Article Title: Neck Pain Clinical Practice Guidelines: A Systematic Review of the Quality and Quantity of Complementary and Alternative Medicine Recommendations

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Abstract

Background: Individuals with neck pain frequently turn to complementary and alternative medicine (CAM) to seek relief. However, conventional healthcare providers often lack adequate CAM therapy knowledge to deliver informed recommendations to patients. The purpose of this study was to identify mention of CAM in neck pain clinical practice guidelines (CPG) and assess the quality of CAM recommendations using the Appraisal of Guidelines for Research & Evaluation II (AGREE II) instrument.

Methods: MEDLINE, EMBASE and CINAHL were systematically searched from 2009 to 2020 in addition to the Guidelines International Network and National Center for Complementary and Integrative Health websites. Eligible CPGs providing CAM recommendations were assessed twice with the AGREE II instrument, once to assess the overall CPG and then once to assess the CAM sections specifically.

Results: From 643 unique search results, 15 CPGs on the treatment and/or management of neck pain were identified, and 8 made recommendations on CAM therapy. Regarding scaled domain percentages, the overall CPG scored higher than the CAM section for 5 of 6 domains (overall, CAM): (1) scope and purpose (93.4%, 93.1%), (2) stakeholder involvement (81.6%, 81.9%), (3) rigour of development (70.8%, 66.3%), (4) clarity of presentation (64.9%, 60.8%), (5) applicability (39.3%, 33.6%), and (6) editorial independence (47.9%, 45.3%).

Conclusions: Most neck pain CPGs made CAM recommendations. The quality of CAM recommendations is lower than overall recommendations across all domains with the exception of stakeholder involvement. This disparity highlights the need for CAM recommendations quality improvement. Although many patients with neck pain seek CAM therapies, few CPGs are available for healthcare providers and patients.

Background

Neck pain is a medical condition defined as stiffness and/or a sensation of discomfort that is felt dorsally in the cervical region [1, 2]. It is second only to lower back pain as the most common musculoskeletal disorder in North America, affecting 30–50% of adults in the general population each year [1, 3]. Neck pain often stems from postural or mechanical stress and could lead to tissue damage in the neck region [2, 4]. Neck pain that does not have a known cause is referred to as non-specific neck pain, while neck pain that stems from a particular injury and/or trauma is referred to as specific neck pain [4]. Whether neck pain is caused by a traumatic injury or sustained as a result of poor posture, neck pain in the general population is often persistent and/or recurrent. Studies suggest that 50–85% of people in the general population who have experienced neck pain at some initial point will report neck pain symptoms 1 to 5 years later [5, 6]. Additionally, about 10% of adults with initially nondisabling neck pain reported that the condition became disabling over the subsequent six months, and about 40% of adults reported having persistent neck pain over those 6 months [7].

"Complementary" therapies are defined as non-mainstream practices used alongside conventional medicine, while "alternative" therapies are defined as non-mainstream practices used in place of conventional medicine [8, 9]. CAM therapies used for the treatment and/or management of neck pain typically include cervical/thoracic manipulation and mobilization, modifiable lifestyle factors such as diet and exercise regimen, acupuncture, heat/ice, massage, and physical therapy modalities [7]. In one American cross-sectional study it was found that approximately 79% of adults with chronic neck pain seek care from a provider each year, among which 53% of them were prescribed therapeutic exercise instruction and more than 25% of them received massage therapy, ultrasound, spinal manipulation, and/or heat [6].

According to a 2016 nationally representative survey, 56% of Canadian adults used at least one complementary and alternative medicine (CAM) therapy, among which 65% of them had "total" or "a lot of" confidence in their CAM provider [10]. More specifically, it has been found that up to 70% of Canadians experiencing back or neck pain used a type of CAM therapy in their treatment [10]. In addition, according to the 2012 National Health Information Survey, 50.6% of American adults who had neck pain utilized complementary health therapies [11, 12]. Although the Federation of State Medical Boards (FSMB) guidelines urge healthcare providers to first consider when an alternative treatment is effective, safe, and researched, studies have found that healthcare providers in the United States lack the knowledge, confidence, and training to provide proper guidance in referring their patients to CAM therapies/providers [13]. In one nationally representative survey in the United States, it was found that 72% of patients using CAM did not disclose to their physicians that they used these therapies [14]. According to a cross-sectional study in Hong Kong in 2017, 72.3% of patients already receiving conventional treatments were also using CAM therapies, including massage therapy, cupping therapy, and spinal manipulation/mobilization [15]. Another 2020 multicentre Italian study found that 48% of a patient's main sources of information about CAM was from the media, whereas only 6% of patients received information about CAM from healthcare providers. More importantly, 85% of patients were not aware of the risk of experiencing side-effects associated with the use of CAM therapies and of the potential interactions between CAM and conventional treatments. These issues highlight the need to improve primary healthcare providers' knowledge of CAM so that they can discuss treatment options with patients and make evidence-informed referrals to the appropriate CAM specialists when necessary [16].

Clinical practice guidelines (CPGs) have become an important part of evidence-based medicine since they assist healthcare providers in making decisions about specific interventions and therapies. Healthcare providers use these documents to diagnose, treat, and manage a variety of conditions, including neck pain. However, there has been growing criticism that recommendations from different CPGs are frequently contradictory [17, 18]. It is often challenging for healthcare providers to discern a neck pain CPG's degree of credibility and quality because they usually lack the time, resources, and skills to gather and critically examine every available CPG [17, 19]. There has been considerable doubt casted on many of the commonly used CPGs because of their poor reliability and lack of specific evidence to support their recommendations [20,21,22]. To date, only one study has examined the methodological quality of non-specific neck pain CPGs; however, the study did not address CAM. The study used the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument and concluded that most non-specific neck pain CPGs were of poor quality overall and lacked methodological consistency [17]. Hence, it is essential that CPGs focusing on CAM treatments are supported by high-quality studies and made available to healthcare providers who are required to make decisions regarding CAM. To our knowledge, the present study is the first to assess the quality of neck pain CPGs that make CAM recommendations using the AGREE II instrument. The purpose of this review was to identify the quantity and assess the quality of CAM recommendations across CPGs for the treatment and/or management of neck pain.

Methods

Approach

A systematic review was conducted to identify neck pain CPGs using standard methods [17] and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria

[23]. A protocol was registered with PROSPERO (registration number: CRD42020182237). Eligible CPGs that made CAM recommendations were assessed twice with the widely used AGREE II instrument, which has been found to be both reliable and valid in assessing the quality of CPGs [23]. The AGREE II instrument consists of 23 items grouped into six domains: scope and purpose, stakeholder involvement, rigour of development, clarity and presentation, applicability, and editorial independence. Assessors applied the 23 AGREE II items to each CPG containing CAM recommendations twice; first, to the overall CPG, and then second, exclusively to the CAM sections of the CPG [24].

Eligibility Criteria

Eligibility criteria for neck pain CPGs were based on the Population, Intervention, Comparison and Outcomes (PICO) framework. Eligible populations were adults aged 19 years and older with neck pain. With respect to interventions, CPGs that provided recommendations for the treatment and/or management of neck pain were included. Comparisons were applicable to the assessment of the quality of neck pain CPGs. AGREE II scores, which reflect CPG content and format, were the outcomes assessed. The following conditions were also applied to define eligible CPGs: published in the English language; developed by non-profit organizations (which include academic institutions, disease-specific foundations, government agencies, or professional associations or societies); and either publicly available or accessible through our library system. Furthermore, CPGs were deemed eligible if they were published in 2009 or later. This time period was chosen in anticipation of a paucity of CAM recommendations across eligible CPGs, while still providing at least five years since the publication of AGREE II (which provided developers with criteria for developing high-quality CPGs). Publications in the form of consensus statements, protocols, abstracts, conference proceedings, letters or editorials, based on primary studies that

evaluated neck pain treatment or management, or focused on neck pain curriculum, education, training, research, professional certification or performance were all ineligible. Only eligible CPGs that included CAM therapy recommendations were assessed using the AGREE II instrument [25], in order to determine the difference in AGREE II scores between the overall CPG and the CAM section of each CPG. Moreover, demographic information is only reported for eligible CPGs that did not contain CAM therapy recommendations.

Searching and Screening

MEDLINE, EMBASE, and CINAHL were searched on April 17, 2020, from 2009 to April 16, 2020, inclusive. The search strategy (Supplementary File 1) included indexed headings and keywords that reflect terms commonly used in the literature to refer to neck pain [26]. The Guidelines International Network, which is a repository of CPGs, was also searched [https://www.g-i-n.net/]. Keyword searches were based on the eligibility criteria, and included "neck pain", "cervical pain", and "musculoskeletal pain". Next, the NCCIH website, which contains a single list of CAM CPGs was also searched [https://nccih-nih-gov.proxy.bib.uottawa.ca/health/providers/clinicalpractice.htm]. JYN and MU screened titles and abstracts from all sources as well as screened full-text items to confirm eligibility. All authors met and reviewed the screened titles and abstracts, and full-text items in order to standardize screening and resolve selection differences between the two reviewers.

Data Extraction and Analysis

The following data were extracted from each CPG and summarized: date of publication, country of first author, type or organization that published the CPG (e.g., academic institutions, government agencies, disease-specific foundations, or professional associations or societies), and whether any CAM therapies were mentioned. If CAM therapies were

mentioned in a CPG, the types of CAM mentioned, CAM recommendations made, CAM funding sources, and whether any CAM providers were part of the guideline development panel were summarized. Most data were available in the CPGs, however, to assess applicability, the website of each developer was searched for any associated knowledge-based resources in support of implementation.

Guideline Quality Assessment

The AGREE II instrument has been found to be both a valid and reliable tool for the assessment of CPG quality [27, 28]. The instrument includes 23 items covering six quality domains: 1) scope and purpose, 2) stakeholder involvement, 3) rigour of development, 4) clarity of presentation, 5) applicability, and 6) editorial independence. Two additional assessment items (overall guideline assessment) are included for the evaluators to make an overall judgement of the CPG. Each item is scored on a 7-point Likert scale, with a "1" indicating "strongly disagree" and a "7" indicating "strongly agree". Next, the quality of the overall CPG is rated using the same scoring system for an overall assessment score, and it is determined whether the CPG should be recommended for use. To date, the AGREE II developers have not set domain score or overall assessment score cut-offs for designating CPGs as high or low quality; however, it allows comparison between CPGs [29]. Thus, in the present review, the final rating was left to the consensus of both evaluators, JYN and MU. Initially, JYN and MU participated in a pilot test of the AGREE II instrument during which both evaluators independently assessed three CPGs. Once completed, inconsistencies in scores were discussed and resolved to standardize scoring. Next, all eligible CPGs containing CAM therapy recommendations were assessed using the AGREE II tool twice, by both JYN and MU, to assess the overall CPG and then to assess the CAM sections specifically. The AGREE II questions were modified for application to the CAM sections of the CPGs

specifically, as found in Supplementary File 2. JS reviewed the screened titles, abstracts, and full-text items to standardize screening and assisted with resolving discrepancies between the two screeners. For each CPG, the average rating for all 23 items of each appraiser was calculated in order to determine the average appraisal scores. Next, the average of these values was calculated for both appraisers. Average overall assessments for each CPG were calculated by taking the average of both appraisers' "overall guideline assessment" scores. Scaled domain percentages were generated for inter-domain comparisons. These were calculated by adding both appraisers' ratings of all items in each domain and scaling by maximum and minimum possible domain scores, before converting this into a percentage. Table 4 shows a comparison between average appraisal scores, average overall assessments, and scaled domain percentages for each CPG.

Results

Search Results (Fig. 1)

Of a total of 681 titles/abstracts retrieved, 646 were unique, and 631 titles and abstracts were eliminated, leaving 15 full-text articles that were considered. The full-texts for the remaining 15 items were further assessed, of which 7 were ineligible because they were CPG appraisal studies (n = 3), were irretrievable (n = 3), or were published before 2009 (n = 1), leaving 8 eligible CPGs for review [30,31,32,33,34,35,36,37]. All 8 CPGs made mention of CAM therapies and made CAM therapy recommendations [30,31,32,33,34,35,36,37].

Guideline Characteristics (Table 1)

Eligible CPGs were published from 2012 to 2020 and originated from Canada (n = 3), the USA (n = 2), Denmark (n = 1), Italy (n = 1), and the Netherlands (n = 1). The CPGs were developed by professional associations or societies (n = 7) and a government agency (n = 1).

Eight CPGs made CAM recommendations [30,31,32,33,34,35,36,37] that included exercise (n = 7), manual therapy (n = 7), cervical/thoracic mobilization and manipulation (n = 7), massage therapy (n = 6), acupuncture (n = 3), traction (n = 3), ultrasound (n = 2), and yoga (n = 2); only the CPGs containing CAM recommendations were assessed using the AGREE II tool. CAM funding sources were used in 6 of the 8 CPGs, and 7 of the 8 CPGs included CAM providers as part of the CPG panel. We provide a summary of CAM recommendations made across neck pain CPGs for the benefit of clinicians and researchers in Fig. 2.

Average Appraisal Scores, Average Overall Assessments and Recommendations Regarding Use of Guidelines: overall CPGs (Table 2)

Each CPG was scored on a 7-point Likert scale which ranges from strongly disagree (1) to strongly agree (7) that the item is met. The average appraisal scores for the 8 CPGs ranged from 3.6 to 6.2 on this scale; of which 5 CPGs scored 5.0 or below, while 1 CPG scored 6.0 or above. Average overall assessments for the 8 CPGs ranged from 3.5 to 6.0. For this measure, 5 CPGs scored 5.0 or below, while 2 CPGs score 6.0 or above.

Average Appraisal Scores, Average Overall Assessments and Recommendations Regarding Use of Guidelines: CAM Sections (Table 2)

Each CPG was scored on a 7-point Likert scale which ranges from strongly disagree (1) to strongly agree (7) that the item is met. The average appraisal scores for the 8 CPGs ranged from 3.6 to 6.2 on this scale; of which 1 CPG scored below 4.0, 4 CPGs achieved or exceeded an average appraisal score of 5.0, and 1 CPG achieved or exceeded an average appraisal score of 6.0. Average overall assessments for the 8 CPGs ranged from 3.5 to 6.0. For this measure, 7 CPGs equaled or exceeded a score of 4.0, while 4 CPGs equaled or exceeded a score of 5.0. Table 2 shows average appraisal scores, average overall assessments, and CAM recommendations regarding use for each CPG.

Overall Recommendations: Overall CPGs (Table 3)

All of the 8 CPGs were recommended by both appraisers. Appraisers agreed in their overall recommendation for 7 of the 8 CPGs including 4 "Yes with modifications"s [30, 32, 33, 36, 37] and 3 "Yes"s [31, 34, 35]. The remaining 1 CPG was rated by the two appraisers as "Yes" and "Yes with modifications", respectively [32].

Overall Recommendations: CAM Sections (Table 3)

All of the 8 CPGs were recommended by both appraisers. Appraisers agreed in their overall recommendation for 7 of the 8 CPGs including 4 "Yes with modifications"s [30, 32, 33, 36, 37] and 3 "Yes"s [31, 34, 35]. The remaining 1 CPG was rated by the two appraisers as "Yes" and "Yes with modifications", respectively [32].

Scaled Domain Percentage Quality Assessment (Table 4)

Scaled domain percentages scores of the CPGs were as follows (overall, CAM sections): scope and purpose (77.8–100.0%, 77.8–100.0%), stakeholder involvement (50.0–91.7%, 50.0–91.7%), rigour-of-development (44.8–92.7%, 44.8–87.5%), clarity-of-presentation (38.9–94.4%, 38.9–94.4%), applicability (25.0–70.8%, 22.9–41.7%), and editorial independence (4.2–79.2%, 0.0–79.2%).

Scope and Purpose

In both the overall CPGs and the CAM sections of the CPGs, the overall objectives were well defined and specified in all CPGs but one [32]. Similarly, the health questions being covered by each CPG were specifically described in all CPGs but one [32]. The target population to whom the CPGs would apply were mentioned in less detail in two CPGs [30, 33] and were often generalized to individuals with neck pain.

Stakeholder Involvement

For both the overall CPGs and the CAM sections of the CPGs, seven CPGs provided a detailed description of the members of the guideline development group, including each member's name, level of education and role [30,31,32, 34,35,36,37], while one did not [33]. Additionally, seven CPGs detailed the views and preferences of the target population [30,31,32, 34,35,36,37], while one did not [33]. In both the overall CPGs and CAM sections of the CPGs, only one of the eight CPGs clearly defined the target population [36].

Rigour of Development

Systematic methods were used to search for evidence in five of the eight CPGs [31, 32, 34,35,36]. The CPGs also varied in their descriptions of the criteria for selecting evidence; five CPGs clearly described selection criteria [31, 32, 35,36,37], while three CPGs did not [30, 33, 34]. Regarding the CAM sections of CPGs, four CPGs used systematic methods to search for CAM evidence [32, 34,35,36]; however, four did not describe the criteria for selecting CAM-related evidence [30, 31, 33, 37]. The strengths and limitations of the body of evidence were clearly described in all CPGs except for three [30, 32, 33]. With respect to the CAM sections of CPGs, those that clearly described the strengths and limitations of evidence of the overall CPG also did so in CAM sections [30, 32, 33]. Additionally, CPGs that clearly described the methods for formulating their recommendations also did this for the sections that made CAM recommendations [31, 32, 34, 36]. Four CPGs thoroughly considered the health benefits, side effects, and risks in formulating the recommendations for the overall CPG and CAM sections [30, 31, 34, 36]. Only two authors provided an explicit link between recommendations, including CAM recommendations, and the supporting evidence [31, 34], while in the other CPGs the link was inconsistent. All CPGs explicitly stated they were externally reviewed by experts prior to publication with the exception of one [37]. Four CPGs

mentioned that the CPG will be updated and provided a procedure for doing so [30,31,32, 34]. The other four CPGs did not provide a procedure for updating the CPG despite mentioning plans for updating [33, 35,36,37].

Clarity of Presentation

For both the overall and CAM recommendations, only three CPGs were specific and unambiguous [31, 34, 35]. Six CPGs clearly presented the different options for the management of the condition [30,31,32, 34,35,36], but two did not [33, 37]. With respect to the CAM sections of the CPGs, six authors did not describe the clinical scenarios in which CAM therapies would be relevant [30,31,32,33, 36, 37]. Key recommendations were generally easily identifiable in all but one CPG [37].

Applicability

For both the overall CPGs and the CAM sections of the CPGs, all CPGs described facilitators and barriers to the application of recommendations, including CAM recommendations [30,31,32,33,34,35,36,37]. However, none of the CPGs provided advice and/or tools on how recommendations could be put into practice. Just one CPG considered potential resource implications of applying the overall recommendations and CAM recommendations [31]. In addition, only one CPG clearly presented monitoring and/or auditing criteria [35], while seven CPGs contained little to no information [30,31,32,33,34, 36, 37]. With respect to the CAM sections of CPGs, all but one CPG provided little or no auditing and/or monitoring criteria to measure the implementation of CAM recommendations [30,31,32,33,34, 36, 37].

Editorial Independence

For both the overall CPGs and the CAM sections of the CPGs, two CPGs reported that the views of the funding source did not influence the contents of the CPG [34, 35]. Of the remaining six CPGs, three declared a funding source but not whether the funding source influenced the contents for the CPG [32, 36, 37], three CPGs declared a funding source and that the funding source did not influence the contents of the CPG [30, 31], and the remaining one CPG did not declare a funding source [33]. No CPGs explicitly stated that no funding supported their development. Two CPGs did not address competing interests [33, 37]. Of the remaining CPGs that did detail their competing interests [30,31,32, 34,35,36], one did not specify how their potential competing interests were identified [36].

Discussion

Summary of Main Findings

The purpose of this study was to identify the quantity and assess the quality of CAM recommendations in CPGs for the treatment and/or management of neck pain. This study identified 8 CPGs published between 2012 and 2020 that provided recommendations for the treatment and/or management of neck pain, of which 8 CPGs made CAM therapy recommendations. Across the 8 eligible CPGs identified, recommendations were made pertaining to various interventions, the following of which were most common: exercise, manual therapy, and cervical/thoracic manipulation and mobilization. The quality of each, as assessed by the 23-item AGREE II instrument, varied widely across overall CPGs and by domain. However, the order of the scaled domain percentages from highest to lowest was identical for the overall CPGs and the CAM sections of the CPGs. The scaled domain percentages for the overall CPGs from highest to lowest were as follows: scope and purpose (93.4%), stakeholder involvement (81.6%), rigour of development (70.8%), clarity of

presentation (64.9%), applicability (39.3%), and editorial independence (47.9%). The scaled

domain percentages for the CAM section of the CPGs from highest to lowest were as

follows: scope and purpose (93.1%), stakeholder involvement (81.9%), rigour of

development (66.3%), clarity of presentation (60.8%), applicability (33.6%), and editorial

independence (45.3%). CPGs generally scored poorly on applicability and editorial

independence domains, and highly variably on stakeholder involvement and clarity of

presentation domains. In assessing the overall CPG, 5 CPGs scored 5.0 or lower in both

average appraisal score and average overall assessment [30, 32, 33, 36, 37], and 1 CPG

scored 6.0 or higher in both of these metrics [31]. (1 = strongly disagree; 7 = strongly agree

that criteria are met).

Comparative Literature

To our knowledge, there is a limited number of studies assessing the quality of neck pain

CPGs. Additionally, no previous studies have identified the quantity nor assessed the quality

of CAM recommendations in neck pain CPGs. Thus, to our knowledge, this is the first study

to assess the credibility and nature of CAM therapy recommendations in neck pain CPGs.

With respect to comparative literature relating to neck pain CPGs, one study published in

2019 summarized and appraised all relevant CPGs for the treatment and management of neck

pain. The study found that 46 CPGs were included for appraisal and review. Each CPG was

assessed using the AGREE II instrument and their findings corresponded with prior studies

that CPGs were of poor quality overall and lacked methodological consistency [17].

Additionally, the study concluded that the majority of the 46 CPGs were developed for

general neck pain that focused on treatment recommendations, while only a small quantity

were aimed at recommendations for diagnosis, prognosis, and outcomes [17]. Furthermore,

this study reported considerably lower scaled domain percentage scores in comparison to the present study. The authors identified 20 CPGs published between 2003 and 2018 that provided recommendations for the treatment and/or management of neck pain. The scaled domain percentages from highest to lowest were as follows: clarity of presentation (68.4%), scope and purpose (66.8%), stakeholder involvement (57.0%), rigour of development (46.8%), editorial independence (46.3%), and applicability (30.5%) [17]. The lower scaled domain percentage scores can be partly explained because, as the study points out, most neck pain CPGs have improved considerably in quality since 2012. Since the present study identified CPGs published between 2012 and 2020, most of the older poor-quality CPGs were not included, which likely raised the scaled domain percentage scores. Additionally, CPGs published more recently (especially those published after 2012) appear to use the AGREE instrument as a template. This may be due to the widespread acceptance and use of the AGREE II instrument in recent years as a method for evaluating CPGs [38]. The acceptance of the AGREE II instrument, which has been found to be both reliable and valid in assessing the quality of CPGs, could be the reason for this in recent years. Another study reviewed variations in the quality of musculoskeletal pain CPGs and found that only 8 of 34 CPGs were of high quality [39]. The study reported a number of factors that contributed to the poor overall quality of musculoskeletal pain CPGs. These factors included the limited involvement of patients in the development process (domain 2), a lack of attention to CPG applicability (domain 5), low editorial independence (domain 6), and the fact that CPG developers used inconsistent language to define MSK pain conditions. Furthermore, several studies in Australia, Canada, and the USA have shown that few CPGs match quality standards as those specified by the AGREE II instrument [40,41,42,43,44]. In addition, since the AGREE II instrument does not assess whether systematic methods were followed to appraise the

research evidence used to support CPG recommendations, most studies noted that the link between research and recommendations was a particular area of weakness [40,41,42,43,44].

With regard to comparative literature pertaining to CAM recommendations in CPGs, a 2016 study by Ng et al. assessed the quantity and quality of CPGs on CAM therapies and revealed that only a few CPGs on CAM therapies were available to support informed and shared decision-making among patients and healthcare providers [45]. Additional studies reviewed CAM recommendations across CPGs for a variety of diseases/conditions including cancer-related pain [46], low back pain [47], rheumatoid arthritis and osteoarthritis [48], and multiple sclerosis [49]. The CAM recommendations across these CPGs both ranged in quantity and quality. Twenty-two CPGs were identified that were relevant to the treatment and/or management of cancer-related pain, 11 of which made CAM therapy recommendations [46]. Twenty-two CPGs were identified that were relevant to the treatment and/or management of lower back pain, 17 of which made CAM therapy recommendations [47]. Fifteen CPGs were identified that were relevant to the treatment and/or management of rheumatoid arthritis or osteoarthritis, 5 of which made CAM therapy recommendations [48]. Lastly, 11 CPGs were identified that were relevant to the treatment and/or management of multiple sclerosis, only 4 of which made CAM therapy recommendations [49]. With regard to the scaled domain percentages across these four studies, for both the studies on cancer-related pain and lower back pain, the applicability and editorial independence domains had the lowest scores and scope and purpose and clarity of presentation domains had the highest scores [46, 47]. With respect to the study on rheumatoid arthritis/osteoarthritis and the study on multiple sclerosis, the applicability, editorial independence, and stakeholder involvement domains had the lowest scores, and the scope and purpose and clarity of presentation domains had the highest scores [48, 49]. Therefore, the findings in the present study about the

variability and suboptimal quality of CAM recommendations across CPGs are consistent with previous findings for other diseases/conditions in the literature. Overall, the present study found that few CPGs containing high-quality CAM recommendations for the treatment and/or management of neck pain are available to support shared decision-making between healthcare providers and patients. This may be reflective of the inconsistency in the literature surrounding the efficacy of different types of CAM therapies for neck pain [50,51,52,53]. For example, in one study, yoga was found to have a beneficial effect on neck pain severity and pain-related functional disability [50]. However, one study found minimal evidence to support the use of massage therapy for patients with neck pain [51], and another study found evidence to support the use of acupuncture for neck pain [52]. The sub-optimal quality and overall variability of neck pain CPGs may be partially explained by a lack of funding [54,55,56,57], a lack of public confidence in CAM's effectiveness [58,59,60,61], and negative attitudes about CAM therapies [62,63,64,65,66]. In addition, there is an inconsistency in the literature surrounding the perceived safety and efficacy of CAM in the context of neck pain [50,51,52,53].

Apart from the AGREE II instrument, several resources can be used to support the development and implementation of neck pain CPGs with CAM recommendations [67,68,69,70]. The development standards and checklists of CPGs have been developed by the World Health Organization (WHO) [71]; additional resources include the Scottish Intercollegiate Guidelines Network (SIGN) [72], the National Institute for Health & Care Excellence (NICE) [73, 74], the Guidelines International Network (G-I-N) [75], and the Institute of Medicine (IOM) [76]. In terms of guideline implementation, the Implementability Framework and Guideline Implementability for Decision Excellence Model (GUIDE-M) [67], the Guideline Implementability Research Application Network (GIRANet) [68], and the

GuideLine Implementability Appraisal (GLIA) [69] have been developed to support the implementation of CPGs. Additionally, the GRADEpro Guideline Development Tool is an application widely used by guideline developers to make evidence profiles and resulting CPGs with interactive evidence to decision frameworks available to others [77, 78].

Strengths and Limitations

A strength of this study is the use of a comprehensive systematic review methodology to identify eligible CPGs for the treatment and/or management of neck pain. Another strength is the use of the AGREE II instrument to assess the quality of CPGs, which is regarded as the internationally accepted gold standard for appraising CPGs [79]. One limitation of this study includes the fact that CPGs were independently assessed by two appraisers rather than by four as recommended by the AGREE II instrument user manual to optimize reliability. To mitigate this, JYN and MU independently appraised three different CPGs as part of an initial pilot test then discussed the results and achieved consensus on how to apply the AGREE II instrument in order to standardize scoring. Additionally, following the appraisal of all eligible CPGs, all three authors met to discuss and resolve any uncertainties without modifying legitimate discrepancies. Another limitation is that we only assessed CPGs published in the English language. This may have excluded CPGs published in languages with traditional systems of medicine (e.g., traditional Chinese medicine in Chinese or Kampo medicine in Japanese).

Conclusions

This study identified eight CPGs published between 2009 and 2020 for the treatment and/or management of neck pain each providing at least one CAM recommendation. CAM therapies identified across CPGs included: acupuncture, cervical/thoracic manipulation and

mobilization, manual therapy, exercise, herbal supplements, massage therapy, traction, ultrasound, and yoga. All eight CPGs were assessed twice using the AGREE II instrument; once for the overall CPG and once for the CAM sections of the CPG. The AGREE II scores revealed that the quality varied between domains within and across CPGs. Specifically, the applicability and editorial independence domains scored the lowest, compared to the scope and purpose and stakeholder involvement domains which scored the highest in both the overall and CAM recommendations. In addition, the scaled domain percentages were generally lower for CAM sections. However, it has been found that more than half of patients with neck pain use some sort of CAM therapy. Patients frequently rely on their healthcare providers to keep them informed about their treatment regimen, and health providers frequently rely on CPGs to assist them in decision-making. Given the high prevalence of CAM use for this patient population, it is concerning that there are few evidence-based CAM recommendations available for healthcare providers to use to guide informed decision-making and open discussions about CAM use with their patients experiencing neck pain. This lack of CPG development and research may encourage the use of CAM for which there are no proven benefits and potential health risks, and could lead to the underuse of potentially beneficial CAM therapies for neck pain. As a result, the findings of the present study support the need for a greater emphasis on the development of CAM therapy recommendations in neck pain CPGs. Future research should focus on evidence-based CAM recommendations so that healthcare providers have reliable resources to utilize when caring for their patients, while also considering the safety and efficacy of these therapies.

Abbreviations

AGREE II: Appraisal of Guidelines for Research & Evaluation II

CAM: Complementary and alternative medicine

CPG: Clinical practice guideline

NCCIH: National Centre for Complementary and Integrative Health

PICO: Patients, intervention, comparison and outcomes

PRISMA: Preferred reporting items for systematic reviews and meta-analyses

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Contributions

JYN designed and conceptualized the study, collected and analysed data, critically revised the manuscript, and gave final approval of the version to be published. MU collected and analysed data, co-drafted the manuscript, and gave final approval of the version to be published. JS collected and analysed data, co-drafted the manuscript, and gave final approval of the version to be published.

Conflict of Interests

The authors declare that they have no competing interests.

Ethics Approval and Consent to Participate

This study involved a systematic review of peer-reviewed literature only; it did not require ethics approval or consent to participate.

Consent for Publication

All authors consent to this manuscript's publication.

Availability of Data and Materials

All relevant data are included in this manuscript.

Figure Legend

Figure 1: PRISMA Diagram

Figure 2: Summary of CAM Recommendations in Clinical Practice Guidelines

Table Legend

Table 1: Characteristics of Eligible Guidelines

Table 2: Average Appraisal Scores and Average Overall Assessments of Each Guideline

Table 3: Overall Recommendations for Use of Appraised Guidelines

Table 4: Scaled Domain Percentages for Appraisers of Each Guideline

Supplementary Files

Supplementary File 1: MEDLINE Search Strategy for Neck Pain Clinical Practice Guidelines
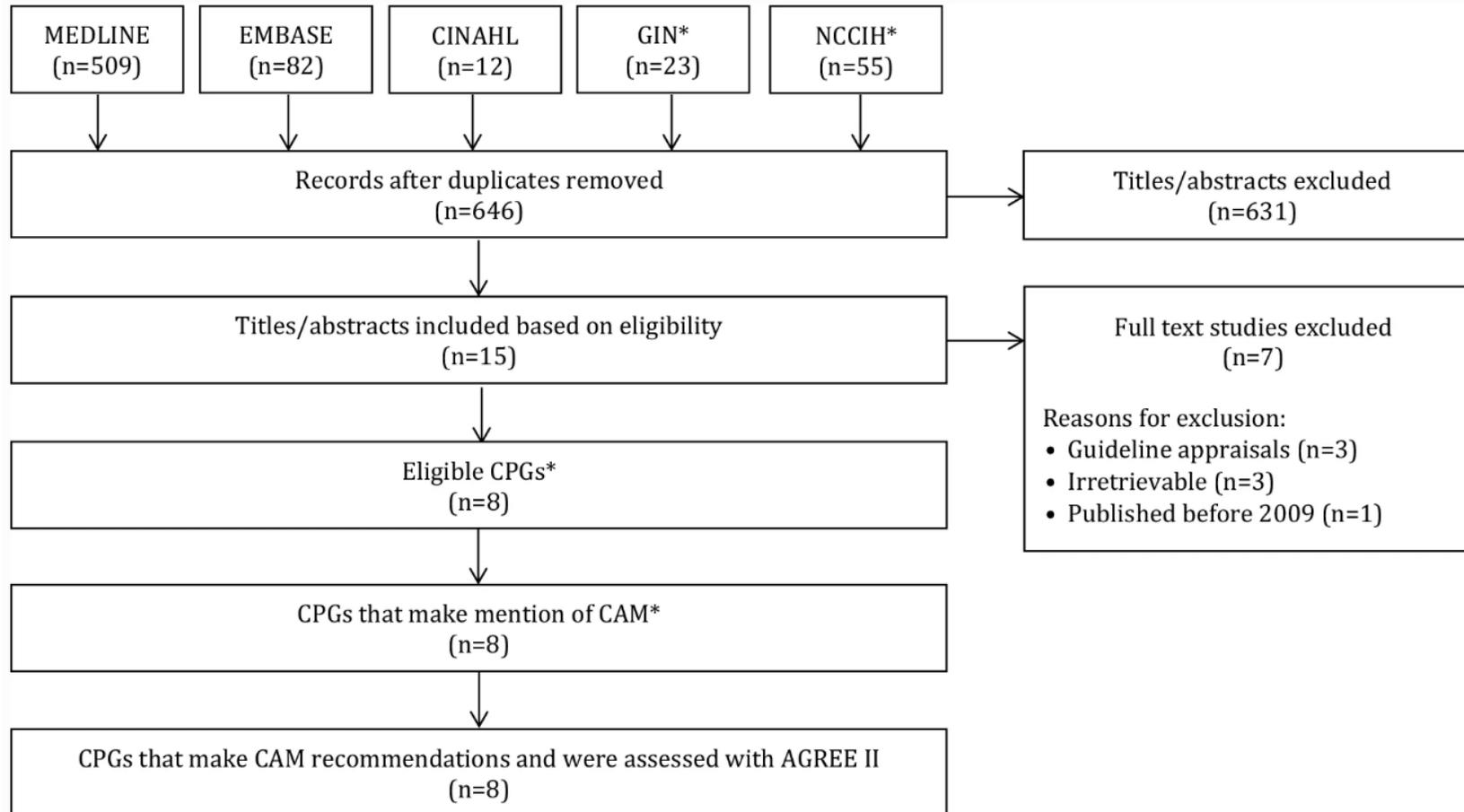
Executed April 17th, 2020

Supplementary File 2: Modified AGREE II Questions Used to Guide Scoring of CAM

Sections of Each Guideline

Figures

Figure 1: PRISMA Diagram

*List of Abbreviations: CAM = complementary and alternative medicine, CPG = clinical practice guideline, GIN = Guidelines International Network, NCCIH = National Center for Complementary and Integrative Health

Figure 2: Summary of CAM Recommendations in Clinical Practice Guidelines

Guideline	CAM Therapies							
	Acupuncture	Exercise	Manual Therapy	Massage Therapy	Manipulation and Mobilization - Cervical/Thoracic (e.g., Chiropractic or Osteopathic Medicine)	Traction	Ultrasound	Yoga
Bier et al. 2018 [30]	N/A	+	+	+	+	N/A	N/A	N/A
Blanpied et al. 2017 [31]	N/A	+	+	N/A	+	+	N/A	N/A
Kjaer et al. 2017 [32]	+	+	+	N/A	+	N/A	N/A	N/A
Monticone et al. 2017 [33]	+	+	+	+	+	N/A	+	N/A
Bussieres et al. 2016 [34]	+	+	+	+	+	0	+	+
Côté et al. 2016 [35]	N/A	+	+	+	+	-	N/A	+
Bryans et al. 2014 [36]	N/A	+	+	+	+	N/A	N/A	N/A
Brosseau et al. 2012 [37]	N/A	N/A	N/A	+	N/A	N/A	N/A	N/A

Legend:
+/green = recommendation for the therapy's use
-/red = recommendation against the therapy's use
0/yellow = recommendation unclear/uncertain/conflicting
N/A/grey = no recommendation provided

Tables

Table 1: Characteristics of Eligible Guidelines

Guideline	Country (First Author)	Developer	CAM Category	Guideline Topic
Bier et al. 2018 [30]	Netherlands	The Royal Dutch Society for Physical Therapy (KNGF)	Cervical/thoracic mobilization and manipulation, exercise, massage therapy	Physical therapy assessment and treatment in patients with nonspecific neck pain
Blanpied et al. 2017 [31]	USA	American Physical Therapy Association	Massage therapy, manual therapy, upper extremity stretching, exercise, cervical/thoracic mobilization and manipulation, traction	Evidence-based physical therapy
Kjaer et al. 2017 [32]	Denmark	Danish Health Authority	Exercise, manual therapy, massage therapy, acupuncture	Non-surgical treatment of patients with recent onset neck pain or cervical radiculopathy
Monticone et al. 2013 [33]	Italy	The Italian Society of Physical and Rehabilitation Medicine (SIMFER)	Exercise, manual therapy, traction, cervical/thoracic mobilization and manipulation, massage therapy, traction, ultrasound, transcutaneous electrical nerve stimulation (TENS), acupuncture, laser therapy	General neck pain recommendations
Bussieres et al. 2016 [34]	USA	Canadian Chiropractic Guideline Initiative	Exercise, cervical/thoracic mobilization and manipulation, manual therapy, Qigong exercises, yoga, massage therapy, low-level laser therapy,	Treatment of neck pain-associated disorders and whiplash-associated

Guideline	Country (First Author)	Developer	CAM Category	Guideline Topic
		(CCGI)	acupuncture, TENS, traction, massage therapy	disorders
Cote et al. 2016 [35]	Canada	Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration	Yoga, cervical/thoracic mobilization and manipulation, relaxation therapy, massage therapy, low-level laser therapy, range of motion exercise, traction	Management of neck pain and associated disorders
Bryans et al. 2014 [36]	Canada	Canadian Chiropractic Association	Cervical/thoracic mobilization and manipulation, manual therapy, massage therapy, nerve stimulation, exercise, trigger point therapy, ultrasound	Chiropractic treatment of adults with neck pain
Brosseau et al. 2012 [37]	Canada	The Ottawa Methods Group (OMG)	Massage therapy, cervical/thoracic mobilization and manipulation, manual therapy, ultrasound, myofascial band therapy	Therapeutic massage for neck pain

Table 2: Average Appraisal Scores and Average Overall Assessments of Each Guideline

Guideline	Metric	Appraiser 1	Appraiser 2	Average	Standard Deviation
Bier et al. 2018 [30]	Appraisal Score	5.0	4.4	4.7	0.4
	Overall Assessment	5.0	4.0	4.5	0.7
Blanpied et al. 2017 [31]	Appraisal Score	6.1	6.3	6.2	0.1
	Overall Assessment	6.0	6.0	6.0	0.0
Kjaer et al. 2017 [32]	Appraisal Score	5.4	4.7	5.0	0.5
	Overall Assessment	5.0	5.0	5.0	0.0
Monticone et al. 2013 [33]	Appraisal Score	3.8	3.4	3.6	0.3
	Overall Assessment	4.0	4.0	4.0	0.0
Bussieres et al. 2016 [34]	Appraisal Score	6.0	5.7	5.9	0.2
	Overall Assessment	6.0	6.0	6.0	0.0
Cote et al. 2016 [35]	Appraisal Score	5.7	5.4	5.5	0.2
	Overall Assessment	6.0	5.0	5.5	0.7
Bryans et al. 2014 [36]	Appraisal Score	5.1	4.7	4.9	0.3
	Overall Assessment	5.0	4.0	4.8	0.4
Brosseau et al. 2012 [37]	Appraisal Score	4.4	3.9	4.2	0.4

Guideline	Metric	Appraiser 1	Appraiser 2	Average	Standard Deviation
	Overall Assessment	4.0	3.0	3.5	0.7

Table 3: Overall Recommendations for Use of Appraised Guidelines

Guideline	Overall Guideline		CAM Section	
	Appraiser 1	**Appraiser 2**	**Appraiser 1**	**Appraiser 2**
Bier et al. 2018 [30]	Yes, with modifications	Yes, with modifications	Yes, with modifications	Yes, with modifications
Blanpied et al. 2017 [31]	Yes	Yes	Yes	Yes
Kjaer et al. 2017 [32]	Yes	Yes, with modifications	Yes	Yes, with modifications
Monticone et al. 2013 [33]	Yes, with modifications	Yes, with modifications	Yes, with modifications	Yes, with modifications
Bussieres et al. 2016 [34]	Yes	Yes	Yes	Yes
Cote et al. 2016 [35]	Yes	Yes	Yes	Yes
Bryans et al. 2014 [36]	Yes, with modifications	Yes, with modifications	Yes, with modifications	Yes, with modifications
Brosseau et al. 2012 [37]	Yes, with modifications	Yes, with modifications	Yes, with modifications	Yes, with modifications

Table 4: Scaled Domain Percentages for Appraisers of Each Guideline

Guideline		Domain Score (%)					
		Scope and Purpose	Stakeholder Involvement	Rigour of Development	Clarity of Presentation	Applicability	Editorial Independence
Bier et al. 2018 [30]	Overall Guideline	91.7	91.7	56.3	63.9	27.1	58.3
	CAM Section	91.7	91.7	56.3	63.9	27.1	58.3
Blanpied et al. 2017 [31]	Overall Guideline	94.4	88.9	92.7	91.7	70.8	75.0
	CAM Section	91.6	91.6	56.25	63.9	27.1	58.3
Kjaer et al. 2017 [32]	Overall Guideline	88.9	83.3	79.2	55.6	33.3	54.2
	CAM Section	88.9	83.3	79.2	55.6	33.3	54.2
Monticone et al. 2013 [33]	Overall Guideline	77.8	50.0	44.8	38.9	35.4	4.2
	CAM Section	77.8	50.0	44.8	38.9	35.4	0.0
Bussieres et al.	Overall	100.0	86.1	87.5	91.7	41.7	79.2

Guideline		Domain Score (%)					
		Scope and Purpose	Stakeholder Involvement	Rigour of Development	Clarity of Presentation	Applicability	Editorial Independence
2016 [34]	Guideline						
	CAM Section	100.0	86.1	87.5	91.7	41.7	79.2
Cote et al. 2016 [35]	Overall Guideline	100.0	86.1	74.0	94.4	52.1	58.3
	CAM Section	100.0	86.1	74.0	94.4	52.1	58.3
Bryans et al. 2014 [36]	Overall Guideline	94.4	88.9	76.0	47.2	29.2	50.0
	CAM Section	94.4	88.9	76.0	47.2	29.2	50.0
Brosseau et al. 2012 [37]	Overall Guideline	100.0	77.8	56.3	36.1	25.0	4.2
	CAM Section	100.0	77.8	56.3	30.6	22.9	4.2