the recommendations

The following information tools are presented to aid in implementing this CPG: a summary Table of the evidence-based cervical pain benefits of chiropractic treatment (Appendix 3); algorithms that illustrate the process of individualizing care (Figure 1) and managing the risk of dissection (Figure 2, discussed in Appendix 1); and a clinical question and answer list (Section 7.1 below). As well, this CPG is reinforced by the extensive dissemination, implementation, evaluation, and revision activities described in the development, dissemination, implementation, evaluation, and revision plan (DevDIER).⁶

For researchers, a set of CPG development Q&As is included in the first and second *Response to profession-wide feedback about the chiropractic clinical practice guideline: evidence-based treatment of adult neck pain not due to whiplash* documents available at The CCA web-site.

7.1 Question and Answer List

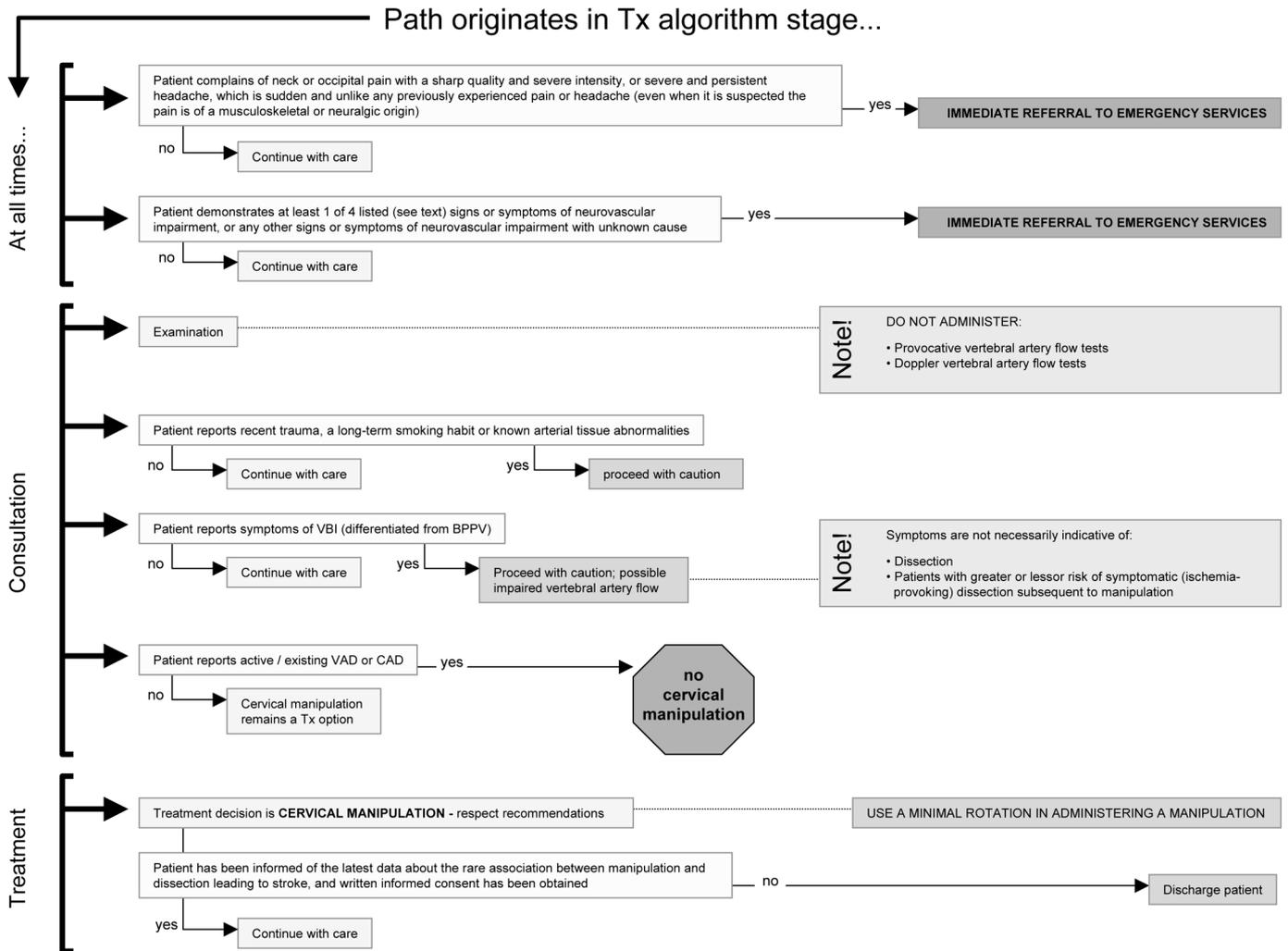
1. How will the guidelines affect my care of, and my recommendations to patients?

In the context of supportive, maintenance, or wellness care, and preventive, intensive or stabilizing care, this CPG indicates modification and discontinuance points in care and assessment activities, and the evidence-based options to consider at each point.

2. Do I have to follow the guidelines "to the letter"?

Although CPGs can link the best available evidence to good clinical practice, they are only one component of a well-informed approach to providing good care. CPGs are not standards that dictate practice, but rather guides and tools for chiropractors and their patients. Each CPG The CCA/CFCRB-CPG is developing and deploying will reflect a well-substantiated consensus about treatment options based on current available evidence. As such, although the

Figure 2: Cervical spine manipulative therapy; decision algorithms coping with the theoretic risk of dissection (enlarged version at <http://ccachiro.org/cpg>)



CPG is not a standard, it is reasonable to expect chiropractors will need to justify interventions outside this consensus.

3. *If a treatment is not present in the guidelines, does that mean I should not use it?*

If a treatment is not mentioned in the guidelines, it is because we did not find any clinically important evidence to comment about it. You should use your clinical judgement and the patient's best interest to decide whether and how to use the treatment.

4. *I have a subluxation-based practice; what use are neck pain guidelines to me?*

The sequence of diagnosis (or assessment leading to diagnosis), treatment and reassessment are relevant to your management of the patient regardless of your focus. However, within a subluxation-based practice, some of the clinical outcomes you rely on to assess your patient may differ from those reported in the literature (and hence also in this CPG), and your assessment may be termed an "analysis" that parallels establishing a separate, formal diagnosis. The priori-

ty topics for future CPGs listed in the development, dissemination, implementation, evaluation, and revision plan (DevDIER)⁶ are directed by the stakeholders from each region of Canada.

5. *Do these guidelines mean that every patient must have 10 to 12 treatments before reassessment?*

No. Any significant change in the patient's condition demands reassessment.

6. *Should I apply this guideline to my patients who have a whiplash-associated disorder (WAD)?*

No. A separate guideline for whiplash-associated disorders (including pain) is planned.

7. *What if my patient has associated comorbid conditions? Should I use this guideline?*

While respecting the guideline recommendations, if the comorbidity falls within your scope of practice, use your clinical judgement and knowledge of the patient's best-interest to determine treatment. If the comorbidity falls outside your scope of practice, make sure that the patient is seen by the appropriate professional.

8. *What should I do if my treatment does not fit well with the categories that you describe?*

The sequential process of diagnosis (or assessment leading to diagnosis), treatment and reassessment does not change. The specific treatments chosen must be adapted to each patient, reflecting the idiosyncratic nature of pain, using your clinical judgement and knowledge of the patient's best interest.

9. *How can I evaluate how successful the recommendations are?*

In the day-to-day clinical context, the main clinical effects of this CPG's recommendations can be evaluated using numerical pain scales (0–10 [unbearable pain]) or visual analogue pain scales (0–100 mm [max pain]), and goniometric ROM assessment tools. One study¹²⁹ determined that a change of 3 points on a 0–10 pain scale (i.e., an 11-point scale) indicated clinically important improvement {L-2c}, corroborating other work in non-chiropractic patients with acute or chronic pain at various locations

and from various causes,^{130–133} although another study¹³⁴ about chronic neck pain suggested that a 1-point change was sufficient {L-5}. Consistent use of the same scales or tools across one patient's treatments, or across all patients will help in understanding the clinical effect of this CPG.

As well, outcome measurements common in the literature (Table 9 in technical version at <http://ccachiro.org/cpg>)¹³⁵ are appropriate to assess the impact of the treatment recommendations, and monitor patients' progress. Recent advances include multilingual adaptations of English pain scales (including Chinese,¹⁰ French¹³⁶ and Turkish¹³⁷), and attempts to predict the impact of treatment using a 17-variable model¹³⁹ or the prognostic indicators of age, concomitant low back pain,^{78,138} cycling, or psychological distress.⁷⁸

The predictors of functional detriment can also be useful monitoring variables apart from pain per se; Luo et al.¹⁴⁰ reported that the predictors in patients with neck pain were (in order of importance): neck pain, work status, back pain, education, stress, arm or shoulder pain, depression, smoking, and anxiety {L-2c}.

For those exploring the boundaries of practice, reports such as those of White et al.¹⁴¹ and Childs et al.¹⁴² can provide leading-edge methods of monitoring based on experimental pain-classification systems. Finally, for researchers, at least one study⁸ has attempted to synthesize a rigorous method to tease out clinically important outcomes from those that are merely statistically significant.

10. *Can I be sued more easily if I don't follow this guideline?*

This guideline is not a standard tacitly "set" by others or a standard that is set by your regulatory board. This guideline describes treatment practices directly supported by the current evidence. This guideline clearly states that, because of the lack of studies, it does not cover the full extent of chiropractic treatment related to the cervical spine in dealing with neck pain. Thus, the GDC considers that this guideline cannot be used to legitimately limit practice, even though not all practice elements are covered in this CPG.

11. *How are you going to ensure that these guidelines won't be abused by practitioners or third-party payers?*

We cannot.

12. *Where can I find a definition of what chiropractic is, or does, in the guideline?*

Chiropractic treatment of neck pain is clarified in Section 1.1. In addition, the principles of chiropractic are summarized in the Appendix 1 of the development, dissemination, implementation, evaluation, and revision plan (DevDIER).⁶

13. *I'm concerned about the lack of evidence supporting my treatment. What can the profession do about this?*

We very strongly recommend that the profession continue to invest effort and money in high-quality, clinically applicable research.

14. *Why do we need this guideline? With other guidelines already in place, why do we need these guidelines?*

This CPG fills a gap in the foundation of evidence-based chiropractic practice by recommending only treatments that are substantiated in the literature. This CPG also draws precise distinctions usually lacking in other chiropractic CPGs, such as separating whiplash and non-whiplash patients. In addition, it was developed and is being deployed in accordance with evidence-based principles; this is discussed at length in the associated document entitled the development, dissemination, implementation, evaluation, and revision plan (DevDIER).⁶

15. *Does this CPG's limitation to those over 18 years of age mean that chiropractic treatment of those under the age of 18 is inappropriate?*

No. This guideline does not intend to restrict chiropractic care of neck pain to those over 18. Our recommendations are based on an analysis of research about people older than 18 years of age, and thus no recommendations for or against the treatment of those under 18 are made.

16. *The evidence is largely dealing with manipulation*

based on a fixation model with little to no consideration of the neurologic consequences – was neurology of the syndrome ignored?

We understand pain to be a neurologic symptom. Additionally, it should be noted that all reported outcomes were included in the evidence extractions; extractions were not purposefully limited to non-neurologic outcomes (detailed outcomes in technical version of this CPG at <http://ccachiro.org/cpg>).

17. *The dissection evidence suggests that we cannot be confident that a positive (impaired) provocative "flow test" is predictive of impaired flow, but even so, what is the relationship between a positive test and the risk for dissection associated with manipulation?*

Some reports suggested that vertebrobasilar insufficiency (VBI) tests were clinically useful {L-5}.¹⁴³ However Haldeman et al.¹⁴⁴ concluded, after using a physical examination technique that included placing the neck in extension and rotation (a commonly advocated pre-manipulative test of the patency of the vertebral arteries), that they were unable to identify any factors that indicated a greater risk for cerebral ischemia after manipulation {L-4}.

Carey¹⁴⁵ and, later, Magarey et al.¹⁴⁶ echoed this theme, suggesting that pre-manipulative tests do not identify all patients at risk (corroborating the ambiguity of results from research about alterations of blood flow associated with insufficiencies within the vertebrobasilar system) and that there is no method for assessing the anatomy of the in-vivo vertebral artery {L-5}. Licht et al.¹⁴⁷ affirmed the uncertainty of functional tests, stating that the literature indicated a test could be negative in the presence of a vertebral artery occlusion, and suggested a negative test did not preclude the occurrence of cerebrovascular "accidents" (accident undefined) {L-5}.

In sum, although some reports suggested otherwise {L-5},¹⁴³ other reports¹⁴⁴⁻¹⁴⁸ suggested that it is not now possible to identify physical factors that indicate a greater {L-4}¹⁴⁴ or lesser {L-5}¹⁴⁷ risk of experiencing a symptomatic (ischemia-provoking) dissection associated with manipulation.

8. Conclusion

Well executed research, and the high caliber evidence this can produce, can objectively quantify outcomes subjectively observed in daily practice. This research can be used to confidently predict the response to a treatment for a clearly delimited problem. Thus, evidence-based practice permits the administration of interventions that are objectively known to produce a favorable clinical response in patients sharing the same problem.

This CPG examined the evidence for treatments designed to alleviate neck pain. Pain is fundamentally qualified by its multi-factor origin and the idiosyncratic way it demonstrates itself as a set of symptoms. Thus, we agree with at least one literature review,¹²⁵ examining the use of research in chiropractic practice, that it is likely impossible for the subjects of any studied group to be experiencing the “same” pain condition – homogeneously susceptible to a tested treatment {L-5}.

One repercussion is that a study assessing the impact of a treatment’s effectiveness is unlikely to satisfactorily direct good practice on its own, because it is likely other patients’ pain (and thus treatment needs) will differ from the studied sample. The GDC concluded this is a unique confounder in using evidence-based chiropractic to treat pain.

Faced with this, we consider that the most effective method of using the scientific literature in practice includes the application of “individualizing” algorithms. These illustrate the optimal decision path used to tailor objectively-determined treatments, which benefit the average patient, to particular patients – the care that is ultimately offered is thereby unique to each patient.

Research recommendation 25. We recommend, in future research about the chiropractic treatment of pain, a concerted effort to develop evidence-based algorithms that illustrate the optimal decision path used to individualize care; our recommended method to incorporate evidence about treatments that are objectively known to benefit the average patient.

Appendix 1: Spotlight on dissection (more detail in Appendix 16, technical version at <http://ccachiro.org/cpg>)

In this CPG, unless otherwise noted: dissection means cervical (carotid or vertebral) artery dissection. Where not noted, the results in Appendix 1 are of Level 5 caliber.

The small sample sizes of the clinical trials supporting this CPG are unlikely to have encountered the rare adverse event of a cervical artery disturbance following manipulation, ranging from arterial insufficiency to vertebral artery dissection.^{112,144,147,149–155} We consider dissection to be independent of stroke; dissection was differentiated from stroke in several articles, and it was reported that not all dissection led to stroke, and not all stroke was the result of dissection.^{148,149,156–160}

The term “spontaneous” was used often in the literature to describe dissections “without a cause.” However, we agree with several authors¹⁶¹ that it is unlikely that dissection occurs spontaneously, and we do not consider this distinction to be clinically useful. We use the term idiopathic (i.e., unknown cause) to denote dissections reported in the literature as being spontaneous or of unknown cause.

The evidence suggests that manipulation is not associated with carotid artery dissection (CAD) {L-4}^{149,153} {L-5},^{162,163} and supports our consideration that there is no anatomic basis for an association between manipulation and CAD {L-5}.

The remainder of Appendix 1 deals with results reported for dissection in general or vertebral artery dissection (VAD) only, unless discussion of the carotid or basilar arteries is warranted. Some of the literature we retrieved considered “vertebrobasilar” dissection without distinguishing which artery the dissection was in. This imprecision weakens the usefulness of these reports {L-5}.^{GDC}

Research, recommendation 26. In studies of the association between manipulation and dissection, we recommend distinction between the carotid, vertebral and basilar arteries to ensure findings are relevant to draw-

ing conclusions. In addition, we *recommend* a focus on VAD in future studies of the association between manipulation and dissection to ensure findings are as relevant as possible to drawing conclusions.

1.1. Incidence of dissection or VAD or VAD-related stroke associated with manipulation

The evidence^{149,156,161,164–167} suggests that VAD following manipulation occurs very rarely (1 per million manipulations [Appendices 16a, 16b in the technical version of this CPG available at <http://ccachiro.org/cpg/>]), and that most VAD arise from ordinary ADL, but none of the evidence is of sufficient quality to support objective conclusions {L-5}.^{GDC} The core difficulty appears to be that if the rate of manipulation-associated VAD is 1 per million manipulations, 12 million manipulations would have to be studied to reach a scientifically confident conclusion {L-5}¹⁶⁷ – a logistically impractical proposition at this time {L-5}.^{GDC}

1.2. Role of manipulation

The evidence suggests that more manipulations do not mean more complications {L-4}¹⁴⁸ and manipulation does not exacerbate the outcome of dissections {L-4}.¹⁴⁹ However, the evidence also suggests there is a statistical association between manipulation and bilateral VAD^{149,153,156,168} (with VAD symptoms moments to 10 days later), but not unilateral VAD {L-4},¹⁴⁹ and between manipulation and VAD within 30 days {L-4}.¹⁵³

Contrasting one study {L-4}¹⁴⁹ but supported by another {L-4},¹⁶⁸ we deem that it is unlikely (based on anatomic principles) that manipulation can be responsible for bilateral VAD but not unilateral {L-5}, and thus an association between manipulation and bilateral VAD is likely not clinically important {L-5}.^{GDC}

Also, as suggested by Hufnagel's results {L-4},¹⁵⁶ it is unlikely (based on physiologic principles) that a manipulation can be responsible for a VAD more than 3 weeks later {L-5};^{GDC} thus, a 30-day association between manipulation and VAD is likely not clinically important {L-5}.^{GDC}

Considering the possibility that manipulation may cause dissection directly, we strongly agree with Sackett's¹⁶⁷ suggestion that none of the available evidence shows causation. However, the evidence does suggest that patients with impaired vertebral artery flow may seek

manipulative care for symptoms of these impairments {L-4}¹⁴⁸ {L-5}.^{149,150,154}

Research, recommendation 27. In studies of the association between manipulation and dissection, we *very strongly recommend* discriminating between realistic and unrealistic post-manipulation periods to ensure findings are relevant to drawing conclusions.

1.3. Managing the issue of dissection

Irrespective of cause, it appears there may be a remote risk of VAD occurring subsequent to manipulation {L-5}.^{GDC} We agree with Magarey et al.¹⁴⁶ that this risk is a clinical factor to be managed, much as drug side effects are in pharmacotherapy and anesthetic adverse events are in surgery {L-5}. This risk does not suggest that manipulation should be excluded from the armamentarium of practice as several authors^{169,170} have hinted {L-5}.^{GDC}

The diagnosis (or assessment leading to diagnosis), treatment and reassessment steps of the decision algorithm in Figure 1 guided our description of the factors relevant to managing the risk of dissection: informed consent (Section 1.3.1 of Appendix 1); pre-disposing history (Section 1.3.2 of Appendix 1); predisposing factors in physical assessment (Section 1.3.3 of Appendix 1); and the occurrence of dissection (Section 1.3.4 of Appendix 1).

1.3.1. Informed consent

The evidence suggests that informed consent is as important for younger and healthier patients as it is for others, because these patients bear a disproportionately high burden of dissection-related stroke {L-3b}¹⁵⁷ {L-4}.¹⁵³

Risk-management, recommendation 28. We *very strongly recommend* obtaining informed consent based on current evidence, and respecting the 3 sequential steps in the decision algorithm (Figure 1) – diagnosis (or assessment leading to diagnosis), treatment, reassessment – when caring for any patient.

1.3.2. Predispositions to dissection in a patient's history

Trauma. The evidence suggests that a recent history of trauma may predispose to dissection {L-4}.¹⁴⁹

Lifestyle. The evidence suggests that among lifestyle fac-

tors, smoking may predispose to VAD¹⁴⁹ among those who are vulnerable to tobacco's negative, cumulative vascular effects¹⁵³ {L-4}. The factor governing this vulnerability is unknown {L-5}.^{GDC}

Sex. The evidence suggests that a person's sex is not a determinant of non-traumatic VAD {L-4}.¹⁶⁸

Non-vascular illnesses. The evidence suggests that a history of non-vascular illness is not a definitive determinant of VAD {L-4}.^{153,156}

Vascular pathologies (excluding dissection or impaired vertebral artery flow). The evidence suggests that a history of vascular pathologies is not a definitive determinant of VAD {L-4},¹⁵⁶ although it may be suggestive of risk; of the vascular pathologies that have been proposed as risks for dissection, the most clearly demonstrated have been tissue abnormalities of the cervical arteries {L-3b}¹⁷¹ {L-4},¹⁷² but the link between these abnormalities and dissection, and the practicality of pre-manipulatively identifying these remains elusive {L-5}.^{GDC} Patients predisposed to dissection by these factors may seek chiropractic care for neck pain {L-5}.^{GDC}

Hyperhomocysteinemia and cervical artery dissection. The evidence suggests that hyperhomocysteinemia is associated with CAD-¹⁷³ or dissection-¹⁷⁴ related stroke {L-3b}, but not CAD per se {L-3b},¹⁷³ contradicting at least one extensive review.¹⁷⁵ The role of 5, 10-methylenetetrahydrofolate reductase (MTHFR, a deficient enzyme form associated with hyperhomocysteinemia) is ambiguous {L-5};^{GDC} it is not associated with dissection-related stroke (a mix of VAD and CAD) {L-3b}¹⁷⁴ or non-dissection stroke {L-5},¹⁷⁵ but it is associated with CAD-related stroke {L-3b}.¹⁷⁴ Hyperhomocysteinemia may be associated with VAD, but results are too inconclusive at this time for this to have clinical importance {L-5}.^{GDC}

Historical predispositions; caution or contraindication? Together, the current evidence^{144,148–150,153,156,158,169,171–179} suggests that none of the predisposing factors hypothesized in the literature definitively predict a dissection-related “cerebrovascular ischemic event” {L-4},¹⁴⁴ and, therefore, none is a contraindication to manipulation {L-5}.^{GDC} However, other evidence suggests that

caution should be exercised in treating patients with a history of trauma {L-4},¹⁴⁹ a smoking habit {L-4}¹⁴⁹ (especially among patients vulnerable to tobacco's negative, cumulative vascular effects {L-4}),¹⁵³ or known arterial tissue abnormalities {L-3b}¹⁷¹ {L-4}.¹⁷²

Risk-management, recommendation 29. We recommended caution in treating a patient with trauma, a smoking habit or known arterial tissue abnormalities to manage the risk for dissection, but the evidence does not warrant that these be contraindications to manipulation.

1.3.3. Noting predispositions during physical examination; impaired vertebral artery flow Doppler identification of impaired vertebral artery flow. The evidence of an extensive review of the literature suggests that a positive (impaired) Doppler “flow test” does not predict impaired vertebral artery blood flow {L-5}.¹⁴⁶

Provocative identification of impaired vertebral artery flow. Pre-manipulative vertebral artery function tests to identify patients with impaired flow have been part of practice knowledge since Smith and Eldridge introduced a test in 1962.¹⁴⁷ Since then, several tests have been developed, and the vertebral artery flow effects¹⁸⁰ of these are moderately well understood: Barré-Leiou's sign test, George's cerebrovascular craniocervical functional test, Maigne's test, Hautant's test, Underberg's test, Dix-Hallpike maneuver (also known as Nylen's or Barany's maneuver), and deKleyn's test.¹⁴⁷ The most common is deKleyn's test.¹⁴⁷

The evidence suggests that a positive (impaired) provocative “flow test” rarely indicates changes in vertebral artery blood flow {L-4}¹⁴⁷ and, consequently, deKleyn's test is neither sensitive nor specific. Thus a positive test should not be an absolute contraindication to manipulation {L-5}.¹⁴⁷ Other results {L-4} have also suggested pre-manipulative flow testing is unlikely to identify patients with flow impedances {L-5}.¹⁴⁶

Observational identification of impaired vertebral artery flow (overt symptoms of VBI). We agree with the evidence defining the signs and symptoms of VBI (nyctagmus, nausea, numbness, diplopia, drop attacks, dysphagia, dysarthria, ataxia),¹⁸¹ as differentiated from

benign paroxysmal positional vertigo (BPPV) {L-5}.¹⁴⁶ It is our understanding that these differentiated signs and symptoms may indicate the vertebral artery has an anatomic predisposition to dissection, has a narrow safety margin for the impairment of flow, or is dissected {L-5}. This suggests caution in proceeding with treatment when overt signs or symptoms of VBI are noted {L-5}.^{GDC}

Risk-management, recommendation 30. We recommend an assessment for signs and symptoms of unprovoked VBI (differentiated from BPPV) to identify the possibility of impaired vertebral artery flow (signs and symptoms are: nystagmus, nausea, numbness, diplopia, drop attacks, dysphagia, dysarthria, and ataxia), because we recommend caution in treating a patient with suspected impairment of flow. However, the evidence does not warrant this being a contraindication to manipulation.

Risk-management, recommendation 31. We do not recommend an assessment for signs or symptoms of unprovoked VBI (differentiated from BPPV) to identify the presence of dissection, or to identify patients with greater or lesser risk of symptomatic (ischemia-provoking) dissection subsequent to manipulation; the assessment lacks predictive value.

Risk-management, recommendation 32. We do not recommend Doppler or provocative pre-manipulative vertebral artery function tests (e.g., deKleyn's test) to identify impaired vertebral artery flow, the presence of dissection, or patients with greater or lesser risk of symptomatic (ischemia-provoking) dissection subsequent to manipulation; the assessment lacks predictive value.

1.3.4. Dissection in the chiropractic clinic

Identifying the occurrence of dissection before or during a visit. We agree with at least 3 other reports^{153,162,182} that manipulation is contraindicated for patients with an active or existing VAD or CAD, although there have been uneventful case reports of manipulation being used with benefit in treating patients who have "recovered" from dissections.^{169,183}

Risk-management, recommendation 33. We do not recommend manipulation for patients who present with active or existing VAD or CAD.

This is relevant because impaired vertebral artery flow can exhibit symptoms^{149,150,154} that may lead to the patient seeking chiropractic care {L-5};^{GDC} VAD and CAD are associated with neck-pain and headache {L-4},^{99,149} although asymptomatic ICAD has been reported {L-5}.¹⁶²

The evidence suggests that symptoms of impaired vertebral artery flow can lead patients to seek chiropractic care {L-4};^{149,156} and that in most patients with dissection-precipitated cerebral ischemia, the event of dissection¹⁶¹ – or the presence of dissection leading to stroke^{148,153} (specifically VAD)^{149,168,184} – is associated with neck or occipital pain with a sharp quality and severe intensity, or a severe and persistent headache, which is sudden and unlike any previously experienced pain or headache {L-4}. However, this pain may not be clearly distinguished from musculoskeletal or neuralgic pain {L-5}.^{144,153}

Risk-management, recommendation 34. We recommend caution in treating a patient who reports a recent (but not ongoing) neck or occipital pain with a sharp quality and severe intensity, or a severe and persistent headache, which was sudden and unlike any previously experienced pain or headache (even when it is suspected the pain was of a musculoskeletal or neuralgic origin).

Risk-management, recommendation 35. We recommend immediate discontinuance of treatment and referral to emergency health services when a patient complains in the course of care (diagnosis [or assessment leading to diagnosis], treatment, reassessment) of neck or occipital pain with a sharp quality and severe intensity, or a severe and persistent headache, which is sudden and unlike any previously experienced pain or headache (even when it is suspected the pain is of a musculoskeletal or neuralgic origin).

Mitigating the harm of VAD; a stroke. The full extent of identifying and managing the risk of stroke subsequent to VAD is beyond the scope of this CPG. However, we con-

clude that any sign of VAD should precipitate immediate referral to emergency health services {L-5}.^{GDC}

The evidence suggests that progression from VAD to stroke may be indicated by specific neurovascular signs or symptoms: unilateral facial paresthesia, objective cerebellar signs, lateral medullary signs, and visual field defects {L-4}.¹⁶⁸ Vertigo is also cited,¹⁶⁸ but we consider this to be a prevalent symptom of various less alarming syndromes, such as those with inner ear involvement {L-5}.^{GDC} We agree with the text by Goetz¹⁸⁵ that provides a more complete list of signs and symptoms {L-5}.

Risk-management, recommendation 36. We recommend immediate discontinuance of treatment and referral to emergency health services when, in the course of care (diagnosis [or assessment leading to diagnosis], treatment, reassessment), a patient demonstrates at least 1 of 4 signs or symptoms of neurovascular impairment (unilateral facial paresthesia, objective cerebellar signs, lateral medullary signs, visual field defects) or other signs or symptoms of neurovascular impairment with unknown cause, irrespective of complaints of neck or head pain. In addition, we recommend immediate investigation for these 4 signs or symptoms of neurovascular impairment whenever a patient demonstrates vertigo – if none are present, we recommend caution in treating the patient because of the continued risk for neurovascular impairment.

1.3.5 Recommendation summary

We recommend management of the risk of VAD subsequent to manipulation in keeping with the decision algorithm of Figure 2, to maximize the demonstrated benefits and minimize the theoretic harms associated with manipulation. We recommend a risk-management approach that includes: 1) informed consent; 2) caution in treating a patient with trauma, a smoking habit, or known arterial tissue abnormalities; 3) caution in treating a patient with signs or symptoms of vertebrobasilar insufficiency differentiated from benign paroxysmal positional vertigo; 4) caution in treating a patient reporting a recent (but not ongoing) neck or occipital pain with a sharp quality and severe intensity, or a severe and persistent headache, which was sudden

and unlike any previously experienced pain or headache (even when it is suspected the pain was of a musculoskeletal or neuralgic origin); 5) no manipulation for patients who present with active or existing VAD or CAD; 6) immediate discontinuance of treatment and referral to emergency health services when a patient complains in the course of care of neck or occipital pain with a sharp quality and severe intensity, or a severe and persistent headache, which is sudden and unlike any previously experienced pain or headache (even when it is suspected the pain is of a musculoskeletal or neuralgic origin); 7) immediate discontinuance of treatment and referral to emergency health services in the course of care when a patient demonstrates at least 1 of 4 signs or symptoms of neurovascular impairment (unilateral facial paresthesia, objective cerebellar signs, lateral medullary signs, visual field defects) or other signs or symptoms of neurovascular impairment with unknown cause, irrespective of complaints of neck or head pain. In addition, we recommend immediate investigation for these 4 signs or symptoms of neurovascular impairment whenever a patient demonstrates vertigo – if none are present, we recommend caution in treating the patient because of the continued risk for neurovascular impairment. We do not recommend provocative vertebral artery function tests. We define caution as proceeding with a particular treatment modality only after an assessment that is as thorough as possible indicates the risk with administering this modality is not exacerbated.

Appendix 2: Stroke; an adverse event of the rotation component of manipulation? (more detail in Appendix 17, technical version at <http://ccachiro.org/cpg>)

In this CPG, unless otherwise noted: dissection means cervical (carotid or vertebral) artery dissection. Where not noted, the results in Appendix 2 are of Level 5 caliber.

Stroke has been associated with chiropractic manipulation in the news media for some time. Reports associating chiropractic treatment with stroke rest on accepting a hypothetical 5-link chain: 1) manipulation may be associated with dissection or cervical artery intima injury with 2) possible clot formation at the site of injury, 3) from which emboli or thrombi may be shed, 4) which in-turn may occlude arteries feeding the brain, 5) possibly causing a full stroke. However, not all dissection leads to stroke, and not all stroke is the result of dissection.^{148,149,156–160}

The evidence suggests that rotary manipulation is very popular but its role in precipitating cerebrovascular (CV) accidents remains unclear {L-5}.^{GDC} On one hand, no particular manipulation technique predicts stroke {L-4},¹⁴⁸ and no particular technique is disproportionately prevalent among manipulation-associated stroke patients {L-4}.¹⁵⁶ On the other hand, rotation techniques applied to the upper-cervical spine are more associated with CV accidents than non-rotation or rotation to the mid- or lower-cervical spine {L-4},¹⁸⁶ and upper-cervical manipulations of any type are 4 times more associated with cerebrovascular incidents (CVIs, transitional signs of possible CV accident) than lower-cervical manipulations {L-4}.¹⁸⁷

Risk-management, recommendation 37. Although the role (alleviating, neutral, exacerbating, causative) of manipulation in CV accidents is unclear, we *recommend* using a minimal rotation in administering an upper-cervical spine manipulation until better information is available, to maximize the benefit to harm balance.

Risk-management, recommendation 38. Extrapolating from our recommendation to use a minimal rotation in

administering an upper-cervical spine manipulation, we also *recommend* the use of a minimal rotation in administering any modality of upper-cervical spine treatment.

2.1. Hyperhomocysteinemia as a risk for stroke or TIA

The evidence that elevated plasma homocysteine concentrations (and the associated, reduced plasma concentrations of folate, vitamin B12 or vitamin B6 {L-1b}¹⁹² {L-2c})^{188–191} correlates with an increased risk of stroke is not conclusive {L-5}^{GDC} – although some evidence directly suggests that specifically sub-optimal levels of vitamin B6, and not hyperhomocysteinemia, are associated with hypothesized increases in the risk of stroke or TIA {L-5}.¹⁹³ Although the evidence is inconclusive, this suggests that patients presenting with known hyperhomocysteinemia should be treated with caution {L-5},^{GDC} but not that an assay of homocysteine levels should be part of an assessment with healthy patients.

2.2. Stroke; predictors of this adverse event subsequent to manipulation

The link between rotation manipulation and stroke is tenuous (above), and at least one study¹⁹⁴ has reported that the maximal angular difference between the head and neck or trunk in the course of a rotation manipulation does not exceed the active physiologic range of motion {L-4}.

However, we concluded that the risk factors for stroke should be accounted for in best practice patterns (Section 5). See Tables 3a to 3h for all identified risk factors that are absolute contraindications, Table 5 for all identified factors that require treatment caution, and Table 6 for stroke-specific risk factors that require treatment modality modification {L-5}. Section 5.3.2 clarifies the clinical meaning of modality modification.

Appendix 3: Evidenced, cervical pain benefit from chiropractic treatments

ref #	citation	evidence			
		modalities discussed	level of evidence for benefit	cervical pain benefit	better than no treatment?
11	Cassidy JD, Lopes AA, Yong-Hing K. The immediate effect of manipulation versus mobilization on pain and range of motion in the cervical spine: a randomized controlled trial. <i>J Manipulative Physiol Ther.</i> 1992; 15(9):570–5.	manipulation	4	yes	not studied
39	Cassidy JD, Quon JA, LaFrance LJ, Yong-Hing K. The effect of manipulation on pain and range of motion in the cervical spine: a pilot study. <i>J Manipulative Physiol Ther.</i> 1992; 15(8):495–500.		4	yes	not studied
40	Vernon HT, Aker PD, 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. <i>J Manipulative Physiol Ther.</i> 1990; 13(1):13–6.		4	yes	not studied
41	Pikula JR. The effect of spinal manipulative therapy (SMT) on pain reduction and range of motion in patients with acute unilateral neck pain: a pilot study. <i>J Can Chiropr Assoc.</i> 1999; 43:111–9.		4	yes	not studied
42	Yurkiw D, Mior S. Comparison of two chiropractic techniques on pain and lateral flexion in neck pain patients: a pilot study. <i>Chiropr Tech.</i> 1996; 8(4):155–62.		4	yes	not studied
49	Rogers RG. The effects of spinal manipulation on cervical kinesthesia in patients with chronic neck pain: a pilot study. <i>J Manipulative Physiol Ther.</i> 1997; 20(2):80–5.		4	unknown	not studied
43	Wood TG, Colloca CJ, Matthews R. A pilot randomized clinical trial on the relative effect of instrumental (MFMA) versus manual (HVLA) manipulation in the treatment of cervical spine dysfunction. <i>J Manipulative Physiol Ther.</i> 2001; 24:260–71.		4	yes	not studied
47	Wallace HL, Jahner S, Buckle K, Desai N. The relationship of changes in cervical curvature to visual analog scale, neck disability index scores and pressure algometry in patients with neck pain. <i>J Chiropr Res Clin Invest.</i> 1994; 9(1):19–23.		4	yes	not studied
44	Cilliers K, Penter C. Relative effectiveness of two different approaches to adjust a fixated segment in the treatment of facet syndrome in the cervical spine. <i>J Neuromusculoskel Sys.</i> 1998; 6:1–5.		4	yes	not studied

45	Moodley M, Brantingham JW. The relative effectiveness of spinal manipulation and ultrasound in mechanical pain: pilot study. <i>Chiropr Tech.</i> 1999; 11(4):164–8.		4	yes	not studied
46	van Schalkwyk R, Parkin-Smith GF. A clinical trial investigating the possible effect of the supine cervical rotatory manipulation and the supine lateral break manipulation in the treatment of mechanical neck pain: a pilot study. <i>J Manipulative Physiol Ther.</i> 2000; 23:324–31.		4	yes	not studied
48	Parkin-Smith GF, Penter CS. A clinical trial investigating the effect of two manipulative approaches in the treatment of mechanical neck pain: a pilot study. <i>J Neuromusculoskel Sys.</i> 1998; 6(1):6–16.		4	yes	not studied
		thoracic manipulation (when added to cervical manipulation)	2b	no	not studied
20	Allan M, Brantingham JW, Menezes A. Stretching as an adjunct to chiropractic manipulation of chronic neck pain – before, after or not at all? A prospective randomized controlled clinical trial. <i>Eur J Chiropractic.</i> 2003; 50(2):41–52.	manipulation, stretching	4	yes	not studied
26	Harrison DE, Harrison DD, Betz JJ, Janik TJ, Holland B, Colloca CJ, et al. Increasing the cervical lordosis with chiropractic biophysics seated combined extension-compression and transverse load cervical traction with cervical manipulation: nonrandomized clinical control trial. <i>J Manipulative Physiol Ther.</i> 2003; 26:139–51.	manipulation, traction	2b, 4	yes	Level 2b – yes –
25	Harrison DE, Cailliet R, Harrison DD, Janik TJ, Holland B. A new 3-point bending traction method for restoring cervical lordosis and cervical manipulation: a nonrandomized clinical controlled trial. <i>Arch Phys Med Rehabil.</i> 2002; 83(4):447–53.		4	yes	Level 4 – yes –
22	Sterling M, Jull G, Wright A. Cervical mobilisation: concurrent effects on pain, sympathetic nervous system activity and motor activity. <i>Man Ther.</i> 2001; 6(2):72–81.	mobilization	2b, 4	yes	Level 2b – yes –
50	Hou CR, Tsai LC, Cheng KF, Chung KC, Hong CZ. Immediate effects of various physical therapeutic modalities on cervical myofascial pain and trigger-point sensitivity. <i>Arch Phys Med Rehabil.</i> 2002; 83:1406–14.	ischemic pressure	4	yes	not studied
51	Ahlgren C, Waling K, Kadi F, Djupsjobacka M, Thornell LE, Sundelin G. Effects on physical performance and pain from three dynamic training programs for women with work-related trapezius myalgia. <i>J Rehabil Med.</i> 2001; 33:162–9.	exercise	4	yes	not studied

10	Chiu TT, Lam TH, Hedley AJ. A Randomized controlled trial on the efficacy of exercise for patients with chronic neck pain. <i>Spine</i> . 2005; 30(1):E1–7.		1b, 4	yes	not studied
52	Berg HE, Berggren G, Tesch PA. Dynamic neck strength training effect on pain and function. <i>Arch Phys Med Rehabil</i> . 1994; 75:661–5.		4	yes	not studied
54	Highland TR, Dreisinger TE, Vie LL, Russell GS. Changes in isometric strength and range of motion of the isolated cervical spine after eight weeks of clinical rehabilitation. <i>Spine</i> . 1992; 17(6 Suppl):S77–82.		4	yes	not studied
53	Kadi F, Ahlgren C, Waling K, Sundelin G, Thornell LE. The effects of different training programs on the trapezius muscle of women with work-related neck and shoulder myalgia. <i>Acta Neuropathol</i> . 2000; 100(3):253–8.		4	yes	not studied
31	Revel M, Minguet M, Gergoy P, Vaillant J, Manuel JL. Changes in cervicocephalic kinesthesia after a proprioceptive rehabilitation program in patients with neck pain: a randomized controlled study. <i>Arch Phys Med Rehabil</i> . 1994; 75:895–9.		4	yes	unclear
32	Takala EP, Viikari-Juntura E, Tynkkyinen EM. Does group gymnastics at the workplace help in neck pain? A controlled study. <i>Scand J Rehabil Med</i> . 1994; 26(1):17–20.		4	yes	unclear
55	Randløv A, Ostergaard M, Manniche C, Kryger P, Jordan A, Heegaard S, et al. Intensive dynamic training for females with chronic neck/shoulder pain. A randomized controlled trial. <i>Clin Rehabil</i> . 1998; 12(3):200–10.		4	yes	not studied
56	Ekberg K, Björkvist B, Malm P, Bjerre-Kiely B, Axelson O. Controlled two year follow up of rehabilitation for disorders in the neck and shoulders. <i>Occup Environ Med</i> . 1994; 51:833–8.	exercise, education	4	yes	not studied
57	Waling K, Sundelin G, Ahlgren C, Järvholm B. Perceived pain before and after three exercise programs – a controlled clinical trial of women with work-related trapezius myalgia. <i>Pain</i> . 2000; 85:201–7.		4	yes	not studied
13	Jordan A, Bendix T, Nielsen H, Hansen FR, Host D, Winkel A. Intensive training, physiotherapy or manipulation for patients with chronic neck pain. A prospective, single-blinded, randomized clinical trial. <i>Spine</i> . 1998; 23:311–8: discussion 319.	exercise, home exercise, education	4	yes	not studied
33	Lundblad I, Elert J, Gerdle B. Randomized controlled trial of physiotherapy and Feldenkrais interventions in female workers with neck-shoulder complaints. <i>J Occup Rehabil</i> . 1999; 9(3):179–94.		4	yes	unclear

34	Levoska S, Keinänen-Kiukaanniemi S. Active or passive physiotherapy for occupational cervicobrachial disorders? A comparison of two treatment methods with a 1-year follow-up. Arch Phys Med Rehabil. 1993; 74(4):425–30.		4	yes	unclear
14	Hoving JL, Koes BW, de Vet HC, van der Windt DA, Assendelft WJ, 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; 136:713–22.	exercise, multi-modal tx	5	yes	not studied
15	Korthals-de Bos IBC, Hoving JL, van Tulder MW, Rutten-van Molken MP, Ader HJ, de Vet HC, et al. Cost effectiveness of physiotherapy, manual therapy, and general practitioner care for neck pain: economic evaluation alongside a randomised controlled trial. BMJ. 2003; 326:911.		5	yes	not studied
35	Wang WTJ, Olson SL, Campbell AH, Hanten WP, Gleeson PB. Effectiveness of physical therapy for patients with neck pain: an individualized approach using a clinical decision-making algorithm. Amer J Phys Med Rehabil. 2003; 82:203–18.		4	yes	unclear
58	Kjellman GV, Öberg BE. A randomized clinical trial comparing general exercise, McKenzie treatment and a control group in patients with neck pain. J Rehabil Med. 2002; 34(4):183–90.		4	yes	not studied
59	Vasseljen OJr, Johansen BM, Westgaard RH. The effect of pain reduction on perceived tension and EMG-recorded trapezius muscle activity in workers with shoulder and neck pain. Scand J Rehabil Med. 1995; 27(4):243–52.		4	yes	not studied
60	Zylbergold RS, Piper MC. Cervical spine disorders: a comparison of three types of traction. Spine. 1985; 10:867–71.		4	yes	not studied
127	Jordan A, Oostergard K. Rehabilitation of neck/shoulder patients in primary health care clinics. J Manipulative Physiol Ther. 1996; 19:32–5.		5	yes	not studied
111	Gross AR, Hoving JL, Haines TA, Goldsmith CH, Kay T, Aker P, et al; Cervical Overview Group. Manipulation and mobilisation for mechanical neck disorders. The Cochrane database of systematic reviews 2002, Issue 3. Art. No.: CD004249.pub2. DOI: 10.1002/14651858.CD004249.pub2, 2002.		5	yes	not studied

29	Horneij E, Hemborg B, Jensen I, Ekdahl C. No significant differences between intervention programmes on neck, shoulder and low back pain: a prospective randomized study among home-care personnel. <i>J Rehabil Med.</i> 2001; 33:170–6.	home exercise	2b, 4	mixed	Level 2b – no –
61	Klemetti M, Santavirta N, Sarvimaki A, Bjorvell H. Tension neck and evaluation of a physical training course among office workers in a bank corporation. <i>J Adv Nurs.</i> 1997; 26:962–7.		4	yes	not studied
16	Taimela S, Takala EP, Asklof T, Seppälä K, Parviainen S. Active treatment of chronic neck pain: a prospective randomized intervention. <i>Spine.</i> 2000; 25:1021–7.	home exercise, education	4	yes	not studied
28	Gam AN, Warming S, Larsen LH, Jensen B, Høydalsmo O, Allon I, et al. Treatment of myofascial trigger-points with ultrasound combined with massage and exercise – a randomised controlled trial. <i>Pain.</i> 1998; 77(1):73–9.	home exercise, ultrasound	2b	no	Level 2b – no –
62	Esenyel M, Caglar N, Aldemir T. Treatment of myofascial pain. <i>Am J Phys Med Rehabil.</i> 2000; 79(1):48–52.		4	yes	not studied
45	Moodley M, Brantingham JW. The relative effectiveness of spinal manipulation and ultrasound in mechanical pain: pilot study. <i>Chiropr Tech.</i> 1999; 11(4):164–8.	ultrasound	4	yes	not studied
23	Ceccherelli F, Altafini L, Lo Castro G, Avila A, Ambrosio F, Giron GP. Diode laser in cervical myofascial pain: a double-blind study versus placebo. <i>Clin J Pain.</i> 1989; 5:301–4.	low-power laser	2b, 4	yes	not studied
21	Gur A, Sarac AJ, Cevik R, Altindag O, Sarac S. Efficacy of 904 nm gallium arsenide low level laser therapy in the management of chronic myofascial pain in the neck: a double-blind and randomize-controlled trial. <i>Lasers Surg Med.</i> 2004; 35(3):229–35.		1b, 4	yes	not studied
63	Özdemir F, Birtane M, Kokino S. The clinical efficacy of low-power laser therapy on pain and function in cervical osteoarthritis. <i>Clin Rheumatol.</i> 2001; 20:181–4.		4	yes	not studied
64	Hagino C, Boscaroli J, Dover L, Letendre R, Wicks M. Before/after study to determine the effectiveness of the align-right cylindrical cervical pillow in reducing chronic neck pain severity. <i>J Manipulative Physiol Ther.</i> 1998; 21(2):89–93.	pillow	4	yes	not studied
17	Foley-Nolan D, Barry C, Coughlan RJ, O'Connor P, Roden D. Pulsed high frequency (27MHz) electromagnetic therapy for persistent neck pain. A double blind, placebo-controlled study of 20 patients. <i>Orthopedics.</i> 1990; 13:445–51.	pulsed electro-magnetic field	2b, 4	yes	not studied

18	Trock DH, Bollet AJ, Markoll R. The effect of pulsed electromagnetic fields in the treatment of osteoarthritis of the knee and cervical spine. Report of randomized, double blind, placebo controlled trials. <i>J Rheumatol.</i> 1994; 21:1903–11.		2b, 4	yes	not studied
24	Smania N, Corato E, Fiaschi A, Pietropoli P, Aglioti SM, Tinazzi M. Therapeutic effects of repetitive peripheral magnetic stimulation on myofascial pain syndrome. <i>Clin Neurophysiol.</i> 2003; 114:350–8.		1b, 4	yes	not studied
13	Jordan A, Bendix T, Nielsen H, Hansen FR, Host D, Winkel A. Intensive training, physiotherapy or manipulation for patients with chronic neck pain. A prospective, single-blinded, randomized clinical trial. <i>Spine.</i> 1998; 23:311–8: discussion 319.	multiple multi-modal tx	4	yes	not studied
15	Korthals-de Bos IBC, Hoving JL, van Tulder MW, Rutten-van Molken MP, Ader HJ, de Vet HC, et al. Cost effectiveness of physiotherapy, manual therapy, and general practitioner care for neck pain: economic evaluation alongside a randomised controlled trial. <i>BMJ.</i> 2003; 326:911.		4	yes	not studied
19	Brodin H. Cervical pain and mobilization. <i>Man Med.</i> 1985; 2:18–22.		4	yes	not studied
34	Levoska S, Keinänen-Kiukaanniemi S. Active or passive physiotherapy for occupational cervicobrachial disorders? A comparison of two treatment methods with a 1-year follow-up. <i>Arch Phys Med Rehabil.</i> 1993; 74(4):425–30.		4	yes	unclear
65	Ylinen J, Ruuska J. Clinical use of neck isometric strength measurement in rehabilitation. <i>Arch Phys Med Rehabil.</i> 1994; 75:465–9.		4	yes	not studied
50	Hou CR, Tsai LC, Cheng KF, Chung KC, Hong CZ. Immediate effects of various physical therapeutic modalities on cervical myofascial pain and trigger-point sensitivity. <i>Arch Phys Med Rehabil.</i> 2002; 83:1406–14.	single multi-modal tx	4	yes	not studied
66	Hong CZ, Lin JC, Bender LF, Schaeffer JN, Meltzer RJ, Causin P. Magnetic necklace: its therapeutic effectiveness on neck and shoulder pain. <i>Arch Phys Med Rehabil.</i> 1982; 63:462–6.	necklace	4	yes	not studied
		magnetic quality (when add to necklace)	1b	no	not studied

27	Viljanen M, Malmivaara A, Uitti J, Rinne M, Palmroos P, Laippala P. Effectiveness of dynamic muscle training, relaxation training, or ordinary activity for chronic neck pain: randomised controlled trial. <i>BMJ</i> . 2003; 327:475.	relaxation	4	no	not studied
		education	4	no	not studied
51	Ahlgren C, Waling K, Kadi F, Djupsjobacka M, Thornell LE, Sundelin G. Effects on physical performance and pain from three dynamic training programs for women with work-related trapezius myalgia. <i>J Rehabil Med</i> . 2001; 33:162–9.		4	no	not studied
57	Waling K, Sundelin G, Ahlgren C, Järholm B. Perceived pain before and after three exercise programs – a controlled clinical trial of women with work-related trapezius myalgia. <i>Pain</i> . 2000; 85:201–7.		4	no	not studied
30	Hanten WP, Barrett M, Gillespie-Plesko M, Jump KA, Olson SL. Effects of active head retraction with retraction/extension and occipital release on the pressure pain threshold of cervical and scapular trigger points. <i>Physiother Theory Pract</i> . 1997; 13:285–91.	occipital release	2b, 4	no	Level 2b – no –
30	Hanten WP, Barrett M, Gillespie-Plesko M, Jump KA, Olson SL. Effects of active head retraction with retraction/extension and occipital release on the pressure pain threshold of cervical and scapular trigger points. <i>Physiother Theory Pract</i> . 1997; 13:285–91.	head retraction-extension exercise combinations	2b, 4	no	Level 2b – no –

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