

Osteopathic management of non-specific neck pain: a modified Delphi study

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Abstract

Background

Neck pain is a widespread and persistent musculoskeletal condition, with over half of cases unresolved for years. Nonspecific neck pain poses a particular challenge, often driven by complex physical, psychological, and social factors that lead to ongoing disability. Osteopaths frequently treat musculoskeletal pain using a biopsychosocial approach, yet their specific strategies for nonspecific neck pain remain largely unexplored and likely vary based on practitioner approach.

Methods

Eleven osteopaths took part in a modified Delphi involving the completion of successive online questionnaires. Across three distinct rounds, participants responded to three different questionnaires distributed via email. Survey development was based on HOAC-II, a patient centred framework for healthcare. Surveys comprised questions related to frequency of use of various osteopathic examination, treatment and management techniques and strategies for patients with nonspecific neck pain. Round 1 and Round 2 comprised open ended questions, Round 3 sought an agreement (Kendall's W) from panel members about what examination, treatment techniques and management approaches are essential for patients with nonspecific neck pain.

Results

This modified Delphi study established a consensus among expert osteopaths regarding the examination and management of patients with NSNP. Employing the patient-centred HOAC-II framework, the study highlighted key elements of NSNP care deemed essential by Australian osteopaths.

Conclusion

The study revealed that the examination techniques and management strategies osteopaths consider essential for patients with non-specific neck pain align with practices frequently used by other health professionals.

Background

Neck pain is a prevalent musculoskeletal concern affecting individuals across various age groups, reaching its peak during middle age, and exhibiting a higher prevalence among females (1). The lifetime incidence of neck pain in the general population ranges from 12–70% (2), with 12-month prevalence estimates in adults ranging from 30–50% (1). More than half of those experiencing neck pain do not experience a complete resolution of symptoms within one to five years (2). Neck pain often coexists with comorbidities such as headache, back pain, arthralgia, and depression (3, 4). Research underscores the impact of neck pain on decreased functional capacity, heightened anxiety, worry, and diminished quality of life (QoL) (5).

Factors contributing to the burden of neck pain encompass trauma, work-related elements (e.g., low job satisfaction, poor perceived work support, high work stress levels), psychological aspects (self-perceived depression, poor psychological health), and smoking (1, 6). Although there are significant comorbidities and psychosocial influences on neck pain, there is often no identifiable underlying disease or abnormal anatomical structure (7) leading to the classification of non-specific neck pain (NSNP) (8).

The diagnosis of NSNP can be established based on clinical assessment if there is an absence of a more serious condition or a specific underlying disease contributing to the pain (8). NSNP is frequently associated with factors such as limited cervical mobility, impaired function, myofascial pain syndromes, and work-related stress (9, 10) and can evolve into a complex disorder where physical, psychological, and social factors interplay, leading to sustained disability (4).

Australian osteopaths treat musculoskeletal conditions, including neck pain, often combining manual therapy, education, and exercise prescription (11–13), underpinned by a biopsychosocial approach to patient care that addresses function and overall health (13, 14). Techniques commonly used by Australian osteopaths include spinal manipulation, muscle energy techniques, massage, and advice on posture, exercise, and stress management (11, 12, 15).

Decisions about treatment choices, management, and lifestyle advice for NSNP on the part of the osteopath, likely involve several clinical reasoning models (16, 17), including hypothetico-deductive, pattern recognition, and collaborative narrative (18). In an osteopathic patient-care context, Thomson, Petty (18) suggest reasoning spans a continuum from a biomedical focus (technical rationality) to a patient-centred, biopsychosocial approach (professional artistry). While NSNP treatment strategies remain under-researched, they are likely shaped by the individual osteopath's therapeutic approach (19).

The modified Delphi approach is valuable for exploring clinical decision-making, especially when traditional methods like randomised clinical trials (RCTs) are impractical due to the complex nature of clinical practice (20). It is widely used in clinical settings to identify problems, establish practice guidelines, and develop quality standards (21). Expert opinions are sought systematically and anonymously in the modified Delphi, facilitating the identification of decision-making factors, prioritisation of interventions, and development of consensus-based guidelines (22, 23) that can inform patient care. Examples of its use include developing consensus-based procedure guidelines, evaluating the appropriateness of interventions, and identifying best practices (24, 25). This method helps build expert consensus, ensuring evidence-based practices are rooted in the practical experience of healthcare professionals (22, 23, 26).

The current study used a modified Delphi to gain a consensus on the examination procedures, techniques used, treatment approach, prognoses and patient outcome measures used by Australian osteopaths for the management of non-specific neck pain. The data from this study have the potential to inform further clinical interventions and research, as well as guide the practice of osteopaths with respect to managing NSNP.

Methods

The modified Delphi took place between May and August 2023. Ethics approval was received from the Victoria University Human Research Ethics Committee (HRE22-151).

Panel selection

Twenty-five experienced osteopaths, currently teaching in one of the three accredited Australian osteopathy pre-professional programs, were invited to participate in a study. Eleven agreed and formed the panel for content validation. Panel selection was based on clinical experience, diversity of expertise, required agreement levels (Kendall's W), and practical constraints. The study included clinician-educators as they possess a unique blend of practical clinical experience and theoretical knowledge. Their involvement enriches the study's findings by providing insights that bridge the gap between research and real-world clinical practice. As the study aimed to develop a consensus using scientific information and osteopathic reasoning, patient inclusion was not deemed necessary.

Study design

Consensus among experts was sought using a modified electronic Delphi (e-Delphi) method, involving the completion of successive questionnaires. Across three distinct rounds, participants received and responded to three questionnaires distributed via email. The formulation of items on each questionnaire was a collaborative effort, involving all authors, including two registered osteopaths with over 15 years of clinical practice experience.

Development of the questionnaires

The Hypothesis-Oriented Algorithm for Clinicians II (HOAC II) was used as a framework to develop the series of questionnaires in the current study. HOAC II, developed by Rothstein, Echternach (27) is a patient-centred framework for physical therapists (such as osteopaths) to use in the management of any type of patient. It addresses the five elements of patient management: examination; evaluation; diagnosis; prognosis; and, intervention (27, 28). The HOAC II provides a means to engage in evidence-based practice and to differentiate between the types of evidence and science used (27, 28).

Round 1

The Round 1 survey consisted of demographic questions related to clinical characteristics, such as reporting which other healthcare professionals are co-located in their practice. The Round 1 survey also comprised several open-ended questions which sought in-depth information from the panel members about their chosen osteopathic examination and diagnostic procedures for patients with NSNP.

Round 2

The Round 2 survey sought panel members' frequency of use of Patient Reported Outcome Measures (PROM) on a 5-point Likert scale including, 'never', 'sometimes', 'about half of the time', 'most of the time' and 'always'. This Round also included open-ended questions related to treatment techniques and management (Intervention) approaches, as well as open ended questions related to prognosis for patients with non-specific neck pain.

The survey responses for Round 1 and Round 2 required the participant to create a user generated code (username) which allowed the research team to track participant responses for the Round 1 and Round 2 surveys. Doing so ensured all panel members provided a response for each Round of the Delphi anonymously.

All questions developed in the Round 1 and 2 surveys were reviewed by all members of the research team during scheduled online meetings and piloted with osteopaths known to the research team but not panel members, over a two-week period prior to release of each round. All feedback was considered by the research group via online discussions, and questions were reworded if there were common threads in the feedback. All open-ended questions in Round 1 and 2 allowed each participant to provide as much detail as they desired, with the text box adapting to their word length requirement.

Round 3

The Round 3 survey consisted of statements seeking level of agreement and questions about frequency of use developed by the research team. These items were informed by the data collected from the participants' completed open-ended responses from the Round 1 and Round 2 surveys.

Each statement in Round 3 sought participants' level of agreement on a 5-point Likert scale (from 'Strongly disagree' to 'Strongly agree'). The Round 3 survey also comprised questions related to frequency of use to capture not only participants' rating of agreement but also their frequency of use. The frequency questions utilised a 5-point Likert scale with the following response options: 'Never', 'Rarely', 'Sometimes', 'Often' and 'Always'.

Before distribution of the Round 3 survey to the panel, all statements seeking agreement and the questions related to frequency of use, were reviewed by each member of the research team during multiple online meetings. The research team focused on syntax to ensure clarity of items. For example, to express the importance of each item included in Round 3 survey, the research team chose to add in the word 'essential'.

Statistical analysis

Round 1 and Round 2 surveys

After the eleven panel members completed the Round 2 survey, data from both Round 1 and Round 2 surveys were exported from Qualtrics into Excel. Frequencies were computed for all ordinal variables in each survey. Content analysis was performed for each round to examine participant responses systematically and objectively with the goal of identifying themes within the data related to Examination Procedures, Treatment and Management Approaches (Intervention) and Prognosis.

The research team met online twice to ensure coding consistency and identify themes across survey rounds. Statements receiving input from at least 50% of panel members (e.g., on examination techniques) were included in subsequent survey rounds. This process applied to examination, treatment, management, and prognosis questions.

Round 3 survey

Round 3 Kendall's Coefficient of Concordance was used to assess level of agreement between panel members for all items in the Round 3 survey. Kendall's Coefficient of Concordance, often denoted as W , is a statistical measure used to assess the degree of agreement or concordance among multiple raters or judges when evaluating or ranking multiple items or subjects (29). This coefficient quantifies the extent to which raters or judges tend to rank items or subjects similarly (29).

Kendall's W ranges from 0 to 1, with 0 indicating no agreement (complete discord) and 1 indicating perfect agreement (complete concord) among the raters or judges (30). Regarding the current modified Delphi Round 3 survey, a W score of 0.6 or above was required for all statements requiring an agreement in the Round 3 survey and is considered to represent *substantial agreement* (P. Legendre, 2005; J. O. May & S. W. Looney, 2020). If a W score of less than 0.6 was achieved for a section of the Round 3 survey, the hypothesis that a consensus was achieved for that section was rejected.

Sections of the Round 3 survey

Dividing the survey into Examination, Treatment techniques (Intervention) and Prognosis sections, allows for further exploration and discussion of each element of the HOAC-II. Frequencies are provided, followed by the relevant Kendall's W score for that section of the survey.

Results

Round 1

Demographics

Eleven osteopaths (5 males; 6 females) participated in all three rounds of the modified Delphi. Panel members had an average of 21.6 years of clinical practice experience, and an average of 21 hours of patient care per week.

Content analysis

For coding and content analysis of Round 1, see Appendix Item 1.

To assist with the visualisation of the results from the open-ended responses, data from Round 1 and Round 2 is presented as themes (Table 1) of the chosen osteopathic examination and diagnostic procedures identified by at least 50% of respondents.

Round 2

For coding and content analysis of Round 2, see Appendix Item 2.

Panel members were asked if they use patient reported outcome measures (PROMs) when managing patients with non-specific neck pain. Six out of eleven (54.5%) panel members reported using PROMs, with four only using them 'sometimes', one using them 'about half of the time' and one using them 'most of the time'.

To assist with the visualisation of the results from the open-ended responses, themes from Round 2 are presented in tabular form (see Table 1), which reports practitioner measurements and treatment frequency.

Table 1

Round 1 and 2 themes based on responses to questions related to examination and management of patients with non-specific neck pain from 11 panel members.

Round	Question	Themes
1	1. Please describe which patient signs and/or symptoms lead you to choose certain examination procedures when you suspect a patient has non-specific neck pain.	Cervical distraction/compression, Kemps, Upper limb neurological exam
	2. Please describe which physical examination techniques (i.e., orthopaedic tests) you use to diagnose patients with non-specific neck pain and provide your rationale for using these techniques.	Cervical distraction/compression, Kemps, Upper limb neurological exam
	3. Please describe which osteopathic examination procedures (e.g., active range of motion, segmental joint assessment) you use for patients with non-specific neck pain and provide your rationale for using these techniques.	Joint assessment, active range of motion/passive range of motion, diagnostic palpation
	4. Please describe which diagnostic tests (e.g, maximal cervical compression test) leads to which intervention when managing patients with non-specific neck pain.	High velocity low amplitude technique, muscle energy technique and soft tissue technique
2	1. Please provide detail about which patient reported outcome measures (PROMs) you use for patients with non-specific neck pain	Neck Disability Index (NDI)
	2. Please describe in detail why you choose to not use patient reported outcome measures (PROMs) when managing patients with non-specific neck pain.	Only use for patients on compensable schemes
	3. Please describe in detail how you evaluate your treatment effectiveness for patients with non-specific neck pain.	Active range of motion/passive range of motion, pain severity/intensity
	4. Please describe in detail how you decide how many treatment sessions a patient with non-specific neck pain requires.	2–3 treatments

Round 3

Examination

Frequencies

Table 2 demonstrates the most frequent techniques used by the panel are cervical spine (Cx) segmental assessment, and diagnostic palpation with all osteopaths (eleven) reporting using these techniques either 'Often' or 'Always'. Followed by active and passive range of motion, with ten panel members (~ 91%) using active and passive range of motion when examining patients with NSNP either 'Often' or 'Always'.

Table 2
Frequency of examination procedures used by panel.

Frequency	Cx spine Compression/Distract ion test	Kemp's Test	Upper limb neurological examination	Cx spine segmental joint assessment	Cx spine active range of motion	Cx spine passive Range of Motion	Diagnostic Palpation
Never	1	1	0	0	0	0	0
Rarely	0	0	6	0	0	0	0
Sometimes	3	6	4	0	1	1	0
Often	7	3	1	5	1	7	2
Always	0	1	0	6	9	3	9

N = 11

Cx = cervical spine.

Statements seeking level of agreement

A Kendall's *W* of 0.708 ($p < 0.001$) was achieved for all statements in the Examination section. Participants agreed to seven statements about Examination of non-specific neck pain in the Round 3 survey. The following statements were included in the calculation:

"When I suspect a patient has non-specific neck pain, it is essential I perform..."

- *"A Cervical Compression/Distract
ion test."*
- *"A Kemp's Test."*
- *"An upper limb neurological examination."*
- *"A segmental joint assessment to the cervical spine."*
- *"Active range of motion testing to the cervical spine."*
- *"Passive range of motion testing to the cervical spine."*
- *"Use diagnostic palpation."*

Treatment Techniques (Intervention)

Frequencies

Table 3 demonstrates the most frequent treatment techniques (intervention) used by the panel were soft tissue techniques to the cervical spine and shoulder girdle, with ten osteopaths (~ 91%) reporting using these techniques either 'Often' or 'Always'. Followed by cervical spine Muscle Energy Technique (MET) with nine (~ 82%) using this technique 'Often'.

Table 3
Frequency of treatment techniques (intervention) used by panel.

Frequency	Cx spine HVLA	Cx spine MET	Soft tissue to neck muscles	Soft tissue to shoulder muscles
Never	0	0	0	0
Rarely	0	1	0	0
Sometimes	7	1	1	1
Often	4	9	7	9
Always	0	0	3	1

N = 11

Cx = cervical spine

Statements seeking level of agreement

Participants somewhat agreed to the four statements presented in Round 3 survey about treatment techniques for patients with non-specific neck pain. A Kendall's W of 0.435 ($p = 0.002$) was achieved for all statements in the section, indicating the preset condition of agreement was not met for this section. The following statements were included in the calculation:

After I have examined my patient with non-specific neck pain, it is essential I provide...

- *"High Velocity, Low Amplitude (HVLA) technique to their neck."*
- *"Muscle Energy Technique (MET) to their neck."*
- *"Soft tissue techniques to the neck."*
- *"Soft tissue techniques to the shoulder girdle muscles."*

Eleven osteopaths completed the Round 3 survey. When all items seeking agreement were included in the Kendall's W calculation, a coefficient of 0.6 ($p < 0.001$) was achieved.

For each domain of Round 3, results from the frequency of use questions are presented in tabular form, followed by the statements included in the calculation seeking a rating of agreement (Kendall's W).

Prognosis

Frequencies

Table 4 demonstrates the most frequent method used for evaluating change in patients with NSNP (prognosis) was change in active and passive ROM of the cervical spine, with nine osteopaths (~ 82%) reporting using these techniques either 'often' or 'always'. All osteopaths ($n = 11$) reported using the Neck Disability Index (NDI) either only 'rarely' or 'sometimes' for patients with NSNP.

Table 4
Frequency – Prognosis methods.

Frequency	Neck Disability Index	Measure Change in Active and Passive Cx Range of Motion	Change in pain intensity
Never	0	0	1
Rarely	5	0	2
Sometimes	6	2	0
Often	0	1	6
Always	0	8	2

N = 11

Cx = cervical spine

Statements seeking level of agreement

A Kendall's W of 0.685 ($p = 0.001$) was achieved for all statements in this section. The following statements were included in the calculation:

"When evaluating a patient with non-specific neck pain:

- "It is essential I administer the Neck Disability Index."
- "It is essential I measure any change in active and passive range of motion."
- "It is essential I measure pain intensity using the visual analogue scale (VAS) or numerical rating scale (NRS)."
- "I believe 2–3 treatments is enough to resolve the patient's complaint."

Discussion

Examination Techniques

All panel members in the current study reported using segmental joint assessment and diagnostic palpation 'Often' or 'Always' when examining patients with non-specific neck pain. Palpation techniques include both static and dynamic (motion) methods, which are often used to identify areas of tissue pain and dysfunction, target manual and manipulative therapies and determine effectiveness of the intervention (31). Previous research has shown osteopaths examine patients with neck pain using palpation (32) among other examinations (33) albeit the reliability of diagnostic palpation for patients with NSNP is poor (34). Given panel members reported that it is essential that segmental joint assessment and diagnostic palpation is performed in the examination of patients with non-specific neck pain (NSNP), further research could delve into the rationale for their inclusion. This exploration may shed light on the nuances of these examination techniques and their contribution to the diagnosis of NSNP by osteopaths.

Panel members deemed active and passive cervical ROM assessment essential for NSNP examination, aligning with studies showing reduced cervical ROM in patients with cervical spine dysfunction (35, 36). ROM assessment is widely used to evaluate impairment severity (37, 38), treatment outcomes (35, 39–43) and disease classification. Its frequent use in trials (38, 41, 44) suggests osteopaths may be using ROM assessment to identify the relationship between joint dynamics and dysfunction location (45). This use by experienced osteopaths appears consistent with the literature, which demonstrates acceptable levels of reliability for active ROM measurements in the cervical spine (40, 46). However, given many of these studies are over 19 years old and investigated reliability in asymptomatic individuals (42, 43, 47) or

used visual estimation (48), exploring the clinical decision-making of more recently graduated osteopaths could reveal if practice has changed.

Additional manual testing was also identified as being a component of the panel's approach to examination of patients with NSNP. Nine panel members reported using Kemp's test either 'Sometimes' or 'Often' when examining patients with NSNP, with one panel member reporting they never use it, and one reporting they use it 'Always'. However, it was included in the final consensus for the examination section. Kemp's has been described in the literature as being potentially useful in diagnosing facet joint pain (or "facet syndrome") (49) so it may be that the panel consider it essential to rule in/out facet joint involvement for patients presenting with NSNP. The cervical compression and distraction test is used to detect the presence of cervical radiculopathy (50). While often/sometimes used, the reliability of the cervical compression and distraction test is questionable (34). This suggests osteopaths may use these movements to reinforce a suspected NSNP diagnosis or simply include it routinely regardless of reliability. The consensus here indicates the panel views this test as valuable for both cervical radiculopathy and broader NSNP assessment. Further research is needed to understand the rationale for using Kemps and cervical compression and distraction in NSNP presentations.

Similarly, the panel considered an upper limb neurological examination as essential, however no panel member performed the technique 'Always'. It may be that to identify a patient as having NSNP, it is important to rule out neurological involvement. It would be useful to ask osteopaths what type of neurological exam they consider essential and to explore their reasons for considering it essential, even if they only use it infrequently.

This study highlights the need for further research into the decision-making processes behind using examination techniques with limited validity, as clinical judgment was not specifically assessed in the current work. This exploration may reveal that panel members employ reasoning approaches such as hypothetico-deductive reasoning, pattern recognition, and narrative reasoning, as outlined by (18) in selecting working diagnoses. Furthermore, the study could explore whether the panel members are influenced by their training, leading them to seek specific tissues they believe to be responsible for the patient's pain. This expanded research could contribute valuable information to enhance the reliability and effectiveness of osteopathic diagnostic practices.

Treatment Techniques (Intervention)

Osteopaths reached moderate agreement on essential treatment techniques for NSNP (30), particularly the use of muscle energy technique, HVLA and soft tissue techniques. There is a range of evidence supporting the positive patient outcomes associated with their use in NSNP. For example, several studies have demonstrated positive outcomes with respect to pain and range of motion with MET, including when combined with cervical traction or therapeutic exercise (51). Similar outcomes have been observed with the use of HVLA and soft tissue techniques. Further, these techniques are amongst the most used by Australian osteopaths, regardless of the presenting complaint. What is not clear from the current work is when the application of these techniques is indicated for NSNP, and the moderate level of agreement amongst the expert panel suggests variability in practitioner treatment choices, aligning with research showing technique-focused approaches in osteopathic care (19). Differences in osteopathic training programs and continuing professional development could contribute to this variation, as well as the non-specific nature of the condition. How osteopaths choose one technique over another, or why they choose to apply a certain technique before another requires exploration through qualitative research methods. For example, interviewing osteopaths in a clinical setting to explore why they choose certain techniques would provide valuable insight into where osteopaths sit on a clinical reasoning continuum described by (18) and whether this is linked to treatment effectiveness.

Soft tissue techniques for the cervical and shoulder girdle were the most frequently used treatment techniques among the panel, aligning with prior research (11–13, 15, 52). While effective for chronic neck pain (53, 54) further research is

needed to determine the specific benefits of soft tissue techniques for NSNP, particularly within a multimodal treatment approach.

Muscle Energy Technique (MET) is a manual therapy approach commonly used by osteopaths to address musculoskeletal dysfunction, including neck pain (15), and was rated as often used by 82% of panel members.

The use of High Velocity Low Amplitude Technique (HVLA) applied to the cervical spine was 'Often/Sometimes' in clinical practice for individuals experiencing NSNP. Research has shown that osteopaths often employ HVLA for patients with neck pain (15) with some demonstrable effectiveness (55) by impacting the nervous system via stimulation to the sensory nerves in the spinal joints, thereby diminishing pain signals (56–58). Additionally, these investigations propose that neck manipulation may have an impact on muscle tone and enhance joint proprioception, thereby contributing to an improved overall function of the neck (56, 58).

Prognosis

The panel indicated the importance of the Neck Disability Index (NDI) for compensable cases of NSNP. Which aligns with research on PROM use by osteopaths (59) and the NDI's widespread use for neck pain (60). The panel also agreed on using a visual analogue scale (VAS) or numerical pain rating scale (NPRS) for pain monitoring, supported by their reliability in assessing neck pain impact (61, 62). The VAS's simplicity likely contributes to its inclusion for prognosis assessment.

Panel members also shared a consensus that a moderately conservative approach, encompassing 2–3 treatments, is deemed adequate for effectively addressing and resolving NSNP. Clinical trials typically adopt a protocol of one treatment session per week over a span of 4–6 weeks (3, 32, 63–65) to assess the efficacy of osteopathic treatment for neck pain. It is plausible that the osteopaths in the current study may have focused on patients experiencing acute pain rather than those dealing with chronic pain, a condition often accompanied by comorbidities. It is also possible that the panel guides the patient towards self-care strategies, encompassing self-care exercises and other management approaches. Further research is warranted to delve into the rationale behind opting for 2–3 treatments specifically for patients with NSNP, shedding light on the potential factors influencing this therapeutic approach.

While research has shown that PROMs are important in clinical practice to evaluate patient outcomes (66), the current study found that their infrequent use is consistent with Australian osteopathic practice (59). Research has identified various barriers to PROM use including clinician capacity concerns, fear of judgment, lack of organisational support, and workflow integration challenges (67–69). Further investigation is needed to determine whether these factors impacted the panel's reported limited use of PROMs.

Based on the findings in the current study, osteopaths should:
- Master essential examination techniques: Become proficient in Cervical Compression/Distraction, Kemp's Test, comprehensive neurological examination, and target assessments specific to the cervical spine.
- Prioritise validated outcome measures: Track patient progress with the Neck Disability Index, diligently monitor pain levels and range of motion, and aim for noticeable improvement within 2–3 treatments, especially in compensable cases.
- Recognise the importance of consensus: While specific treatment methods may vary, align your practice with the broader expert consensus on NSNP examination and management to deliver consistent, high-quality care.

Limitations

The study aimed to attain a consensus level of W = 0.6 for the survey as a whole as well as for each section, prompting consideration for an additional survey round to meet this goal. However, recognising the potential burden on the expert

panel and aiming to avoid restricting the essential techniques osteopaths view as vital for neck pain treatment, in alignment with the analyses of Rounds 1 and 2, a 'moderate' level of agreement was deemed acceptable, provided that all items in the Round 3 survey, including those from each section, reached a 'good' level of agreement ($W = > 0.6$). Further, conducting an additional round to establish a consensus on a treatment approach involving various techniques for a non-specific condition might constrain the range of techniques deemed necessary by the expert panel.

Absence of face-to-face meetings in this study may have deprived the experts from exchanging important information, such as clarification of reasons for disagreements. However, ensuring participant anonymity in this study likely reduced the effects of dominant individuals, and potentially reduced coercion to conform to certain viewpoints (70). The asynchronous nature of the data collection process and feedback rounds used in this study allowed panel members to contribute without the need for simultaneous coordination, reducing logistical challenges.

While consensus methods pose potential biases like participant selection (71), this study's careful approach likely mitigates these concerns. The research team focused on expertise when selecting the panel, balanced the number of participants, used open-ended questions, and had defined consensus criteria. These steps strengthen the validity and reliability of the findings.

Further, the strategic inclusion of open-ended questions in the initial and subsequent rounds of the study offered the opportunity to add additional detail from the expert panel, decreasing the likelihood of constraining responses and thereby enhancing the depth and breadth of the data collected.

Okoli and Pawlowski (72) argue the effectiveness of modified Delphi studies may be contingent upon the clarity of the initial problem statement, and ambiguous or ill-defined issues could hinder the consensus-building process. To mitigate this potential issue in the current study, two rounds of questionnaires with open-ended responses were utilised, providing panel members the opportunity to input appropriate responses that capture their approach when managing patients with non-specific neck pain. This approach allowed for the emergence of clearer questions and preamble on the survey rounds from the collective expertise of the panel, ensuring that subsequent questions posed in each round of the study were relevant and focused.

Conclusion

This modified Delphi study achieved consensus among expert osteopaths, revealing core elements of NSNP examination and management within the patient-centred HOAC-II framework. The panel identified essential examination techniques, including Cervical Compression/Distraction, Kemp's Test, neurological exams, and specific assessments for the cervical spine. For management of compensable patients, the panel indicated outcome measures like the Neck Disability Index, monitoring pain and range of motion, and targeting resolution within 2–3 treatments. While there was less consensus on specific treatment methods, these findings offer valuable insights into standard osteopathic practice for NSNP and provide valuable guidance for osteopaths and other healthcare providers who manage neck pain.

Exploring the decision-making process behind an osteopath's selection and sequencing of techniques offers a promising avenue for understanding how their clinical reasoning directly influences positive patient outcomes. Qualitative research methods, such as in-depth clinical interviews with osteopaths, can identify the intricate considerations that underpin their technique choices. By exploring the nuances of their thought processes, researchers may identify the connections between specific techniques, their sequencing, and the desired therapeutic effects, ultimately leading to more effective and personalised patient care.

Declarations

Ethics approval and consent to participate:

Consent for publication:

Consent has been given to publish this work.

Availability of data and materials:

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests:

The authors declare that there is no conflict of interest regarding the publication of this article.

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Authors' contributions:

MF conceived the study. MF collected the data. MF analysed the data which was reviewed by all authors. MF drafted the background, methods, results, and discussion. All authors critically reviewed, edited, and approved the final manuscript.

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