

SYSTEMATIC REVIEW

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Attitudes and perceptions of health care professionals concerning chiropractors and chiropractic practice: a systematic review

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Abstract

Background Chiropractic care often exists outside of national healthcare systems, with exceptions in some national settings. This situation has led to suboptimal interprofessional communication and referral, with implications for the provision of appropriate and efficient care. To find solutions, the attitudes and perceptions of other professions must be better understood. We conducted a systematic review to assess other healthcare professionals' perceptions and attitudes towards chiropractors and chiropractic care.

Methods The review was registered with PROSPERO (CRD42023403381). Reporting was guided by the PRISMA statement. A search was carried out on PubMed, CINAHL, AMED, Index of Chiropractic Literature (ICL) and MEDLINE in Jan 2021 and updated on Jan 2022, February 2023 and June 2024. We included qualitative and quantitative study designs, focusing on healthcare professionals' attitudes toward and perceptions of chiropractic. Methodological quality was assessed using the Centre for Evidence Based Medicine tools for qualitative and cross-sectional survey studies.

Results The search retrieved 245 articles, of which 43 were included for review. Studies had been conducted across multiple national jurisdictions. A total of 10,108 participants were included across the studies, including primary and secondary healthcare professionals as well as healthcare students. Issues identified with influencing opinions of chiropractic practice included participants' knowledge of chiropractic methods, scope of practice, interprofessional communication, research base, and education. While some participants reported a perception of positive clinical outcomes associated with chiropractic care, communication between healthcare professionals and chiropractors was often lacking. Attitudes towards chiropractic varied, with factors like knowledge, patient interest, and referrals influencing perceptions.

Conclusions To improve interprofessional attitudes and perceptions, the chiropractic profession might prioritise increased communication and information access concerning contemporary chiropractic care with other health care professions including educational interventions. Mitigation of a persistent lack of reliable information may improve how the profession is perceived in general, reduce misinformation and increase the likelihood that patients receive the joined-up care they need.

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Keywords Chiropractic practice, Chiropractors, Attitudes, Perceptions, Healthcare professionals

Background

In many jurisdictions across the world, chiropractic care remains outside of national health systems [1]. In the UK for example chiropractors, uniquely amongst legally registered health care professions, are not considered to be part of the national recognised healthcare work force [2, 3]. Globally, it is typically uncommon for chiropractors to work in multidisciplinary practice or in hospitals, although there are exceptions [4–6]. These are often pioneered by individual chiropractors who have forged relationships and opportunities with partnerships across the healthcare landscape [7–13]. In some countries, chiropractors have made inroads into national health systems; in the United States in 2019 approximately 15% of chiropractors reported working within an integrated healthcare facility with over 5% holding hospital staff privileges [14]. In other examples, such as in some Nordic countries and Switzerland, the chiropractic profession has been more successful in its acceptance as part of healthcare systems [12, 13, 15–17]. In Denmark for example, over 90% of chiropractors in private practice are partially funded by government subsidy, whilst a smaller number (approximately 5%) practice in private or public hospital settings [18]. Conversely, a UK survey in 2021 showed a decline in chiropractors working within the NHS, from 18% in 2002 [19] to just 2% [20].

The persistent exclusion of chiropractic from many national healthcare systems raises the question of why this remains the case after over a century of chiropractic care. One speculative reason may be the adherence by a minority of the profession to outdated dogma [21]. In this regard, several authors have invoked the idea of cross-roads [22–24] where the chiropractic profession over the years face a fundamental choice. This has typically characterised as a road that embraces expectations and norms within contemporary healthcare or an alternative route that cleaves to an historical dogma that sees the profession as separate and distinct [25]. Such polarised professional discourse continues to occupy significant time and effort despite such views constituting a minority of the profession [26–29].

This, combined with possibly negative perceptions from other healthcare practitioners who act as gatekeepers to healthcare systems, may hinder the profession's acceptance and integration. These attitudes can also impede contemporary patient-centred paradigms that favour interprofessional collaboration, which is increasingly encouraged and preferred by patients [30]. The exclusion of chiropractors from these practices could limit patient access to diverse, appropriate care and negatively impact patient experiences and outcomes.

Therefore, this review aims to explore the existing literature to understand the perceptions and attitudes of other healthcare professionals towards chiropractors and chiropractic practice.

Method

This systematic review has been written up in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [31].

Literature search

An initial scoping search was conducted in 2021 to refine the research question and construct the full review protocol which was published on PROSPERO (CRD42023403381). A detailed search strategy was developed and derivatives and synonyms of key terms describing non chiropractic professionals, attitudes and perceptions was used. An example of search string is shown in Table 1. Databases searched included PubMed, CINAHL, AMED, Index of Chiropractic Literature (ICL), and MEDLINE. Initial searches were conducted in January 2021, updated in January 2022, February 2023, and June 2024. There were no date restrictions.

Article selection

Table 2 shows the inclusion and exclusion criteria used to identify studies eligible for inclusion in the review.

Titles and abstracts were screened independently by two authors (KY and JF) using pre-determined inclusion and exclusion criteria. Any variation was agreed upon between these authors and disagreements were resolved, if necessary, with the assistance of a third author (DN). Full texts were read by two reviewers (AN and DN) and data extracted independently. The screening and selection of studies is documented in the PRISMA in Fig. 1.

Data extraction and analysis

Data extraction included Title, Author, Date, Design/Method, Jurisdiction, Population, Analysis and Results. Quality assessment was conducted by two reviewers (AN and DN) using the Centre for Evidence Based Medicine (CEBM) qualitative and cross-sectional survey quality assessment tools [32, 33]. For the quality assessment we categorised the total scores into approximate thirds to provide 3 quality categories (Low, Medium, High). Data extraction and synthesis was also conducted by these two reviewers using a narrative synthesis to collate and integrate the findings of the included studies [34].

Table 1 Example search terms

#1	[MH "Physicians, Family"] OR [MH "Physical Therapists"] OR [MH "Occupational Therapists"] OR [MH "Nursing Assistants"] OR [MH "Physical Therapist Assistants"] OR [MH "Nurses+"] OR "general practitioner*" OR "nurse" OR "occupational therapist" OR "Physiotherapist" OR "Physical Therapist" OR "surgeon" OR [MH "Surgeons"]
#2	[MH "Chiropractors"] OR [MH "Chiropractic Practice"] OR [MH "Chiropractic"] OR [MH "Manipulation, Chiropractic"] OR "Chiropract*"
#3	#1 AND #2
#4	[MH "Attitude of Health Personnel+"] OR "attitude" OR "perception"
#5	#3 AND #4

Table 2 Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Population/Focus	Studies specifically exploring attitudes, perceptions, or beliefs of any health professionals (including students) concerning chiropractic/chiropractors	Studies of general CAM that do not specifically mention chiropractic; studies reporting only referral rates without exploring attitudes, beliefs, or views.
Study Type	Primary empirical studies (qualitative, quantitative, or mixed methods).	Case studies, non-empirical studies, secondary research (reviews, commentaries, opinion pieces).
Language	Published in English.	Non-English language studies.
Publication Type/Availability	Full text available.	Studies where only the abstract could be sourced.

Results

Study characteristics and overview

Forty-three studies were identified as eligible to be included in the review. (see Fig. 1). Included studies are categorised by country in and Table 3. Professional roles reported in the included studies were standardised into four analytic categories (Primary Care Doctor, Specialist Doctor, Other Health Professional, and Medical Student/Trainee) to enable consistent comparison across jurisdictions (see footnote in Table 3 for details). Due to delays caused by the COVID-19 pandemic and subsequent

delays in registration of the protocol we performed follow up searches in 2022 and 2023 finding one additional eligible study [35]. A final search conducted in 2024 failed to identify any further eligible studies.

Included studies were conducted across a wide range of national settings. Study designs were substantially homogenous with a majority using cross-sectional surveys (86%). However, some studies used a range of qualitative approaches including interviews (2%), focus groups (4%) and mixed methods [survey/interview/focus groups/combinations] (8%). A total of 10,108 participants were included across studies with a broad representation of healthcare professionals both qualified and in training, which included general practitioners, physicians, doctors, medical doctors, midwives, nurses, physiotherapists, osteopaths, and manual therapists.

Results of the quality assessment generally indicated high to moderate quality (Tables 4 and 5). For the cross-sectional studies 33% (*n* = 14) fell into the high-quality category with the remaining [*n* = 29] were of moderate quality. Most studies scored high for research question, design, and selection of subjects, whereas sampling that allowed generalisation and sample size calculations were generally not determined. Response rates above 50% were mixed among the studies and most studies failed to provide precision (95% CI) and mitigation of potential confounders. For the 3 qualitative studies 2 were high and 1 was of moderate quality.

Populations and themes

We describe the results based on broad categories of health care professionals and attitudinal/perception themes as documented below.

Primary care and specialist doctors (PCSD)

Studies that included PCSDs (general practitioners, family physicians, primary care physicians, doctors of osteopathy (US), orthopaedic surgeons, obstetricians, gynaecologists and hospital doctors) were synthesised with six broad attitudinal/perception themes emerging: *knowledge concerning chiropractic care or chiropractors, scope of practice, chiropractic care in health systems, interprofessional communication, research base for chiropractic care and education of chiropractors.*

Knowledge of chiropractic Across all included studies exploring PCSDs’ knowledge of chiropractic care or the chiropractic profession, some level of understanding was frequently reported. However, the depth of knowledge varied ranging from simply having heard about chiropractic [11, 24, 39, 47, 48] to having moderate to high levels of knowledge [36, 60, 67]. The most comprehensive knowledge was reported in two studies of Primary Care Doctor where 80% and 60% respectively of respondents had heard

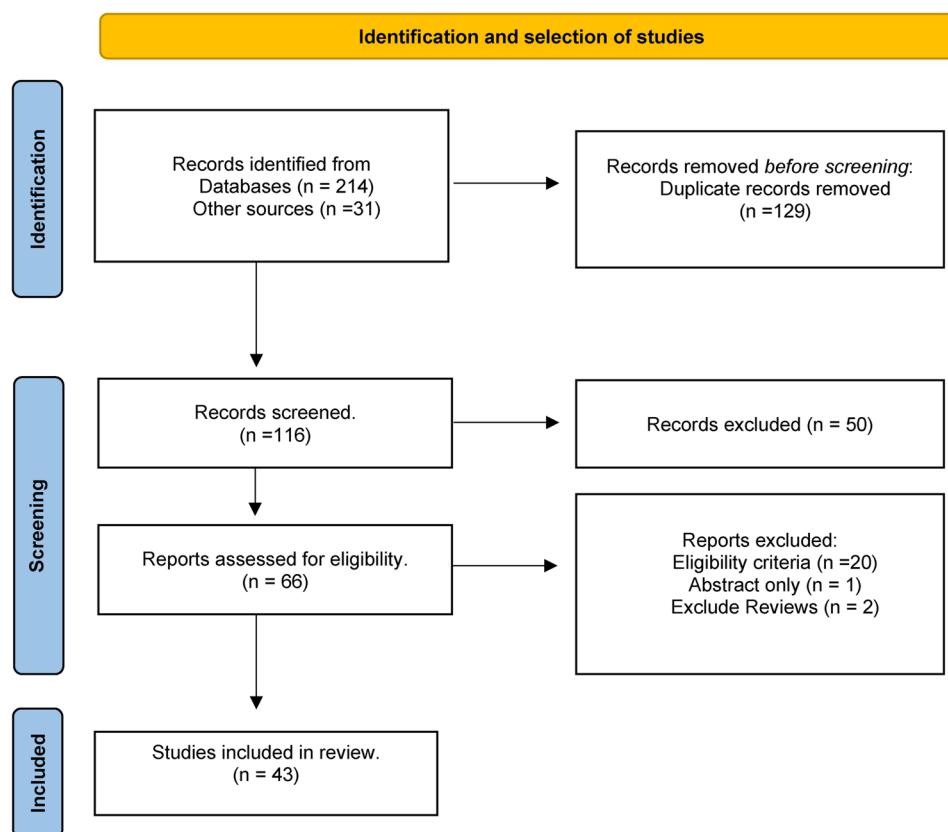


Fig. 1 Study selection flowchart

of or knew of the historic principals of chiropractic care [60], although it was unclear what principals had been referred to. The most frequent percentage of PCSDs possessing “some” knowledge was around 50% [60, 63]. Some studies also reported a desire for further learning about chiropractic interventions, particularly concerning the efficacy of chiropractic care [48, 52, 63]. Sources by which PCSDs obtained their knowledge were documented in some studies. Most PCSDs reported obtaining their information through medical journals [41, 56], treatment, relationship with a chiropractor, conversations with other colleagues or friends, family and media coverage [56] or patients [52].

Scope of practice The majority of PCSDs perception of chiropractic scope recognised that care provided was beneficial in the management of musculoskeletal [MSK] or neuro-MSK disorders [11, 41, 43, 58, 66]. Studies reported PCSDs identifying specific conditions as legitimate targets of care including mechanical low back pain, neck pain, upper back pain and cervicogenic headaches [41] although MSK diagnostic skills were not always associated with perceptions of efficacy [43]. One study found that some subjects reported being in favour of regular visits to the chiropractor in the prevention of recurrent conditions [11]. Other conditions that chiropractic care

was recognised to provide benefit for included: scoliosis, torticollis, growing pains, headaches, and colic, although the percentage of participants in agreement ranged widely from 20 to 46% across the included studies. For non -MSK conditions some PCSDs disagreed that chiropractic care was efficacious [52].

Chiropractors in public health systems Two studies reported PCSDs agreeing that collaboration with a chiropractor, where clinically appropriate, can improve patient health and treatment outcomes [41, 43]. White et al. [61] reported that 50% of participants agreed that chiropractic care should be included in the UK National Health Service (NHS). Similar attitudes reported in a US study suggest 52% of primary care physicians and obstetrics-gynaecology physicians in a group practice model health maintenance organisation (HMO) agreed chiropractic should be available in such organisations [65].

Views differed on how chiropractic care might be integrated. Some PCSDs saw chiropractors as primary care practitioners, whilst others suggested chiropractors required referral from a medical physician to provide care within public health systems [11, 36]. Some PCSDs perceived chiropractic care as a therapy outside conventional medicine [67] or described it as ‘not conventional medicine’ [57] or expressed little interest in sharing care

Table 3 Characteristics and results of included studies

Citation ^{ref}	Design/Method	Population	Results
AUSTRALIA			
Preston-Thomas et al., (1993) [36]	• Design: Survey • Format: Written questionnaire, 12 multiple choice questions, questionnaire was mailed • Sampling: 100 Primary Care Doctor in the Auckland area • Validity: Piloted on a small sample of 5 Primary Care Doctors	Primary Care Doctor	Response rate: 49 Primary Care Doctor responded (49%) Results: • 97% felt that referral by them should always be necessary before spinal manipulation therapy. • 40% had moderate to excellent knowledge of chiropractic. • Knowledge source: 65% from patients, 45% personal communication with therapist, 15% from the media • 9% of Primary Care Doctors have experienced manipulative therapy themselves. • Primary Care Doctors who rated themselves as having the greatest knowledge of chiropractic were significantly more likely to refer patients with chronic pain to chiropractic ($p < 0.001$) than those with less knowledge of chiropractic
Hopper and Cohen (1998) [37]	• Design: Survey • Format: Questionnaire • Sampling: 1097 1st, 3rd, and 5th year medical students • Validity: Not documented	Medical Student/Trainee	Response rate: 800 students responded (73%) Results • Generally positive towards complementary therapies • Students reported little knowledge of chiropractic despite it being at the time, one of two most common complementary therapies in Australia
Simpson (1998) [38]	• Design: Survey • Format: Questionnaire • Sampling: Pseudo random (every second on official list of 3018 i.e., sample 1509) • Validity: Not documented	Primary Care Doctor	Response rate: 784 participants responded (52%) Results • 82% Male • Percentage replying affirmative to following questions comparing Physiotherapists and Chiropractors ♣ Legitimate care providers: Chiro 23%/Physio 95% ♣ Treat in hospitals: Chiro 14%/Physio 95% ♣ Remain primary care: Chiro 29%/Physio 63% ♣ Ethical to deal with: Chiro 35%/Physio 99%
Pirotta et al., (2000) [39]	• Design: Survey • Format: Questionnaire • Sampling: Survey was mailed to 800 (764 after removal of 36) Primary Care Doctor: non-responders were sent a reminder postcard and follow-up survey if necessary • Validity: Survey was developed from existing literature and using a focus group of Primary Care Doctor	Primary Care Doctor	Response rate: 488 Primary Care Doctor responded (64%) Results • 82% Male • 80% reported they knew something about chiropractic. • 7% thought chiropractic care was frequently harmful, 75% occasionally harmful, 17% not often harmful. • 11% thought chiropractic is Highly effective, 70% occasionally effective, 14% not often effective. • 55% of Primary Care Doctor would practice chiropractic with appropriate training, and amongst these, 69% said that chiropractic should be eligible for Medicare rebates (national health insurance scheme) • 29% of respondents have had patients ask them for a referral, 69% have never referred, 78% have rarely or referred a few times a year and 22% either monthly or weekly refer patients to chiropractors. • 24% of Primary Care Doctor are interested in training for chiropractic and 8% already had trained.

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Wardle et al., (2013) [40]	• Design: Survey • Format: Questionnaire • Sampling: Survey was mailed 1486 Primary Care Doctors and a reminder card was sent after two months. • Validity: Survey based on a previous questionnaire and was piloted at the department of general practice in the University of Newcastle.	Primary Care Doctor	Response rate: 698 Primary Care Doctor responded (40.7%) Results <i>Descriptive analysis:</i> • Modal age 45 to 55, 53% were male. • 23% of Primary Care Doctors referred to a chiropractor or osteopath at least once per month, 41% at least few times per year, 22% stated they would not refer to a chiropractor or osteopath. • Only 2% were unable to identify practitioners to refer to • 10% of respondents performed manipulative therapies themselves (chiropractic or osteopathic techniques), 21% had a personal professional relationship with a specific individual chiro or osteopath. • Significantly more likely to refer if they had a high patient load or had knowledge of chiropractic or osteopathy. <i>Inferential analysis:</i> • Primary Care Doctors who believed in the efficacy of chiropractic or osteopathy, had seen positive results or who perceived access to medical specialists not being a driver for CAM use were significantly more likely to refer. • Primary Care Doctors who had not seen positive result were 2.41 (95% CI: 1.18, 5.12) time more likely to refer if there was no other option available.
Engel et al., (2016) [41]	• Design: Survey • Format: Questionnaire • Sampling: Survey was mailed 24,377 Primary Care Doctors currently working in Australian private practice • Validity: Tested on a focus group of 19 experienced vocational trainers at General Practitioner conference	Primary Care Doctor	Response rate: 630 participants responded (2.6%) Results • Greatest proportion of respondents were > 40 and had < 10 years in practice compared to the national average. • 30% obtained information about chiropractors from medical journals. • 66% disagreed that there was a growing body of evidence on the efficacy of chiropractic • 70% believed chiropractic education was not primarily evidence based. • 62% responded in a negative way to "would a better understanding of chiropractic make you reconsider referring a patient to a chiropractor?" • 32% agreed they would co-manage a patient with a chiropractor if clinically appropriate. • 29% strongly agreed or agreed that the ability to understand the role of a chiropractor have been affected by media coverage. • 31% were either dissatisfied or very dissatisfied with the communication between themselves and chiropractors, 41% hadn't had enough communication to respond to the question. • 49% reported having patient referred to them by a chiropractor. • 68% reported not being interested in learning more about the education of chiropractors. • Top three conditions that Primary Care Doctors thought chiropractors could be helpful were: mechanical LBP, neck, upper back pain and cervicogenic headaches.

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Grace et al., (2018) [42]	• Design: Qualitative: Critical Realist analysis of free text responses of prior survey (Engel, 2016) • Format: NA • Sampling: Original survey targeted the 24,377 Primary Care Doctor currently working in Australian private practice • Validity: NA	Primary Care Doctor	Response rate: 184 Primary Care Doctors responded with free text (0.7%) Results Themes 1. <i>Chiropractic Is Not a Safe Practice</i> 2. <i>There Is a Lack of Evidence to Support Chiropractic and Osteopathy</i> 3. <i>Chiropractors and Osteopaths are insufficiently trained and should not be allowed to practise as primary contact health practitioners.</i> 4. <i>Chiropractors make financially motivated decisions about treatment that are associated with false advertising.</i> 5. <i>Chiropractic and osteopathy are redundant due to the presence of physiotherapy.</i> . • Unfavourable responses towards chiropractic were far greater than osteopathy. • 13% raised concerns about the potentially harmful side effects associated with chiropractic but not osteopathy. • 22% referred to the lack of evidence for the efficacy of chiropractic intervention. A similar proportion also raised the same concerns regarding osteopathy. • 12% reported chiropractic and osteopathy offered real benefits particularly for MSK issues but cited the mechanism as due to patient belief. • 24% raised issues of credibility with the education background of chiropractors. • 10% referred to unwillingness to refer patients to chiropractors due to an inability to identify “good” and “bad” chiropractors. • 73% identified the antivaccination stance of some chiropractors as problematic. • 32% concerned about chiropractors making financially motivated decisions and their use of false claims about the benefits of chiropractic intervention in advertising. • Primary Care Doctors expressed the opinion that they can refer patients to physiotherapists for treatment of MSK conditions making chiropractic and osteopathy redundant.
CANADA Newton-Leo et al., (1994) [43]	• Design: Survey • Format: Questionnaire • Sampling: All (148) Primary Care Doctor listed in Canadian Medical Association in Downsview were contacted. Of these 70 were sent the survey based on expectation they would response based on secretary's advice. • Validity: Revision of a questionnaire used by LeBrun et al. (1978) including rewording some questions and deleting others. Survey underwent face validity with professionals and lay public.	Primary Care Doctor	Response rate: 26 Primary Care Doctors responded (37%) Results • 69% unaware of length of training • Some thought reflexology, homeopathy and iridology were part of the curriculum (54, 31 and 19% respectively) • 92% thought chiropractors diagnosed MSK, but only 65% felt they could control pain • Only 31% were aware that risk of cardiovascular event due to cervical spine adjustment was very low. • 88% had referred and 65% had had referral 23% had been treated - Opinions: 91% positive to neutral; agreed working with chiropractors collaboratively would improve patient's health

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Verhoef and Sutherland (1995) [44]	• Design: Survey • Format: Questionnaire • Sampling: Mailed to 400 Primary Care Doctor (200 Ontario, 200 Alberta). Subsample of non-respondents were mailed a brief one-page questionnaire addressing age, sex and perceived usefulness of complementary medicine. • Validity: Survey was adapted from a previous questionnaire and rated the practitioner's level of knowledge of chiropractic, usefulness, and effectiveness	Primary Care Doctor	Response rate: Alberta 124 (62%), Ontario 86 (43%), non-respondent survey (43%) Results • Majority male 69%, urban practice (69%), mean age 44 SD=9.5 • 65% said there is a perceived demand for complementary therapy. • 44% of the total sample stated they referred patients to chiropractors. • Ontario physicians were more likely to refer patients (60% and 32% respectively) • Referrals were predominantly back pain, MSK pain, chronic pain. Reason for referral were non-response to conventional medicine and patient preference. • Only 1 participant had received training on chiropractic and 6% wished to receive training 1/5th of the participants indicated that chiropractic influenced their opinion on complementary therapy. • Level of "some" knowledge (majority of respondents): Ontario (65%) Alberta (68%) • General usefulness: Majority "Useful," Ontario: 43% Alberta: 52% • Effectiveness for neck/back pain problems: Majority "Somewhat" Ontario: 35%, Alberta: 44%
Verhoef and Page (1996) [45]	Comments extracted via secondary analysis of above survey (Verhoef et al., 1995)	Primary Care Doctor	Results • Approximately 1/5th of the comments offered by participants mentioned chiropractic specifically. • <i>Positive Views</i>: Most of these comments suggested that the positive view of chiropractic was due to feedback/results heard/observed in patients or family members who had received chiropractic care or because of chiropractic services they had received or from professional interactions they had with them. Only two practitioners reported positive views arising from reading scientific literature. • <i>Balanced views</i>: Around a ¼ of respondents provided both positive and negative experiences regarding chiropractic. Management of MSK conditions was deemed appropriate but was not considered so for non MSK (e.g., asthma, diabetes. These views arose from anecdotal reports from patients. • <i>Negative views</i>: Only 5 respondents provided negative responses with some suggesting that chiropractors focused on financial gain.
Garner et al., (2008) [46]	• Design: A mixed method • Format: Questionnaires and Focus Groups • Sampling: Two community health centres (CHCs) in Ottawa, Ontario. Assessment was recorded at baseline 9 months and 18 months after chiropractor joined. Educational sessions were run to post first 2 focus groups to expose providers to evidence-based chiropractic. • Validity: Questionnaire used a seven-point Likert scale and was pilot tested including face validity at both CHCs before the study began	Primary Care Doctor Other Health Professional	Population: Twelve providers were assessed Results • Mean age was 44.1 years of age, range of experience 2-5 years, each practitioner had worked for 5+ years. • There was a statistically significant ($P=0.004$) increase willingness to trust chiropractic in shared care cases and greater respect for the chiropractor's knowledge and skills ($p=0.008$) post educational intervention. • Further changes were also noted post inclusion of the chiropractor including, legitimacy and effectiveness of chiropractic moved from neutral to more positive, providers indicated that chiropractic care was safer than anti-inflammatory medication, scepticism about efficacy and safety was "dissipated" and questions regarding experience with chiropractic and patient outcomes moved from neutral to positive Analysis of focus group data saw a shift within medical teams from a negative and limited view of chiropractic to generally more positive attitude. E.g., thick quotes included, <i>"I have only had positive feedback from many of the clients; they have always had some sort of change in their outcome, and they have always had some sort of positive thing to say."</i> <i>"We are able to give patients hope and encouragement, and actually, I have a lot of patients that it (chiropractic) helped with their pain reduction and certainly has taken the burden off me psychologically and time wise"</i>

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Busse et al., (2009) [47]	• Design: Survey • Format: Questionnaire • Sampling: Random sample $n=500$ for both Canada and US. Power calculation for multivariable regression suggested 240 completed returns were needed. Canadian (total population 764) and US (total population 24,172) • Validity: Chiropractic Attitudes Questionnaire CAQ	Specialist Doctor	Response rate: 680 completed surveys from 1000 sent (68%) Results • 71% not exposed to information on chiro during medical school (of the 139 that were only 7% reported favourable exposure) • 86% respondents said attitudes were formed after medical school (29% positive views/45% negative views) • US more likely to agree that neck manipulation is safe and there are ideas that could benefit wider healthcare/Canadian more likely to agree chiro had adequate training, did not engage in aggressive marketing, and did not breed dependency. • Variables that were associated with attitudes were, relationship with specific chiropractor, Research literature, medical school, and age
Busse et al., (2011) [48]	• Design: Thematic analysis of written comments in above survey (Busse et al., 2009)	Specialist Doctor	Response rate: 680 completed surveys from 1000 sent (68%) and 174 provided written comments (25% of original 680 respondents) Results: Themes identified • Variability amongst chiropractors <i>"Wide range of practice - some are evidence based... others do all sorts of crazy stuff"</i> • Chiropractic care perceived as effective <i>"I find their usefulness is limited to lumbar mechanical back pain care"</i> • Chiropractic care perceived as unhelpful/problematic <i>"Chiropractors are dangerous when they portray themselves as replacements for patients' primary care physicians"</i> • Chiropractic rationale <i>"The concept of 'adjusting subluxations' is nonsensical"</i> • Chiropractic training <i>"Life chiropractors are scary", and "I visited the Canadian Memorial Chiropractic College in Toronto. I was impressed with the similarity of their basic science curriculum - same books as used in medicine - and the extent of information covering all symptoms. This does not seem to be the case for all schools in North America"</i> • Unethical behaviour <i>"Major problem as I see it, chiropractors tend to place patients on an 'x amount of treatment' plan such as 20 visits. In my opinion they need to perform the service and see if the patient responds and proceed from there. Not just say 'you need an x amount of treatment' plan"</i> • Scientific basis <i>"Most students now have undergraduate degrees and are relatively well educated in basic sciences in their first 2 years (preclinical). The problem begins when they move into their clinical years where education becomes 'indoctrination'."</i> • Personal experience <i>"I need more knowledge to utilize chiropractors better!"</i>

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Chung et al., (2012) [49]	• Design: Questionnaire intervention: Implicit association test (IAT) developed to test attitudes toward chiropractic and medical care • Sampling: A convenience sample was recruited from students and faculty associated with a Physical Therapy program. • A survey determined which words best reflected the profession of either chiropractic or medicine. These words were used in the word association task of the IAT. • Explicit questions followed by a list of words were developed.	Medical Student/Trainee	Participants: Total of 49 physiotherapy students, majority female and mean age of 29, majority in 1/2nd year, only 29% previous experience Results • Most had a preference of medical treatment (91% preferred and 81% agreed with medicine) • Explicit prejudice was an average of 53% which might be considered neutral rather than prejudiced or accepting. • Implicit attitudes suggest strong negative implicit bias toward chiropractic (That is, the word association task took statistically significantly longer to complete when “chiropractic” was paired together with “positive” terms than when “chiropractic” was paired together with “negative” terms)
Wong et al., (2013) [50]	• Design: Mixed methods approach (survey, interviews and focus group) • Format: Questionnaire, 20 min interviews and single focus group (1 h). • Sampling: Survey, all of Year 2 $n = 224$; Focus Group $n = 8$; Interviews $n = 9$ • Validity: developed through a literature review to discern thematic areas suggested by current studies. Face validity using 4 students.	Medical Student/Trainee	Response rate: 112 completed surveys (50%), equal female/male ratio Results <i>Quantitative</i> • Responses to questions positive, negative, undecided • Largest proportion had poor knowledge of chiropractic. • Individuals with poor knowledge significantly indicated don't know/undecided to questions. • Individuals with previous experience indicated more positive (if friend or family member then considered it as a career, received chiropractic care and more positive) • Individuals who responded no to learning more about chiropractic were significantly more negative attitudinally. • Highest proportion undecided as to chiropractic being a mainstream profession but agreed it was CAM. • Highest proportions were undecided that the medical school was knowledgeable about chiropractic but agreed that Interprofessional education was important. <i>Qualitative Themes</i> • Knowledge of chiropractic “I do remember hearing some injuries that can be caused when people have some specific condition, but I don't think we've ever had anything really too positively that I can recall in lecture.” • Chiropractic in medical education “We did have an interprofessional development day... and there weren't any alternative medicine or chiropractors, and I feel that would be a good opportunity to introduce students to it.” • Role of chiropractic in healthcare “If I were the practicing physician, I may not choose (chiropractic) treatment for a patient just because I don't understand it. If I understood the risks and benefits to particular patients, I would definitely have a positive attitude towards it and know when to access it.” • Chiropractic in clinical settings “If (chiropractors) are part of the same healthcare team then it would be easier for the patient to access all the services in the same place and part of the same group of ‘circle of care.’”

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Wong et al., (2014) [51]	• Design: Mixed methods (survey and focus group) • Format: Follow up using survey used in study above (Wong et al. 2013) post a 1 h intervention • Sample: As above • Validity: As above	Medical Student/Trainee	Response rate: Of 112 students (50% of class) 58 responded (26% of class) post 1 h intervention. Results • Attitudes differed between pre and post intervention. • A statistically significant increase in number of attitude-positive responses ($p < 0.0001$), decrease in attitude-negative ($p 0.03$) and decrease in undecided responses ($p < 0.001$). • In terms of understanding of chiropractic, post intervention, participants ranked themselves significantly higher as a group ($p < 0.0002$) and a larger percentage rated themselves as having at least a “Good” understanding of chiropractic (35% vs. 21%)
Weis et al., (2016) [52]	• Design: Survey • Format: Online questionnaire • Sample: 659 or 1433 members of the Society of Obstetricians and Gynaecologists of Canada • Validity: Modified existing survey was designed to assess attitudes of obstetricians towards chiropractic care for pregnant patients with LBP. Added Chiropractic Attitude Questionnaire (CAQ). Piloted with a group of 5 staff obstetricians.	Specialist Doctor	Response rate: 91 completed surveys ((14%) Results • 64% Female, 78% practiced for > 5 years, 55% practiced in hospitals, 84% endorsed general obstetrics as their area of specialism. • Positive, neutral, or negative views equally distributed in the sample. • 40% referred at least some patients for chiropractic care each year; patient request (32%) nonresponse to medical treatment (20.9%). • Views of chiropractic primarily from patient feedback (48%), family and friends (40%), personal treatment experience (26.4%), or a relationship with a specific chiropractor (21%). • Most respondents (56%) were interested in learning more about chiropractic care. • Mean CAQ score was 41.2 (max positive score obtainable was 80) • Most participants strongly agreed or agreed that chiropractors provide effective therapy for some musculoskeletal conditions (76.6%), that chiropractors provide a patient-centred approach (58%), and that chiropractic care is a useful supplement to conventional medicine (60.0%). • Most respondents disagreed (32%) or strongly disagreed (42%) that chiropractors can provide effective therapy for non-musculoskeletal conditions, and 54% of respondents disagreed or strongly disagreed that chiropractic manipulation of the neck is a safe therapy. • 39% viewed chiropractic care as effective for pregnant patients with LBP. • Trend suggested personal experience with chiropractic resulted in higher scores. • No variables significantly predicted positive attitudes although personal treatment experience was near statistical significance
Busse (2021) [53]	• Design: Survey • Format: Questionnaire • Sampling: Follow up survey (Busse et al. 2009) of a random sample of Canadian Primary Care Doctor (directory of possible 2429 participants). • Validity: Chiropractic Attitudes Questionnaire CAQ	Primary Care Doctor	Response rate: 162 respondents (7%) Approximately half of respondents Results • Majority endorsed a positive impression of chiropractic care, but a quarter held negative views. • Most respondents referred at least some patients for chiropractic care. • Most physicians believed that chiropractors provide effective therapy for some musculoskeletal complaints and most disagreed that chiropractic care was beneficial for non-musculoskeletal conditions. • The majority agreed that chiropractic care was a useful supplement to conventional care, but most respondents also indicated that practice diversity among chiropractors presented a barrier to interprofessional collaboration. • Attitudes towards chiropractic care changed trivially over the decade from the original survey in 2010 to present survey in 2019 with only 1/3rd of a point improvement on an 80-point scale. • More negative attitudes were associated with older age, belief that adverse events are common with chiropractic care, reported use of the research literature or medical school as sources of knowledge. • More positive attitudes were associated with endorsing a relationship with a specific chiropractor.

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Zivcic (2014) [54]	• Design: Survey • Format: Questionnaire • Sampling: Snowball method (chain of referrals that starts with the identification and locating of a certain number of target population members that satisfy the pre-established criteria) • Validity: MAQ (Integrative Medicine Attitude Questionnaire). Modifications made in translation to Croatian. Larger the score more favourable	Other Health Professionals Specialist Doctor	Response rate: $n = 325$ replied, 104 Physiotherapists, 98 Physicians, 123 Nurse/Paramedics. (response rate not reported) Results • Single question referring to chiropractic care: <i>Chiropractic is a valuable method of resolving a wide variety of musculoskeletal problems (not just back pain)</i>; Maximum score is 7 where 1 is absolutely disagree and 7 is absolutely agree. • Physicians mean score, 3.41. • Physiotherapists mean score, 3.33. • Nurses/paramedics mean score 3.59. • No statistical difference between groups.
NETHERLANDS			
Langworthy et al., (2000) [55]	• Design: Survey • Format: Questionnaire • Sampling: Random sample of 299 Physiotherapists (Ps) from a list of 500 provided by national association. Also sent to 100 Manual Therapists and 95 Osteopaths (Total 494) • Validity: Survey constructed for the study around opinions about chiropractic. Piloted for face validity.	Other Health Professionals	Responses rate: 237 responses returned (48%) (Proportions, 50% Manual Therapists, 45% Physiotherapists, 52% Osteopaths) Results • Most Osteopaths and Manual Therapists were male whilst most Physiotherapists were female. • 70% Osteopaths thought their knowledge was good but only 1% of Manual Therapists and 7% of Physiotherapists said they had <i>only heard something</i>. • 1/3rd encountered chiropractic care through their patients. • 10% of Physiotherapists and 25–33% of Manual Therapists and Osteopaths had heard of chiropractic during training. • Around 1/5th of Osteopaths and Physiotherapists heard through media although this was least preferred with most preferring information via published research. • Around 1/2 Manual Therapists and 2/3rd Physiotherapists and Osteopaths had had no contact with chiropractors • Existing levels of communication and cooperation between the professions was considered poor to non-existent by over 80% of respondents; felt it should be improved and would help professionals and patients. • All Osteopaths and 1/2 Manual Therapists and Physiotherapists thought chiropractors were skilled practitioners especially if they had personal experience but around 2/3 of Manual Therapists and Physiotherapists saw chiropractors as competition. • Manual Therapists and Physiotherapists were generally unsupportive of statutory registration of chiropractors in The Netherlands.
Brusse et al., (2001) [56]	• Design: Survey • Format: Postal questionnaire • Sampling: 252 questionnaires were sent to Primary Care Doctor in 84 cities where chiropractors were working with addresses obtained from The Netherlands Institute for Research in Primary Care, which randomly chose 3 addresses in each city • Validity: Piloted by stakeholder	Primary Care Doctor	Response rate: 115 returned questionnaire (46%) Results • Knowledge about chiropractic was high although the depth of knowledge varied extensively. • 78% of knowledge came from patients being treated by chiropractors the rest from colleagues or medical journals (26%, 25%) • 10% of Primary Care Doctors regularly referred. For those that did it was significantly related to knowledge of or positive relations with chiropractors • > 80% wanted more information about and more feedback from chiropractors even if they didn't refer. • Primary Care Doctors felt Chiropractic reports often contained confusing terminology
NEW ZEALAND			

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Poynton et al., (2006) [57]	• Design: Survey • Format: Postal questionnaire • Sampling: Nationwide random sample of 500 Primary Care Doctor from a population of 2358 were mailed a two-page questionnaire. A second questionnaire was sent to non-responders 2.5 weeks later. • Validity: Informed by previous research	Primary Care Doctor	Response rate: 300 of the 499 eligible practitioners replied (60%) Results • Mean age was 50.3. • 43% saw chiropractic manipulation as conventional medicine. • 80% of respondents rated chiropractic as moderately, very, or highly beneficial. • 80% have referred to a chiropractor.
NORWAY/SWEDEN			
Westin et al., (2013) [58]	• Design: Survey • Format: Postal questionnaire • Sampling: Sent to every other GP in proportionate numbers to the numbers of Primary Care Doctor in Sweden and Norway. <i>N</i> = 1600 surveys sent • Validity: Informed by 2 Master-projects from the Anglo-European College of Chiropractic in England.	Primary Care Doctor	Response Rate: 735 total returned (Sweden, 44.8%; Norway, 45.3) Results • Around half of Primary Care Doctors were older than 50 with around 60% being male in both countries • In Sweden over 50% said they had poor knowledge and in Norway 12% • Regarding education as being satisfactory, 49% and 80% agreed in Sweden and Norway respectively. • Regarding competency to treat MSK, 69% and 93% agreed in Sweden and Norway respectively. • Unusual terminology was perceived by 11 and 23% in Sweden and Norway respectively. • Regarding patient experience, 47% and 66% agreed this was good in Sweden and Norway respectively. • Only 12% and 3% agreed a variable or bad patient experience in Sweden and Norway respectively. • Primary Care Doctors stated they had been asked about recommendation (43% and 79% Sweden and Norway respectively) (NB: Primary Care Doctors in Sweden cannot refer)
SOUTH AFRICA			
Louwe and Myburgh (2007) [11]	• Design: Survey • Format: Postal questionnaire • Sampling: Random sample of 596 practitioners were drawn from medical practitioners in South Africa, working as Primary Care Doctor in one of five selected cities. Total population of 4448 Primary Care Doctor in private practice (South African Medical Association database). • Validity: Questionnaire developed by Langworthy et al., 2000)	Primary Care Doctor	Response rate: Participants returned 596 questionnaires (13.8%) Results • 80% knew something about chiropractic, 20% nothing • 43% communicated, 9% regularly: just over half respondents reported positive experience. • There was a highly statistical associated with how much knowledge Primary Care Doctor reported and referral/communication. • Primary Care Doctor strongly identify chiropractors with the management of neuro-musculoskeletal disorders. • 44% were in favour of regular chiropractic visits to prevent the onset of recurrent conditions. • Role of the chiropractor is perceived as one of referral and rehabilitation, rather than primary contact. Example quotes • <i>Chiropractic provides a useful, non-invasive modality for numerous medical conditions, especially back and other musculoskeletal pain.; Chiropractors are very under-utilized; they could do much more, doctors need to know more about what they do.</i> • <i>I don't feel chiropractors add greatly to the health of general population especially the poor.; I am not sufficiently informed about chiropractors and their ability, to refer patients to them. I feel that physiotherapists are best able to deal with these problems, and I get good results with them.: Chiropractors tend to overtreat.</i>

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Naidoo and Bühler (2009) [59]	• Design: Survey • Format: Questionnaire • Sampling: Questionnaires given to first and final-year physiotherapy ($n = 72$) and chiropractic students ($n = 49$) ($n = 127$ in Durban, KwaZulu-Natal.) • Validity: The questionnaire was piloted for content validity using second year physiotherapy students. No changes were made post the pilot study.	Medical Student/Trainee	Response rate: 38 1st year and 34 final year physiotherapy students responded (100% return rate) Results • 92%, 85% female and mean age was 19 and 22 in year 1 and 4 respectively. Percentage knowledge of chiropractic average score for 1st and final year students were 58 and 62% respectively. • Proportion of class who saw the chiropractors as direct competition was 84% and 76% in 1st year and 4th year respectively (The main reason cited for this is that "Physiotherapists and chiropractors do things that are similar" or "Chiropractors do everything originally done by physiotherapists" • 4% of the first-year students felt "rehabilitation is not done by chiropractors." Final year physiotherapy students felt that the skills physiotherapists have are "more and different" with "treatment of the chest and musculo-skeletal system." • 6% felt that "Chiropractors are doctors but do things that are actually physiotherapy techniques." • 45% first year and 53% final year physiotherapy students reported that they would like to work more closely with chiropractors. Physiotherapy students listed some of the following as barriers or facilitators for improved working relations with chiropractors as follows: • "Chiropractors take over the Physiotherapists job". • "Unfair that Chiropractors are called doctors; what about physio- therapists?" • "Both professions are equally important, but their domains should be separated"; "Would like to know more about chiropractors". • "Physiotherapy needs to be marketed more". • "There is place for both professions, therefore there is no need for competition". • "Both professions need more knowledge and information about each other."
Thondhlana et al., (2021) [35]	• Design: Survey • Format: Postal questionnaire • Sampling: Total population of 88 registered private Primary Care Doctor in Harare as of October 2017. Sample size calculation (95% confidence interval) suggested 72 doctors as appropriate to provide generalisability to the entire population of Primary Care Doctor in Harare • Validity: A self-administered questionnaire, adapted from those used in similar studies	Primary Care Doctor	Response rate: 48 respondents (55%) Results • Approximately one-third had never heard of chiropractic care. • Of the two thirds that had, almost 66% believed chiropractors to be competent in the treatment of musculoskeletal complaints and approximately one-third in the treatment of neurological ailments. • 40% of Primary Care Doctors believed that chiropractors were adequately trained to play a role in mainstream medicine, but the majority were unsure whether chiropractors' education was adequate in this regard. • More than half of the respondents agreed with chiropractic referral for musculoskeletal conditions. • Primary Care Doctor perceptions rather than knowledge appeared to determine the utilisation (referral) of chiropractors by Primary Care Doctors Main reason for non-referral of musculoskeletal complaints to a chiropractor was lack of knowledge by the GP followed by uncertainty of treatment efficacy and the belief that there were no chiropractors in the area • Primary Care Doctors who were more knowledgeable also had more positive perception of the profession.

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Perkin et al., (1994) [60]	• Design: Survey • Format: Questionnaire • Sampling: Questionnaires sent to 100 randomly selected Primary Care Doctor and hospital consultants and 237 preclinical medical students from two UK schools. A second questionnaire was sent to non-responders. • Validity: Not reported	Primary Care Doctor Specialist Doctor Medical students/Trainee	Response rate: 87 Primary Care Doctors, 81 Specialist Doctors and 230 Medical students/Trainees completed questionnaires (87% Primary Care Doctors, 81% Specialist Doctors and 97% Medical students/Trainee) Results • 51% of students, 91% of Specialist Doctors and 82% of Primary Care Doctors had heard of chiropractic. • 15% of students, 49% of Specialist Doctors, and 60% of Primary Care Doctors knew the principles of chiropractic. • 5% of students, 8% of Specialist Doctors, and 33% of Primary Care Doctors knew the qualifications needed to be a chiropractor. • In all three of these items Primary Care Doctors were statistically significantly more knowledgeable • In terms of referral to chiropractic 14% of Specialist Doctors referrals were suggested by the doctor and 7% was suggested by the patient. In contrast, 54% of Primary Care Doctors referrals were suggested by the doctor and 51% were suggested by the patient a statistically significant difference between professionals. • In comparison to the other alternative therapies, significantly less medical students had heard of chiropractic.
White et al., (1997) [61]	• Design: Survey • Format: Questionnaire • Sampling: All Primary Care Doctor on register in Devon and Cornwall ($n = 972$). • Validity: Piloted questionnaire created by authors	Primary Care Doctor	Response rate: 461 returned questionnaire (47%) Results • 77% Male • 46% either referred to or endorsed chiropractic (highest of the CAM therapies mentioned in this study), with the most common profession referred to in the previous week being osteopathy or chiropractic (18% referred 63% recommended) • 69% rated osteopathy and chiropractic as effective (highest rating) and 56% thought chiropractic care should be included in the NHS (slightly higher than Osteopathy (52%)) • Adverse events were mentioned by 38% most being around spinal manipulation
Perry and Dowrick (2000) [19]	• Design: Survey • Format: Postal questionnaire • Sampling: Questionnaires sent to all Primary Care Doctor principals registered with Liverpool Health Authority ($n = 252$). One reminder was sent to non-responders 3 weeks later. • Validity: Piloted with 20 Primary Care Doctors, five clinical members were also used to ensure reasonable response rate	Primary Care Doctor	Response rate: 131 questionnaires were returned (52%) Results • Younger doctors were significantly more likely to respond than their older colleagues. • 7% or Primary Care Doctors refereed and 11% endorsed chiropractic care. • 1 GP used manipulation with their patients.

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Schmidt et al., (2002) [62]	• Design: Survey • Format: Postal questionnaire • Sampling: In the UK, the local health authority provided a list of addresses for Primary Care Doctor by electoral ward in the Plymouth area. This list did not constitute a random sample but was ordered according to geographical area ($n = 97$). German Primary Care Doctor were selected by randomly choosing addresses from the Yellow Pages for Mecklenburg Vorpommern, a north-eastern region in Germany (formerly German Democratic Republic) ($n = 99$) • Validity: Questionnaires developed based on previous literature and piloted Primary Care Doctor.	Primary Care Doctor	Response rate UK 133 (69%), Germany 67 (68%) Results • Majority were male (94% UK and 63% German). British sample practicing longer. • Overall, more positive in Germany than UK toward CAM in general • The most popular UK Primary Care Doctor referred their patients to were chiropractic treatment (79%), acupuncture (67%) and osteopathy (66%). • German Primary Care Doctor referred their patients mainly to acupuncture treatment (82%), chiropractic treatment (73%) and herbal medicine (28%) • Most Primary Care Doctor, irrespective of country, were concerned about the lack of scientific evidence about CAM. British Primary Care Doctor were also highly concerned about lack of knowledge about its indications and the lack of availability on the NHS. • 8% and 11% of UK and German Primary Care Doctor claim to have practiced chiropractic and 6% of UK Primary Care Doctor had used chiro (the highest use) and 7% in Germany (second highest)
Davidson., (2007) [63]	• Design: Survey • Format: Postal questionnaire • Sampling: Postal survey Primary Care Doctor in Grampian, Scotland with 433 receiving the questionnaire • Validity: Questionnaire designed for study	Primary Care Doctor	Response rate: 135 completed the questionnaire (31%) Results • 48% had heard of chiropractic treatment for children and 11.8% knew of a chiropractor in the area who treated children. • 74% would prefer written communication and 78% would communicate by letter to a chiropractor. • 60% would like to know more about the efficacy and scope of practice. • < 1% Primary Care Doctor believed chiropractic paediatric care is evidence based. • 46% of Primary Care Doctor believed chiropractic can treat sports injuries, scoliosis 37%, torticollis 37.9%, growing pains 31.1%, headaches 25%, colic 20% • 4% had received paediatric referral from chiropractor and 2.2% had referred a child to the chiropractor
Kier et al., (2013) [64]	• Design: Survey • Format: Postal questionnaire • Sampling: 385 Primary Care Doctor were contacted representing approximately 20% of the Primary Care Doctor in Wales. • Validity: Short questionnaire was designed and initially piloted internally for face/construct validity	Primary Care Doctor	Response rate: 182 participants completed the questionnaire (51%) Results • 65% were male and 79% were 40+ • 26% of Primary Care Doctor had personally sought treatment from and 72% indicated that they had referred a patient to a SMT practitioner. • 21% Primary Care Doctor indicated they have not and would not refer a patient to a SMT practitioner. • 13% of Primary Care Doctor personally would seek of consider seeking chiropractic therapy specifically and 7% would consider referring their patient to chiropractor.

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Perry et al., (2014) [20]	• Design: Survey • Format: Postal questionnaire • Sampling: Sent to all Primary Care Doctor registered with Liverpool Primary Care Trust. Reminders were sent at 3 weeks and further postal drop at 3 months. • Validity: Questionnaire was adapted from the one used Perry (2000)	Primary Care Doctor	Response rate: 78 returned the survey (32%) Results • Changes since 2000 survey was a reduction in referral (7% to 4%) and endorsement (11% to 8%) but an increased confidence in discussing chiropractic (18 to 28%) • Only 8% of those that completed the questionnaire discussed chiropractic with patients. • Mean effectiveness of chiropractic was judged as second highest of included CAMs (44%, where 100% represented completely effective) • 40% of respondents reported that their patients had experienced benefit from chiropractic care in the past three months. • Most frequent adverse event observed was increased pain from chiropractic manipulation.
USA			
Reiter (1965) [7]	• Format: Face to face interview • Sampling: 33 randomly selected physicians were interviewed. • Validity: Questionnaire was adapted from the one used Perry, 2000 (REF). Physicians were asked to use a 5-point Likert scale to answer the questions (1 = extremely unfavourable; 5 extremely favourable)	Primary Care Doctor	Response rate 33 participants completed the interviews (100%) Results • Mean ranking by participants for the three professions: Podiatrist 3.2, Osteopaths 2.7, Chiropractors 1.3 • Ratings indicated that chiropractors are generally very unfavourably perceived compared to osteopaths and podiatrists. • Total average rating for osteopaths and podiatrists was significantly higher than that for chiropractors
Gordon et al., (1998) [65]	• Design: Survey • Format: Postal questionnaire • Sampling: Questionnaires were sent out to 1027 Physicians and 225 Obstetricians and Gynaecologists. • Validity: Not reported	Primary Care Doctor Specialist Doctor	Response rate: Physicians $n=624$ (61%), Obstetrics and Gynaecologists $n=157$ (70.4%) Results • 34% of adult primary care clinicians and 38% of Obstetrics/Gynaecologists have used or recommended Chiropractic therapy. • 52% of adult primary care clinicians and 58% of Obstetrics/Gynaecologists would like the health maintenance organisations (HMOs) to make Chiropractic available to members
Mainous et al., (2000) [66]	• Design: Survey • Format: Postal questionnaire • Sampling: A random sample of 400 Primary Care Doctor was selected from the American Board of Family Practice Membership and Resource Directory • Validity: Not reported	Primary Care Doctor	Response rate: $n=400$ questionnaires completed (39%) Results • Primary Care Doctor are much less likely than chiropractors to feel that chiropractors are primary care practitioners. • Although physicians are significantly less likely than chiropractors to feel comfortable sharing care, neither group is particularly oriented toward wanting to share care. • Physicians' perceptions of <i>chiropractors as an excellent source of care for some musculoskeletal problems</i> was 2.50 but was 4.25 In response to the question that <i>chiropractors are an excellent source of care for some non-musculoskeletal problems</i> (1 = strongly agree; 5 = strongly disagree)

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Chan and Wong (2004) [67]	• Design: Survey • Format: Postal questionnaire • Sampling: Questionnaire mailed to all physicians on list provided by Hawaii Medical Service Association ($n = 1713$) • Validity: Survey developed based on existing literature of national and regional surveys assessing physician knowledge attitudes and practice of CAM.	Specialist Doctor	Response rate: $n = 299$ physicians responded (17.5%) Results • Physicians reported moderate knowledge about chiropractic. • Chiropractic was perceived as therapy but not as having a role in conventional medicine
Greene et al., (2006) [68]	• Design: Survey • Format: Postal questionnaire • Sampling: Survey sent to all physicians and DO's (Primary Care Physicians) in Iowa ($n = 1561$). • Validity: Initial pilot using a convenience sample of primary care practitioners (PCPs).	Primary Care Doctor	Response rate: $n = 517$ responses (33%) (Key: (Medical doctors (MDs), Doctors of Osteopathy (DOs)) Results • Most Primary Care Doctors are willing to suggest patients see a chiropractor but unwilling to formally refer with 88% preferring their patients contact chiropractors themselves. Reasons included fear of litigation, that alternative care providers may be a threat to their practice, they did not have enough knowledge or didn't see chiropractic as a legitimate profession. • Odds of accepting referrals were 67% higher in male than females • Common reasons for referring a patient to a chiropractor were: back/neck pain, unresponsive chronic pain, fibromyalgia's and MSK conditions. • Between 80 and 90% reported that their patients had asked them for information on chiropractic. • 75% have patients who have requested a referral to a chiropractor, with 65% recommending patients to see a chiropractor. • Between 25 and 30% have referred a patient themselves to a chiropractor and between 82.5% and 55.4% accepted referral from chiropractors. • Around 20% indicated chiropractors did not send them any clinical information about referred patients. • 73% sent a case report when referring a patient to a chiropractor with 77% sending follow-up clinical information for referred patients. Participants were also more likely to send x-rays or x-ray reports and other clinical records to other primary care doctors rather than chiropractors. • Primary Care Doctors in private practice were twice as likely to recommended patients to a chiropractor.
Mullin et al., (2011) [69]	• Design: Survey • Format: Postal questionnaire • Sampling: • Email invitation was sent to 9000 email addresses of individuals with professional status as a midwife working in the United States. The questionnaire was available for 3 months and IP addresses were tracked to allow each responder to complete the survey only once. • Validity: Survey was not validated and exploratory in nature but was pilot tested with two midwives	Other Health Professional	Response rate: $n = 187$ midwife respondents completed the questionnaire (2.1%) Results Professional training and knowledge of chiropractic • 30% indicated receiving formal training about chiropractic, 46% indicated receiving some information on chiropractic in their seminars with 75% indicating interest in learning more about chiropractic care. • 99% were aware that chiropractors work with "birthing professionals" and 92% considered themselves knowledgeable about the roles of chiropractors in prenatal care. • 40% were not aware that chiropractic was a licensed profession. • 87% wanted to see more information regarding the evidence of chiropractic management. Experience of chiropractic • 89% have had a professional experience with a chiropractor with 97% of these being a positive experience. • 92% had referred a patient to the chiropractor with 72% indicating referral to specific care of an infant. • 100% perceived chiropractic care as safe during pregnancy with 97% considering it was safe for infants.

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Ingram et al., (2013) [70]	• Design: Survey • Format: Post clinical experience survey • Sampling: Physical Therapy students from a south-eastern and mid-western PT program ($n = 341$) • Validity: Survey was reviewed by a panel of 5 directors of clinical education unaffiliated with the participating institutions.	Medical Student/Trainee	Response rate: $n = 229$ physical therapy students completed the survey (67%) • Respondents reported that little was said about chiropractic from tutors but that clinical instructors were reported to be bad mouthing another health profession. • 61% of students heard the badmouthing occurring 2 + times. • 22% of these comments were about chiropractic and chiropractors and was one of was one of the top three most mentioned professions that were badmouthed.
Bowden and Ball (2016) [71]	• Design: Survey • Format: Class administered questionnaire • Sampling: 2nd-year graduate students enrolled in either the adult Nursing or Physician Assistant programs ($n = 95$) • Validity: adapted version of Wong and Kopansky-Giles survey (REF)	Medical Student/Trainee	Response rate: $n = 92$ returned questionnaires (97% Overall; 100% from physician assistant students and 94% from nurse practitioner students) Results • 88% Female, majority of > 25 years of age were nurse practitioner students • Poor current level of understanding (43%); Majority indicated lack of awareness of current scientific evidence of chiropractic care (75%); Most open to learning more (63%) although 65% said they did not make effort outside of medical school to learn. • Students > 25 years of age more likely to have had experience and more likely to be positive. • 45% saw chiropractic as mainstream while 73% saw as CAM. • Participants demonstrated a wide spectrum of correct responses for types of treatment and areas where chiropractors can provide effective treatment. • Survey respondents seemed to lack knowledge that chiropractic care may constitute a range of interventions. • Respondents mostly agreed, however, that chiropractors can provide effective treatment for back pain, neck pain, headaches, shoulder pain, strain/sprain of upper and lower extremities, disc herniation, and peripheral nerve entrapment.
Neff et al., (2016) [72]	• Design: Survey • Format: Questionnaire • Sampling: Sampled whole cohort ($n = 116$) of Physicians and Physician Assistants working in an integrated health setting with chiropractors. • Survey underwent face validity.	Medical Student/Trainee Specialist Doctor	Response rate: $n = 26$ surveys returned (22.4%) Results: • Respondents with less knowledge and awareness of supportive research had lower opinions. • Physician Assistants had a higher opinion than Physicians. • Those who do refer to chiropractors have a high satisfaction with the results of the consult. • The providers who see the most patients per week seem to have the lowest opinion of chiropractic and report the least knowledge of chiropractic.

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Penney et al., (2016) [73]	• Design: Qualitative analysis as part on multiphase mixed methods study • Format: Interviews • Sampling: Invitation emails sent to 86 Primary Care Doctors	Primary Care Doctor	Participants: 25 interviews were conducted, distributed nearly evenly among participants who were high, medium, and low referrers for acupuncture and/or chiropractic according to plan referral records for both types of services. General comments about Chiropractic and Acupuncturists • Generally, clinicians had little relationship therefore little communication - Physicians selectively assent to patients who have had previous positive experience and didn't want opioids. Requests denied if contraindicated via guidelines. • Many physicians believe Acupuncturists are successful because of placebo, so held back with patients they felt didn't buy into CAM (however patient focus groups said they would be open even if no previous experience) • Physicians didn't feel they knew enough about the modality or the practitioners. • Physicians expressed concern over not being able to provide patients more guidance, seemed anxious about the lack of oversight, and questioned the quality controls for ensuring patient treatment. • Variability amongst acupuncture providers and quality made choices difficult. Chiropractic quotes from participants concerning communication • The near consensus from participants was there was no effective communication. • Coupled with the negative bias in the occasional reports from patients further eroded participant confidence in these modalities: <i>"I've actually had less happiness with chiropractors the longer I've been in practice, just because of what I hear back from patients. [...] part of it is I don't know who I'm referring to. Because it's this sort of contract, people that we contract with. [...] I also don't get notes back from them. So, I have no feedback as to what they're doing. Whereas all the Kaiser physical therapists put a note in [the chart]... And I can review what they've done, and how many times the patient has gone and the progress they've made or not made."</i>

Table 3 (continued)

Citation ^{ref}	Design/Method	Population	Results
Bond et al., (2018) [74]	• Design: Survey • Format: Questionnaire • Sampling: Convenience sample across 3rd year Physical Therapy students in two University programs (U1 and U2). $n = 144$ U1 (no chiropractic faculty interaction across health care programs) and 80 at U2 (with chiropractic faculty interaction across healthcare programs) • Validity: Chiropractic attitude questionnaire (CAQ)	Medical Student/Trainee	Response rate: $n = 165$ questionnaires returned (74%) Results of whole cohort: Responses statistically differed between U1 and U2: Questions scaled from Strongly agree; Agree; Undecided; Disagree; Strongly disagree. • Chiropractic has place in health care (Highest proportion response: Agree) • Information concerning chiropractic profession should be in curriculum (Highest proportion response: Agree) • Chiropractic care is evidence based (Highest proportion response: Undecided) • Chiropractors perform excessive imaging (Highest proportion response: Undecided) • Chiropractic care is patient centred (Highest proportion response: Agree) • Manipulation of the neck is safe (Highest proportion response: Undecided) • Chiropractic is effective for non MSK (Highest proportion response: Undecided) • Chiropractic can reduce MSK load for PTs (Highest proportion response: Undecided) • Chiropractors lack training (Highest proportion response: Disagree) • Chiropractors engage in aggressive marketing (Highest proportion response: Undecided) • Chiropractors have no role in care of PT patients Highest proportion response: (Disagree) • Chiropractic care breeds dependency (Highest proportion response: Agree)
Salsbury et al., (2018) [75]	• Design: Qualitative • Format: Focus groups and interviews • Sampling: Goal for participant recruitment was to invite all persons who were likely to interact with the chiropractor (patients, family and community members, administrative personnel, and members of the clinical team (medical doctors, nursing staff and therapy staff)). Qualitative analysis was part of a larger organizational case study that used ethnographic methods to explore the process of integrating a chiropractor into an established multidisciplinary team	Specialist Doctor Other Health Professional	Participants: Sixty participants were interviewed: 48 staff members, 6 patients, 4 family members and 2 community members Study setting was a 62-bed skilled nursing facility located in north-eastern United States Themes were developed from participant responses that centred around qualities, competencies and attitudes that make a chiropractor able to work in a multidisciplinary team. These included: • Clinical acumen: to be an expert and experienced health care professional, deep understanding of musculoskeletal conditions and neurological conditions. <i>Chiropractors should only use the therapeutic modalities that were likely to improve patients' health status.</i> • Efficacious treatment: chiropractic care would offer effective, evidence-based options <i>Worries that the delivery of chiropractic care to patients who have had spinal cord injuries could further injure them.</i> • Teamwork: <i>"We're 95% team oriented here"</i> • Resourcefulness: <i>"have to be very flexible to work here,"</i> willingness to change an approach that is not working • Openness to feedback Personality fit: <i>"will feel comfortable educating the staff"</i> • Institutional compliance and mission alliance

For consistency across jurisdictions, diverse professional titles were standardised into four categories. Primary Care Doctor included general practitioners (GPs) from Australia, Canada, the Netherlands, New Zealand, Norway/Sweden, South Africa, the UK, and the USA, as well as family physicians (Canada, USA), primary care physicians (USA), and doctors of osteopathy when practising in a primary care role (USA). Specialist Doctor encompassed orthopaedic surgeons (Canada), obstetricians and gynaecologists (Canada, USA), hospital doctors (UK), and physicians in Canada and the USA when clearly described as specialists rather than primary care providers. Other Health Professional included nurses (Canada, USA), nurse practitioners (USA), physician assistants (USA), midwives (USA), physiotherapists (Canada, South Africa, Netherlands), osteopaths (Netherlands), manual therapists (Netherlands), therapy staff (USA), and paramedics (Canada). Finally, Medical Student/Trainee referred to medical students (Australia, Canada, UK, USA), physical therapy students (Canada, USA), and nurse practitioner and physician assistant students (USA)

with chiropractors [66]. One study explored PCSDs views attributes that would be important in integrating chiropractic care into wider institutional healthcare teams [75]. These included clinical acumen, efficacious

treatment, teamwork, resourcefulness, openness to feedback, personality fit, institutional compliance and mission alliance. However, attitudes and behaviour can be in conflict amongst these professionals. For example,

Table 4 Methodological assessment of included survey designs

	Picotta 2000 ²⁶	Busse et al 2009 ²⁷	Busse et al 2011 ²⁸	Perry 2000 ²¹	Greene et al 2006 ²²	Poynton 2006 ²¹	Ingram 2013 ³²	Bowden 2016 ³⁴	Reiter 1965 ¹²	Gordon 1988 ²¹	Schmidt et al 2002 ²³	Kier 2013 ^{34a}	Wardle 2013 ³⁷	Verhoof 1995/1996 ^{41,46}	Louw et al 2007 ³⁶	Engel et al 2016 ³⁸	Weis 2016 ³⁴	Grace 2018 ³⁸	Perkin et al 1994 ^{34a}	Thondhlana 2021 ³⁸	Newton-Lee et al 1994 ³⁷	White et al 1997 ³⁸	Simpson 1998 ³⁸	Mainous et al 2000 ³⁸	Brusse et al 2001 ³⁵	Wong et al 2014 ³⁸	Neff et al 2016 ³⁹	Preston-Thomas et al 1993 ³²	Chung et al 2012 ³⁴	Bond et al 2018 ³⁵	Hopper 1998 ³³	Langworthy 2000 ³⁸	Naidoo 2009 ³⁶	Wong et al 2013 ³²	Westin et al 2013 ³⁸	Perry 2013 ^{34c}	Zivic 2014 ⁴⁰	Chan 2004 ³³	Davidson et al 2011 ³¹	Mullin 2011 ³⁰			
Did the study address a clearly focused question/issue?	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	
Is the research method (study design) appropriate for answering the research question?	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Is the method of selection of the subjects (employee, teams, divisions, organizations) clearly described?	2	2	2	2	2	2	1	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1	2	1	2	1	2	1	2	2
Could the way the sample was obtained introduce selection bias?	2	2	2	2	2	2	1	1	2	1	1	2	2	2	2	1	0	1	2	1	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0	2	1	1
Was the sample of subject's representative regarding the population to which the findings will be referred?	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	0	1	0	1	2	0	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Was the sample size based on pre-study considerations of statistical power?	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Was a satisfactory response rate achieved? (>50%)	2	2	0	2	0	2	2	2	2	2	2	2	0	2	0	0	0	0	1	2	0	0	2	0	0	2	0	0	2	0	0	1	2	1	0	2	2	0	0	0	0	0	0
Are the measurements (questionnaires) likely to be valid and reliable?	2	2	2	2	2	2	2	1	1	1	2	2	2	1	2	2	2	2	1	2	2	1	1	1	2	1	2	1	2	1	1	2	1	1	1	1	1	2	2	1	1	0	0
Was the statistical significance assessed?	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2	2	0	0	1	0	0	0	0	0	0	0	2	0	1	0	0
Are confidence intervals given for the main results?	2	2	2	0	2	0	2	2	0	0	0	0	2	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Could there be confounding factors that haven't been accounted for?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total: Max 24	19	19	17	16	16	16	16	16	15	15	15	15	15	15	14	14	14	14	14	14	13	13	13	13	13	13	13	13	12	12	12	11	11	11	11	11	11	11	11	11	10	9	9

We arbitrarily defined 0–8, 9–16 and 17–24 as low, medium, and high-quality studies respectively

a study of PCSDs in the UK, highlighted lack of knowledge concerning indications for use and lack of scientific evidence as a potential barrier despite chiropractic being referred to in the UK by 79% of these participants [62].

Communication between chiropractors and PCSDs A consistent theme regarding communication between PCSDs and chiropractors emerged from the included studies with PCSDs often perceiving there to be little to no effective communication [41, 56, 68, 73]. Some of the underlying reasons stated were a lack of information provided by chiropractors and the use of confusing or non-standard terminology [56, 68, 73].

The proportions of PCSDs who had referred to or would consider referring to a chiropractor showed considerable heterogeneity across studies were reported, ranging from 2% to 79% of participants [19, 20, 39, 44, 45, 56, 63, 64, 68]. Whilst direct referral was the preferred route, alternative routes included informal endorsements or recommendations to patients to seek chiropractic care [19, 68].

Motivations behind willingness to refer or recommend patients seemed to be related to knowledge of chiropractic care where PCSDs with such insights were significantly more likely to refer patients [40, 56]. Studies further reported that patient interest was also a motivating factor, with requests from patients often being looked on as favourable reasons to consider recommendation [39, 44, 45, 68]. Other motivating factors included: patients' lack of response to conventional medicine [44, 45], personal beliefs concerning efficacy of chiropractic

care, perception of positive results for patients, high PCSD patient loads or absence/exhaustion of other options [40].

PCSDs' attitudes and perceptions regarding referral were not equally distributed amongst demographic or practice categories. Younger doctors, who made up 67% of respondents in included studies were more likely to consider referral [65]. In a US study, PCSDs in private practice were twice as likely to recommend patients to a chiropractor than those not in private settings [68]. Direct comparison across countries was rare but in one study, PCSDs experiences of chiropractic care for their patients differed between Norwegian (66%) and Swedish (47%) clinicians reporting good experiences of chiropractic care for their patients [58].

Factors that discouraged PCSDs referring included: a lack of knowledge of chiropractic care or absence of positive experience/relationships, as well as fear of litigation and threat to practice reputation [56, 68].

The research base for chiropractic care Findings regarding the perceived efficacy of chiropractic care were heterogeneous. For example, Engel [41] and Grace [42] reported 21% and 66% respectively of participants disagreeing with the notion that there was a growing body of evidence supporting the efficacy of chiropractic approaches to care despite these studies being published at a similar time. Other surveys reported positivity regarding evidence for effectiveness where PCSDs considered chiropractic practice to be generally primarily evidence based [41, 63].

Table 5 Methodological assessment of qualitative studies

	Penney et al 2016 ⁴³	Grace 2018 ⁴⁸	Salsbury 2018 ⁷²
Was a qualitative approach appropriate	2	2	2
Was the sampling strategy appropriate for the approach?	2	2	1
Are data collection methods described in sufficient detail?	2	2	0
Was the data analysis approach appropriate for the methodology used?	2	2	1
Is the researcher's position described?	2	0	2
Do the results answer the question, are they credible?	2	2	2
Are the conclusions drawn justified by the results?	2	2	2
Are the finding transferable to other clinical settings?	1	1	1
Total Max 16	13	11	9

We arbitrarily defined 0–5, 6–10 and 11–16 as low, medium, and high-quality studies respectively

However, the proportion of respondents aligning to this view varied considerably (12–70%) [20, 39, 42, 44, 45].

Views concerning perceived adverse effects and/or potential harm were also heterogenic. White et al. [61] Pirota [39] and Grace [42] reporting 13%, 38% and 75% of participants respectively showing concern that chiropractic care maybe occasionally harmful. This also varied across national settings where US based orthopaedic surgeons were more likely to feel that neck manipulation was safe in comparison to their Canadian colleagues [47].

Chiropractic education and skills There were mixed opinions regarding perceptions related to chiropractic education and skills. Negative perceptions included Grace [42] where one quarter of respondents were concerned about the credibility of the educational background of chiropractors, whilst Engel [41] reported 70% of PCSDs

believing that chiropractic education was not primarily evidence based. More positively, Westin [58] found that 80% of their Scandinavian study PCSDs agreed that the education of chiropractors was satisfactory while Canadian orthopaedic surgeons felt chiropractors had adequate education [47].

Other Health Professionals (OHPs)

Studies exploring attitudes and perceptions of OHPs included nurses, nurse practitioners, physician assistants, midwives, physiotherapists, osteopaths, manual therapists, therapy staff and paramedics. Similar themes (*knowledge concerning chiropractic care or chiropractors, chiropractic care in health systems and the education of chiropractors*) emerged as for PCSDs apart from scope of practice, research base and interprofessional communication which were largely absent.

Knowledge of chiropractic Studies included, reported midwives, osteopaths, physiotherapists, and manual therapists had some knowledge of chiropractic. Langworthy [55] noted that two thirds of osteopaths, manual therapists and physiotherapists had heard something about chiropractic. In midwifery there were high levels of knowledge reported where 98% were aware that chiropractors work with midwives, 92% considered themselves knowledgeable of the role of chiropractic within prenatal care, 59% knew that the chiropractic profession was a licensed profession and 75% showed interest in learning more about the profession [69].

Sources of information used by OHPs to gain knowledge of chiropractic were heterogenic. For example, formal education as to the role of chiropractic in healthcare varied from 10% of physiotherapists, 25–33% of manual therapists and osteopaths and 30% of midwives [55, 69]. In addition, one third of physiotherapists, osteopaths and manual therapists gained their knowledge through talking to their own patients. Furthermore, despite being the least preferred method of learning, 20% of physiotherapists and osteopaths obtained information from media outlets with the preferred method through scientific journals [55]. Finally, 46% of midwives in one study also received information from attending seminars [69].

Views concerning the efficacy and safety of chiropractic care was explored amongst midwives and nurses. For the midwifery study, 100% of participants agreed that chiropractic is safe during pregnancy and 96% agreed that chiropractic is also safe for infant care [69].

Chiropractic in public healthcare systems Views concerning inclusion in healthcare systems included perceiving the chiropractic profession as direct competition, with half perceiving the profession to be best described as a complementary alternative therapy. These respondents were generally unsupportive of statutory registration for the profession, but this was over 2 decades ago [55]. More positively, most physiotherapists, osteopaths and manual therapists agreed that better communication and collaboration between professionals would likely be better for patient care [55]. Interestingly in the single study concerning midwifery, 88.8% of respondents reported having worked with chiropractors professionally with 97% of this cohort reporting a positive experience. 92% of this cohort also reported having referred to chiropractors for infant care [69]. However, the return rate for the survey was only 2.1% with responder bias likely to be significant.

Chiropractic education and skills A single study reported that 50% of physiotherapists and 100% of osteopaths felt chiropractors were skilled professionals [55].

Medical student/trainees (MST)

Studies concerning attitudes and perceptions of MSTs included medical students, physical therapy students, nurse practitioner students.

For medical students we identified a single common theme centered on lack of knowledge of current chiropractic care. Respondents included 1,200 medical students from UK, Australia, and Canada in 4 separate studies. Here the primary theme was around *knowledge concerning chiropractic care or chiropractors*.

Knowledge of chiropractic Most participants indicated poor knowledge and understanding of chiropractic care [50, 60]. Perkin [60] compared general practitioners, medical doctors and medical students and reported that general practitioners were statistically more knowledgeable than both medical doctors and medical students, with medical students being the least knowledgeable.

In one study, sources of knowledge for MSTs were from informal sources such as conversations with friends, small groups, student clubs and lecturers [50]. Some participants noted these experiences often painted a negative impression of chiropractic with most participants unable to recall positive descriptions concerning chiropractic by academic staff.

This study further explored medical students' perceived knowledge of a chiropractors' scope of practice and showed half of medical students surveyed were undecided or had no knowledge, associated with apprehension concerning referring. When asked about how medical students perceived chiropractic care within the healthcare landscape, 61.6% of participants perceived chiropractic as a CAM profession [50].

Despite most participants having limited knowledge of chiropractic care, interest in learning more was expressed by 67% of participants. These students expressed particular interest in learning what conditions chiropractors commonly treat, with 83.9% agreeing that interprofessional education is important [50].

In an Australian study by Hopper et al. [37], 84% of medical student respondents indicated chiropractors should be on a professional register whilst only 48% felt they should be remunerated through the national system.

Results from studies exploring nursing/physician assistant students [71] or physiotherapy/physical therapy students [59, 74], generated similar themes as emerged as in other cohorts including *knowledge concerning chiropractic care or chiropractors*, *chiropractic in public healthcare systems*, *chiropractic education skills* and *the chiropractic research base*.

Knowledge of chiropractic The knowledge students possessed concerning chiropractic care showed heterogeneity across studies. Amongst physiotherapy students in South

Africa in 1st and final years, 58% and 62% respectively showed a good level of knowledge [59]. In contrast, within this same cohort, 38% of 1st year students and 49% final year students thought “chiropractors do the same thing as physios.” In contrast nursing students showed a poor level of understanding of the profession despite recognizing a chiropractor’s scope of practice as regularly treating patients with back pain, neck pain, headaches, shoulder pain, strain/sprain of extremities, disc herniations, and peripheral nerve entrapments [71]. When asked about interest in learning about the profession, 65% responded that they wouldn’t try to learn outside of school, with most students having no personal interest in learning about chiropractic care. In contrast, when physiotherapy students were asked about their interest towards learning about the profession, 55.3% agreed that chiropractic information should be in the curriculum [74].

Chiropractic in public healthcare systems Questions regarding chiropractic care as delivered within the wider public health system were explored in some studies with 60.3% of physical therapy students agreeing that chiropractic has a place in healthcare [71]. Where chiropractors and physiotherapists attitudes towards each other were explored, 76% of 1st year physiotherapy students and 84% of final year students perceived chiropractors as direct competition, with some believing chiropractors delivered similar care to physiotherapists. Interestingly as these students progressed through undergraduate education, interest in referring to chiropractors decreased. Moreover, and somewhat contradictory, 43% of 1st year students and 53% final year students were happy to work closely with chiropractors in patient care [59]. Generally, attitudes concerning chiropractic care as integrated into wider healthcare systems showed considerable variation with students seeing chiropractic as a complementary or alternative medicine or mainstream [71].

Research base for chiropractic care Evidence for chiropractic care emerged as an issue for physical therapy students where 46.3% were undecided as to whether chiropractic is evidence-based and 47.8% were undecided that chiropractic can provide effective care for non-MSK patients [74]. In exploring other perceptions, 38.2% of the same cohort believed that manipulation of the neck is generally safe, and 43.4% were undecided whether chiropractic care bred patient dependency. However, a somewhat contradictory 57.1% of respondents felt chiropractors provide patient-centered care leading. In contrast, Naidoo and Buhler [59] found 25% and 50% of 1st and final year students respectively, who have had previously consulted a chiropractor, agreed that chiropractic care was effective. Nursing students reported a lack of awareness of the scientific evidence on chiropractic care [71]. Overall, consid-

erable variation and potential cognitive dissonance may exist amongst these cohorts.

Chiropractic education and skills Education and training of chiropractors was briefly mentioned in the study conducted by Bond et al. [74] where only 7% of physical therapy students agreed with the proposition that chiropractors lack sufficient training.

Interestingly a single study explored unconscious attitudes and perceptions amongst non-medical students using an implicit association test. Here a list of words identified in a survey of physiotherapy students that best described chiropractic or medicine as determined by these students was subsequently used in a word association test with negative or positive terms. The authors reported that the word association task took statistically significantly longer to complete when “chiropractic” was paired together with “positive” terms than when “chiropractic” was paired together with “negative” terms uncovering potential subconscious negative bias toward chiropractic [49].

Secondary analysis over time within countries

There was considerable heterogeneity of samples, professions and survey instruments between national settings and over time, although research designs were generally homogeneous. We attempted to identify any trends over time by grouping studies by national jurisdiction to mitigate differences in cultural, fiscal, and legislative settings. Table 6 shows summary comments within each country and where only one study exists a general comment summarizing the study is made. Although there are limitations to this approach, we identified a general absence of overt positive change in attitudes and perceptions over time in countries with more than one study. Indeed, where trends could be robustly identified via repetition of the same survey, either negative sentiment and perceptions remained [47, 53] or attitudes and cooperation worsened [19, 20]. Consistent themes emerged over time around a continued lack of knowledge concerning chiropractic practice, education, and scientific evidence, particularly amongst medical personnel. Generally, (although with exceptions) the literature reviewed here suggests referrals between most chiropractors and medical doctors in most national jurisdictions remains low and that this situation has persisted over time.

Importantly, where good relationships within clinical or educational institutions were present or amongst individual health care professionals and chiropractors, there was evidence of increased positivity and cooperation. In addition, where greater knowledge was present this was also often associated with more positive attitudes.

Table 6 Summary of results and trends (where appropriate) within countries

Country	Number of studies: (dates)	Summary
Australia	N = 7: (1998–2013)	POTENTIAL TREND: <i>Remained negative</i> : Continued suspicion around chiropractors' education and lack of evidence base with poor communication/referral between the professions maintained over 25 years despite some evidence of increased knowledge.
Canada	N = 10: (1994–2001)	POTENTIAL TREND: <i>Remained suspicious/uninformed</i> . Personal experience and educational interventions including exposure to the evidence base significantly improved attitudes, perceptions, and willingness to work with the profession
Croatia	N = 1: (2014)	Minimal data on attitudes
Netherlands	N = 3: (2000–2011)	NO IDENTIFIABLE TREND: Mixed knowledge base amongst professionals about chiropractors with midwives been very high along with osteopaths, both professions being more positive than Primary Care Doctor, Manual Therapists or physiotherapists. These other professions wanted more knowledge but generally had little contact or referring. Primary Care Doctor thought chiropractic terminology was confusing
New Zealand	N = 1: (2006)	Generally positive attitudes
Norway/Sweden	N = 1: (2013)	Generally, Norway more positive attitudes than Sweden
South Africa	N = 3: (2007–2021)	POTENTIAL TREND: <i>May have worsened</i> . In 2007 around 20% Primary Care Doctors had not heard of chiropractic but by the 2021 survey this was over 33%. Interestingly both in 2007 and 2021 contact with or knowledge of chiropractic was associated with more communication and utilisation. Physiotherapists saw chiropractors as competition and titles such as 'Dr of chiropractic' were seen as unjustified and unfair.
United Kingdom	N = 7: (1994–2013)	POTENTIAL TREND: <i>Reduction in positive views from non-positive starting point</i> One study looked at trends over a 11-year period and found there had been a reduction in Primary Care Doctors signposting (7 to 4%) or endorsing (11 to 8%) chiropractic care but more willingness to discuss with patients (18 to 28%).
United States	N = 11: (1965–2018)	POTENTIAL TREND: <i>Remained suspicious/uninformed</i> A story emerges over the years of mutual isolation, misunderstanding, lack of knowledge, and lack of certainty about the type and evidence base of care. Notably, where chiropractors worked with or had interactions with other professions or professional health care individuals these attitudes markedly improved

Discussion

This review has summarised the published data concerning attitudes and perceptions of a wide range of health care professionals and health care students toward chiropractors and chiropractic care.

Major themes regarding *knowledge concerning chiropractic care or chiropractors, scope of practice, chiropractic in public healthcare systems, interprofessional communication, the research base for chiropractic care, and the education of chiropractors* emerged. These themes appeared in varying degrees across all groups surveyed but not all themes were present in every group.

Not surprisingly those professions more closely aligned to the scope of practice commonly associated with chiropractors [musculoskeletal] tended to have more knowledge and broadly more acceptance [55], whereas participants with limited contact with chiropractors or chiropractic patients were less informed [37, 50].

Positively, perception of the potential harm associated with chiropractic care appears to have reduced over time. However, some themes have persisted and may be impacted by a lack of consistent and accurate information about chiropractic in the minds of participants. For example, lack of knowledge amongst PCSDs in included studies for example, appears to be related to a general lack of working together despite clinicians often expressing the importance of collaboration [43, 51, 55] However, where other health professionals came into contact with

chiropractors within their day-to-day work, attitudes shifted positively [46].

Concerning evidence, Neff [72] reported that physicians and physician-assistants that had lower knowledge of supportive research for chiropractic care, also had lower opinions of the profession generally, so a paucity of knowledge here also may have important implications for attitudes and perceptions more widely.

Doubts concerning the adequacy of chiropractic education also appears to have persisted [43, 48, 74] although in one study such doubts differed for chiropractors graduating from different institutions.

In non-medical healthcare participants similar themes arose but in physiotherapists, added to perceived competition [59]. These professionals often had good knowledge of the chiropractic profession although the sources of this knowledge were diverse and did not include the chiropractic profession themselves. Despite some studies reporting lack of support of chiropractors working within the health systems, generally there was consensus around cooperation and multi-professional patient management.

Attitudes and perceptions were however somewhat malleable, where more positive attitudes seemed to be generated post an educational intervention shifted attitudes toward the positive [51]. Here, after the intervention there was a statistically significant increase in number of attitude-positive responses compared to the prequestionnaire. The authors conclude that

formal education within medical curricula may help to mitigate hidden curriculum issues and support collaboration between medical and chiropractic providers post-graduation.

Suboptimal communication between chiropractors and other health care professionals stood out as a particular factor with achievable solutions. Lack of sufficient information about referred patients provided by chiropractors was cited as a problem in some studies [56, 58]. Another element related to communication was chiropractors' use of confusing or non-standard terminology [56, 58]. These factors have been explored in both Australia and the UK with evidence of a continued prevalence of chiropractic specific terminology on the chiropractors' websites [76, 77]. An increase in better communication might usefully be addressed education settings, as well as in guidelines from regulators.

Professional identity has long been debated within the chiropractic profession [21–24, 26–29, 78, 79]. Some chiropractors see themselves as primary care [80, 81], but this review demonstrates that many physicians do not consider them so. Here, educational interventions for other health care professionals including integrating knowledge of chiropractic care within curricula of medical and non-medical health care professionals may prove useful.

In addition, perceptions of scope of practice were generally accepted to be limited to MSK conditions [52]. Interestingly contemporary views of some chiropractic students suggest that a tendency toward limitless scope of practice aspirations are associated with 'magical thinking' [82]. Given that other healthcare professionals have strong views condoning a predominantly MSK focused scope of practice, and the evidence for management of non MSK conditions by chiropractors is weak or absent [83], addressing variations in chiropractic students perceptions and views concerning scope of practice may be beneficial.

Healthcare students identified fewer, but similar themes centring predominantly on a lack of knowledge of the profession, particularly in medical students with sources of knowledge ranging from anecdotal conversations amongst students themselves to medical faculty, who were perceived as generally less than positive [70]. Despite this there was a desire to learn more in addition to support for interprofessional cooperation [71].

The implications for the chiropractic profession of the insights provided by this literature review ultimately rests on where the profession desires to go, how it aspires to be identified and in what capacity it wishes the existing healthcare community to understand and interact with chiropractors. It is not disputed that interprofessional communication and working relationships between

health care professionals for the benefit of their mutual patients is both desired by patients and increases the likelihood of higher satisfaction and better outcomes [19, 76]. Further research would usefully explore the attitudes and aspirations of the chiropractic profession in this regard. For example, the profession as a community may feel they do not desire to work in the wider healthcare landscape having curated successful practices, both clinically, reputationally and financially, without having to do so. Such isolationism is perhaps understandable as a consequence of early and sustained persecution by the medical profession in the US where to be '*separate and distinct to medicine*' had kept pioneering chiropractors out of jail [84]. However, these times have passed, and the continued isolation of the profession has been contemporarily paraphrased by some as '*separate and extinct*' [85]. Perhaps continuing isolationist desires from a vocal part of the profession to cleave to this separateness may not be sustainable in the long term. On the other hand, if a majority desire to forge better and more cohesive relationships with other health care professionals, this review suggests a number of ways to facilitate this trajectory including educational interventions, which may be particularly efficacious in underpinning increased knowledge and a willingness to work toward interprofessional support of mutual patient communities. This particularly so at undergraduate level where interprofessional learning in joint classrooms may facilitate a *learn together, work together* mindset [86]. Clearly however there must be willingness from both sides to cooperate better. Where such models exist, they may constitute general exemplars of structures and cultures where such aspirations may be realised [87].

The translation of these findings into practice, will require a joined-up approach which will probably differ depending on the national setting and health system context where chiropractors find themselves. However generalisable future efforts could prioritise structured interprofessional education initiatives, both at undergraduate and postgraduate levels, to familiarise other health care providers with the scope and evidence base of chiropractic care. At the service level, pilot programs embedding chiropractors within multidisciplinary teams, shared clinical placements, or joint case management meetings may offer practical routes for improving mutual understanding and collaboration. Professional associations could also play a role by co-producing accessible educational resources with other health professional bodies, ensuring information is both credible and contextually relevant. Taken together, these strategies may help address the knowledge gap identified in this review and foster more constructive interprofessional relationships.

Strengths

This review is, as far as we know, the first to comprehensively review the large number of studies that have surveyed other professions as to attitudes and perceptions of chiropractic care and chiropractors. We chose to not limit the date which meant we were able to explore any changes of attitude over long periods, particularly where identical surveys were repeated at different time point in some jurisdictions, although this was limited by several factors as discussed below.

Limitations

There are clear limitations to this review. Firstly, we chose not to limit the period of the publications which resulted in a large time window within which the results were available where issues initially present in older studies may have been mitigated in more recent surveys. Our attempt to explore changes in perceptions over time was clearly limited by study heterogeneity from one study to the next, except in just a few cases where surveys were repeated by the same authors.

Survey instruments were also heterogenic although most had attempted some degree of face validity or had created surveys based on previous literature. However, the degree with which detail concerning attitudes could be extracted was varied with one study providing only a single question concerning attitudes regarding the chiropractic profession [54]. Notwithstanding, such heterogeneity in the wording and design of surveys, and within national jurisdictions would suggest caution in interpreting any observed similarities or differences between studies results. In addition, only a third of studies were deemed high quality as judged by the risk of bias assessment in the review with the remaining two thirds being medium quality. In the absence of a sub analysis based on quality, the reporting of high and medium quality studies as a homogenous group may have confounded attempts to summarise themes.

Lastly, not all national jurisdictions were represented equally with Australia, Canada, USA and UK dominating the data set. We attempted to mitigate this by presenting characteristics of studies within national jurisdictions and summarising any observed changes within these jurisdictions over time. However, this observational summary may not be as robustly representative as desired to confidently identify changes.

Conclusion

The results of this review suggest that a consistent issue impacting attitudes and perceptions of other professions toward chiropractic care or chiropractors is a general lack of knowledge concerning key aspects of the chiropractic profession. Where knowledge was higher, generally attitudes and perceptions were more positive and

where educational interventions were used to increase knowledge such efforts generated improved perceptions. The solution to this knowledge gap may be multifactorial and include efforts to produce accessible and digestible quality information concerning the themes highlighted in this review and/or greater visibility of the chiropractic profession within diverse healthcare settings or through greater shared management of patients.

Supplementary Information

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Supplementary Material 1.

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Authors' contributions

DN designed the study and conducted scoping searches. AN and DN completed all searches whilst AN, KY and JF applied the exclusion/inclusion criteria with AN and DN assessing quality and risk of bias. AN, DN, MH and MS completed the draft manuscripts whilst all authors contributed to the final text and approved the manuscript for submission.

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Data availability

All data generated or analysed during this study are included in this published article [and its supplementary information files].

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Competing interests

The authors declare no competing interests.

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