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Protocols

European Delphi Consensus on Minimum Training Standards for Dry Needling (EDNES): a protocol for a modified Delphi study

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ABSTRACT

Background: Dry needling is increasingly used in physiotherapy, yet substantial variation exists in training duration, curriculum content, competency expectations, and regulatory approaches across countries. No unified European framework currently defines minimum educational and competency standards for dry needling practice.

Methods: This protocol describes a modified Delphi study aiming to establish European consensus on minimum training standards and clinician-level competencies for dry needling in physiotherapy. An international expert panel of clinicians, educators, and researchers (approximately 25–35 experts) will participate in 2–4 online rounds. An evidence-informed initial item set will be rated using a 5-point Likert scale, with controlled feedback between rounds. Consensus will be defined as ≥70% agreement in Round 1 and ≥75% in subsequent rounds. The study will be conducted in accordance with CREDES recommendations and was preregistered on the Open Science Framework (OSF Registries, DOI: 10.17605/OSF.IO/32TAZ).

Ethics and dissemination: Ethical approval has been obtained from the CEIC Aragón (CEICA; Ethics: PI26/237). The study will be conducted in accordance with the Declaration of Helsinki, and findings will be disseminated through peer-reviewed publication and relevant professional channels.

Discussion: This study is expected to provide a structured consensus-based framework to support greater consistency, safety, and harmonisation in dry needling education and practice across Europe.

Keywords: dry needling; Delphi study; education standards; physiotherapy; competency; consensus; Europe.

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1. Introduction

Dry needling (DN) is a minimally invasive technique used by healthcare professionals to manage musculoskeletal pain and movement disorders, involving the insertion of solid filiform needles without the injection of substances. It is widely used in physiotherapy practice, with evidence indicating increasing adoption in clinical practice[1–3]. However, substantial heterogeneity exists in training duration, curriculum content, competency expectations, and regulatory approaches across countries. This variability reflects the absence of a unified, evidence-informed framework defining minimum educational and clinical standards for DN practice within physiotherapy.

Available literature further supports the presence of variability in DN education and practice. Evidence from entry-level Doctor of Physical Therapy curricula in the United States has demonstrated marked heterogeneity in programme structure, instructional hours, supervision models, and content[4]. In parallel, recurring priorities are consistently identified within these curricula, including safety-focused training, integration of anatomy into clinical application, and the development of practical skills and minimum competencies. Additionally, broader acupuncture training frameworks, such as the WHO benchmarks, emphasise competency-based education, patient safety, ethical and legal considerations, and clearly defined training pathways adapted to the professional background of healthcare providers[5].

This lack of standardisation has important clinical and professional implications. Variability in training and competency development can lead to inconsistencies in clinical reasoning, technical execution, and safety practices, which, in turn, can affect treatment quality and patient safety. These challenges are particularly relevant within the European Union, where differences in educational pathways and regulatory requirements create additional barriers to comparability and professional recognition. Cross-border mobility in this context is governed by Directive 2005/36/EC on the recognition of professional qualifications, later modernised and strengthened by Directive 2013/55/EU, which further enhanced transparency and efficiency of recognition procedures and facilitated the mobility of professionals across Member States[6,7].

Survey-based evidence from physiotherapy practitioners further reinforces these concerns. U.S. physical therapists reporting current DN practice have shown considerable variation in training pathways, technique selection, and patterns of clinical application, alongside frequent minor adverse events and rare but clinically important complications, including pneumothorax, nerve injury, and infection[1]. These findings further highlight the importance of structured training and clearly defined competency standards in supporting safe and effective practice.

Previous initiatives, including the CARE-DN consensus project, have addressed reporting standards for DN case reports[8]. However, reporting standards do not address the underlying variability in education, training, and clinical competence. Furthermore, there is still no agreed-upon European framework that defines minimum training requirements, core competencies, and safety standards for DN within physiotherapy practice.

In areas where high-quality evidence is limited or where variability in practice persists, structured consensus methods such as the Delphi technique provide a rigorous and transparent approach to synthesising expert opinion. Modified Delphi approaches, which begin with a pre-developed evidence-informed item set rather than open-ended item generation, are widely used

in healthcare research to develop clinical standards, competency frameworks, and educational benchmarks, and are supported by methodological guidance including the Guidance on Conducting and REporting DElphi Studies (CREDES) recommendations[9] and prior physiotherapy Delphi studies using iterative rounds, predefined consensus thresholds, and controlled feedback[8,10,11].

Taken together, the observed heterogeneity in DN education and practice across Europe, combined with the absence of an agreed framework, indicates a clear need for consensus-based minimum standards with the potential to enhance patient safety, improve consistency in education and clinical practice, support professional recognition across jurisdictions, and inform future research, policy, and quality assurance in DN education.

Therefore, the aim of this study is to establish a European consensus on minimum educational standards and clinician-level competencies required to support safe and clinically adequate DN practice within physiotherapy.

The specific objectives of this study are:

- To define minimum standards for DN education programmes, including training duration, curriculum content, and instructional structure.
- To identify core competencies required for safe and effective DN practice, including clinical reasoning, technical skills, and safety-related competencies.
- To establish consensus on key safety principles and risk management considerations associated with dry needling practice.

Given the conceptual distinction between educational provision and clinical competence, the Delphi process will consider both programme-level training standards and clinician-level competencies, recognising that the former should support the latter.

2. Materials and Methods

2.1 Study Design

This study will employ an online, modified Delphi methodology, defined as a structured and iterative consensus process using a pre-developed item pool informed by literature mapping and expert input, anonymised questionnaire rounds, predefined consensus thresholds, and controlled feedback between rounds. The aim is to develop consensus on minimum educational standards and clinician-level competencies for DN practice within physiotherapy. The study will be conducted in accordance with established methodological guidance, including the CREDES recommendations[9], to ensure transparency, rigour, and reproducibility. The CREDES checklist for this protocol is provided as Supplementary File 1. The study protocol was preregistered on the Open Science Framework (OSF Registries, DOI: 10.17605/OSF.IO/32TAZ)[12] prior to initiation of the Delphi process to enhance transparency and reproducibility.

2.2 Study Setting, Participants and selection criteria

A purposive sampling strategy will be used to recruit an international panel of experts with demonstrated expertise in DN training, education, or related research. The panel will priori-

tise individuals with direct DN teaching experience, involvement in curriculum development, or contributions to DN research, recognising that expertise in training standards is distinct from clinical experience alone. Eligible participants will include physiotherapists or other regulated healthcare professionals who meet at least one of the following criteria: formal training or certification in DN; a minimum of five years of DN clinical experience; experience teaching DN courses at any level; involvement in DN or physiotherapy curriculum development; or a track record of relevant academic activity such as peer-reviewed publication or professional leadership in the field. Participants who do not meet any of the above criteria, are unwilling or unable to commit to participating in the full Delphi process, or withdraw consent prior to or during the study will be excluded. Participants will be identified through professional networks, scientific publications, relevant organisations, and recommendations from existing panel members. Participation will be voluntary, and informed consent will be obtained prior to enrolment. A balanced composition of clinical and academic perspectives will be sought to enhance the validity and applicability of the consensus.

While the regulatory context described earlier primarily reflects European Union (EU) frameworks, this study will adopt a broader European perspective by including experts from both EU and non-EU countries, recognising that variability in training, regulation, and clinical practice extends beyond EU jurisdictions. This approach is intended to enhance the representativeness, external validity, and applicability of the resulting consensus across diverse European healthcare contexts.

2.3 Sample Size

There is no universally accepted standard for sample size in Delphi studies, and panel size is typically determined by the scope of the topic, the level of expertise required, and the need to ensure diversity of perspectives. In the dry needling literature specifically, Delphi panel sizes have varied considerably, ranging from as few as 9 to over 100 panellists[8,13–15].

In this study, a panel of approximately 25–35 experts will be sought. This range is considered sufficient to capture a breadth of informed opinion while remaining feasible for iterative rounds of feedback and consensus development, and is consistent with established Delphi methodology guidance recommending a minimum of 20 to 30 panellists for expert consensus studies[16]. To maintain panel continuity, only panellists who complete a given round will be invited to participate in subsequent rounds. Attrition rates will be recorded and reported for each round. Should the panel fall below 15 participants in any subsequent round, the research team will assess whether findings retain sufficient representativeness to proceed.

2.4 Initial item development

Prior to initiating the first round of the Delphi procedure, an initial set of items will be developed through an evidence-informed and conceptually structured process conducted by the research team. Item generation will be based on the available literature on DN education, competency-based training, safety considerations, clinical practice patterns, and relevant professional or policy frameworks, together with internal expert input from the research team.

In line with the study aim, the initial item set will be organised into two complementary domains reflecting the conceptual structure of the framework:[1] programme-level educational

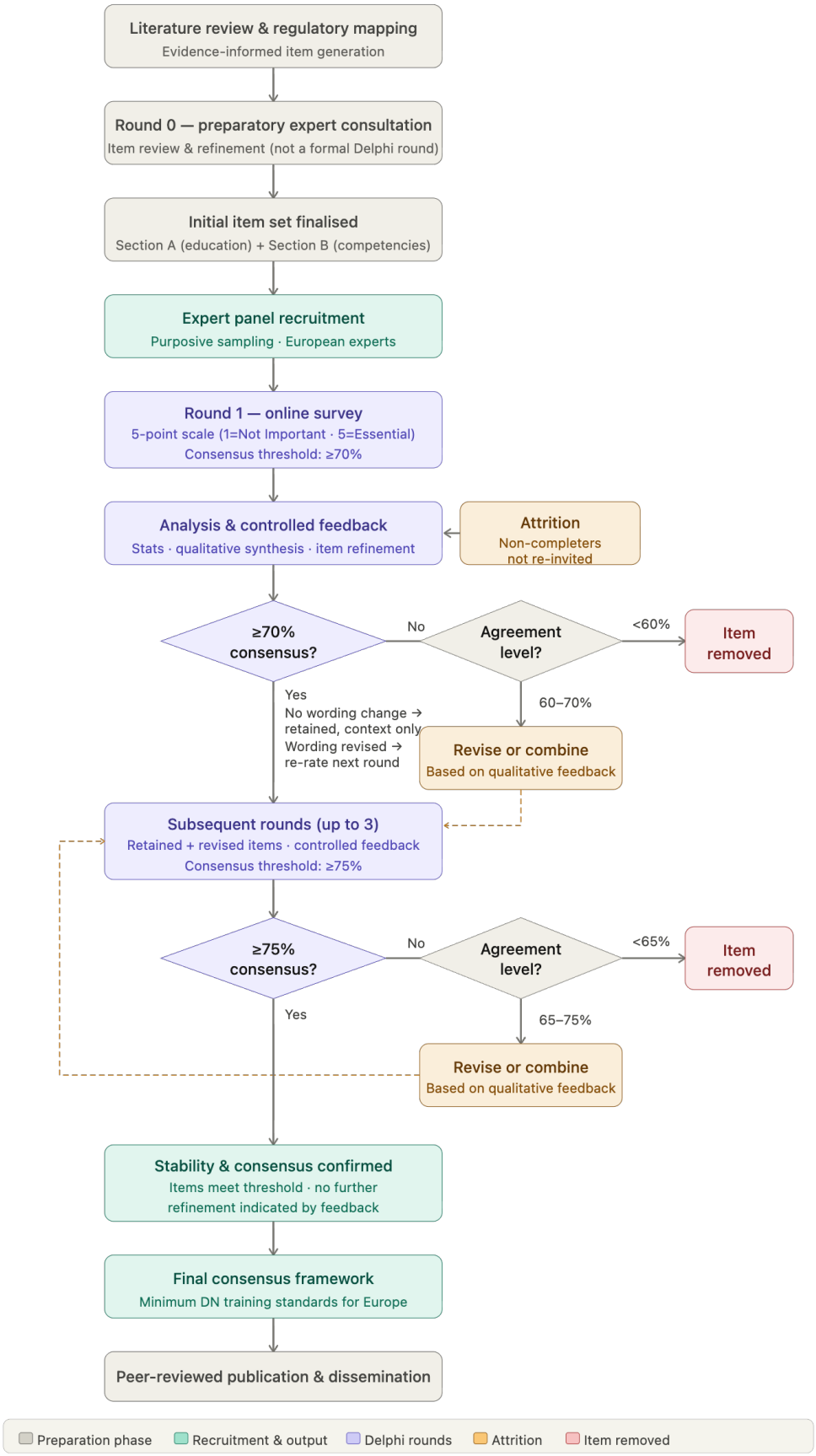
standards for DN training, and[2] clinician-level competencies required for safe and independent DN practice. Across these domains, items will address areas including eligibility and entry requirements, curriculum content, applied anatomy, clinical reasoning, practical skills, dosing, safety and adverse event management, assessment of competence, and ethical considerations.

Prior to Round 1, the preliminary item set will be reviewed and refined through a preparatory expert consultation (Round 0), conducted with a small international team of content experts selected for their recognised expertise in DN education, clinical practice, and/or curriculum development, with a minimum of 15 years of experience in DN clinical practice, representing different European countries. Participation of Round 0 experts in subsequent Delphi rounds is permitted where they meet the eligibility criteria for panel inclusion, given that their involvement in item refinement was conducted prior to and independently of the formal consensus process.

2.5 Delphi Procedure

The Delphi process will be conducted through a series of sequential online questionnaire rounds. A modified Delphi approach will be used, beginning with a pre-developed, evidence-informed item set. Participants will be asked to rate each item using a 5-point ordinal scale: 1 = Not Important, 2 = Slightly Important, 3 = Important, 4 = Very Important, 5 = Essential. Free-text fields will be provided to allow participants to suggest modifications, clarifications, or additional items. Following each round, responses will be analysed and summarised. Participants will receive controlled feedback, including aggregated group results and anonymised comments, to inform subsequent ratings. Items not reaching the consensus threshold will be subject to the following predefined criteria: items scoring more than 10 percentage points below the consensus threshold will be considered for removal; items scoring within 10 percentage points below the consensus threshold will be revised or combined based on qualitative feedback. Items reaching or exceeding the consensus threshold will be retained unchanged, unless qualitative commentary indicates a need for wording refinement, in which case the revised wording will be re-submitted for rating in the subsequent round. The Delphi process is expected to involve 2–4 rounds, or until stability of responses and predefined consensus criteria are achieved. The Delphi process will conclude when all items have reached the predefined consensus threshold and no further item refinement is indicated by qualitative feedback. Items that have achieved consensus and required no wording revision will be displayed in subsequent rounds for contextual reference only and will not be subject to re-rating. Stability of responses will be considered achieved when revised or newly introduced items meet the predefined consensus threshold and qualitative feedback does not indicate a need for further refinement. Participants who complete the first round will be invited to participate in all subsequent rounds. The research team will be responsible for summarising responses, refining items, and preparing feedback between Delphi rounds. Any decisions regarding item modification, merging, or removal will be based on predefined criteria and participant feedback. Data collection will be conducted using a secure online survey platform (SurveyMonkey) through individualised email invitations. Each participant will receive a unique survey link, allowing controlled participation and restricting responses to one submission per invited contact. The overall study design is illustrated in Figure 1.

Figure 1. EDNES study flowchart



DN = Dry Needling; EDNES = European Delphi Consensus on Minimum Training Standards for Dry Needling; pp = percentage points

2.6 Statistical Analysis and Consensus Definition

Descriptive statistics will be used to summarise responses at each round, including the proportion of participants rating each item within each category of the Likert scale and the percentage agreement for predefined consensus thresholds.

The consensus threshold applies specifically to ratings within the upper two categories of the scale (scores of 4 or 5 — Very Important or Essential). Items for which the modal response falls at or below the midpoint of the scale (score of 3 — Important) will not be considered to have reached consensus regardless of the overall percentage agreement, and will be subject to revision or removal in the subsequent round. Interquartile range values will also be calculated as an indicator of response dispersion, with lower interquartile range values reflecting greater agreement among participants. Qualitative feedback from free-text responses will be analysed using a descriptive content approach and used to inform item refinement between rounds. Attrition rates between rounds will be recorded and reported. To minimise social influence and promote independent judgement, responses will be treated as pseudonymous throughout the Delphi process. Participant identities will be known to the research team solely for the purpose of administering subsequent rounds and tracking response rates; however, individual responses will not be attributed to specific participants at any stage of data analysis, feedback preparation, or reporting. Aggregated and anonymised summaries of responses will be shared with panellists as controlled feedback between rounds.

Consensus will be defined a priori as ≥70% agreement in Round 1 and ≥75% agreement in all subsequent rounds, based on ratings within the upper categories of the scale (scores of 4 or 5). These thresholds were chosen as they align with ranges commonly applied in Delphi studies within physiotherapy and in the development of clinical practice standards[8,10,11]. Items not meeting consensus criteria will be retained, revised, or excluded based on level of agreement and participant feedback. Only items meeting the predefined consensus thresholds will be included in the final framework. The Delphi process will conclude when consensus is achieved across items or when stability of responses is observed across consecutive rounds. Data collection will be conducted in a pseudonymised manner. Participant contact details, including name and email address, will be used solely for invitation and response tracking purposes within the SurveyMonkey Email Invitation system. Access to identifiable information will be restricted to the core research team. Prior to statistical analysis, survey data will be exported and fully de-identified, and only the de-identified dataset will be used for analysis.

3. Ethical Aspects and Dissemination

Ethical approval was obtained from CEIC Aragón (CEICA), the regional biomedical research ethics committee of Aragón, Spain (Ethics: PI26/237). The study will be conducted in accordance with the principles of the Declaration of Helsinki and applicable data protection regulations. Participation in the Delphi process will be voluntary, and all participants will receive written information about the study objectives, procedures, expected time commitment, and data handling before providing informed consent.

Responses will be collected and stored in accordance with the General Data Protection Regulation (GDPR) and applicable institutional data protection requirements. Data will be analysed and reported in de-identified (anonymised) form, and no identifiable personal data will be disclosed in any publication or dissemination arising from the study. All findings will be reported in aggregate form as outcomes of the Delphi process; no individual responses will be identifiable, and no attribution of findings to specific experts or individual-level interpretation of responses will be made. Participants will have the right to withdraw from the study at any stage prior to data analysis without consequence.

Delphi participants will be acknowledged for their contribution to the study, and any form of group authorship will be determined in line with the guidance of the International Committee of Medical Journal Editors and the authorship requirements of the journal selected for submission.

4. Discussion

This study aims to establish a consensus-based framework for minimum educational standards and clinician-level competencies in DN practice within physiotherapy. Given the observed heterogeneity in training pathways, curriculum content, and regulatory approaches across Europe, the use of a structured Delphi methodology provides an appropriate and rigorous approach to synthesising expert opinion in an area where empirical evidence alone is insufficient to guide standardisation. The modified Delphi design adopted in this study allows for systematic refinement of expert input through iterative rounds, controlled feedback, and predefined consensus criteria. This approach is particularly suitable for developing educational and competency frameworks, where variability in practice and contextual differences across healthcare systems require the integration of diverse expert perspectives. The inclusion of both clinical and academic experts from multiple European countries is expected to enhance the relevance, applicability, and external validity of the resulting consensus.

4.1 Strengths

This study has several methodological strengths. It is grounded in an evidence-informed item development process, aligned with established methodological guidance such as CREDES, and incorporates both programme-level and clinician-level dimensions of training. Furthermore, the European scope of the panel allows the resulting framework to reflect a broad range of regulatory and educational contexts, supporting its potential utility for harmonisation efforts.

4.2 Limitations

However, certain limitations should be acknowledged. As with all Delphi studies, findings are dependent on the composition of the expert panel and may be influenced by selection bias. The anonymised design of the study, while reducing group influence and promoting independent judgement, precludes tracking of individual responses across rounds and limits the ability to assess attrition bias in detail. In addition, the absence of patient or public involvement reflects the study's focus on professional training standards, although future work may benefit from incorporating patient perspectives, particularly in relation to safety and acceptability.

Despite these limitations, several methodological safeguards strengthen the rigour and transparency of this study. The protocol was prospectively registered on the Open Science Framework (OSF) prior to data collection, supporting reproducibility and reducing the risk of outcome reporting bias. Ethical approval was obtained prior to study commencement, ensuring compliance with established standards for research involving human participants. Furthermore, the study was designed and will be reported in accordance with the CREDES recommendations, which provide a structured framework for methodological transparency in Delphi research. The international and multi-European composition of the expert panel, encompassing professionals from diverse regulatory, educational, and clinical contexts across European countries, further strengthens the transferability and relevance of the findings beyond any single national context. Collectively, these measures enhance the credibility and robustness of the findings.

4.3 Conclusions

The findings of this study are expected to provide a structured and consensus-based foundation for the development of minimum training standards in DN. The resulting framework may inform educational programme design, professional guidelines, and policy development, while also supporting future research and potential accreditation initiatives within the field.

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Editorial information

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Author Contributions

G.T.: Conceptualization, Methodology, Investigation, Project Administration, Writing – Original Draft, Writing – Review & Editing, Supervision. K.G.: Methodology, Writing – Review & Editing. K.S.: Methodology, Writing – Review & Editing. All authors have read and agreed to the published version of the manuscript.

Ethics Statement

This study was approved by the CEIC Aragón (CEICA), the regional biomedical research ethics committee of Aragón, Spain (Ethics approval number: PI26/237). The study will be conducted in accordance with the principles of the Declaration of Helsinki. Participation is voluntary and all panellists will provide informed consent prior to enrolment.

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This research received no external funding.

Data Availability Statement

No primary data have been generated at this stage of the research. Upon completion of the Delphi study, anonymised consensus data and results will be made available via the Open Science Framework repository (DOI: 10.17605/OSF.IO/32TAZ) or upon reasonable request to the corresponding author.

Conflicts of Interest

The authors declare no conflicts of interest.

Suggested citation

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Supplementary Material — CREDES Checklist

European Delphi Consensus on Minimum Training Standards for Dry Needling (EDNES)

A Protocol for a Modified Delphi Study

This checklist maps the Guidance on Conducting and REporting DElphi Studies (CREDES) recommendations (Jünger et al., Palliat Med, 2017;31:684–706) to the corresponding sections of this protocol. Items relating to results, conclusions, and final dissemination will be completed and reported in the full publication upon study completion.

CREDES Item	Description	Location in Protocol / Notes
1. Rationale for Delphi Technique		
Justification	The choice of the Delphi technique as a method of systematically collating expert consultation and building consensus needs to be well justified.	Section 1 (Introduction); Section 2.1
2. Planning and Design		
Planning and process	The Delphi technique is a flexible method and can be adjusted to the respective research aims and purposes. Any modifications should be justified by a rationale and applied systematically and rigorously.	Section 2.1; Section 2.5
Definition of consensus	An a priori criterion for consensus should be defined, including: (a) how to proceed with items in subsequent rounds; (b) the threshold to terminate the process; (c) procedures when consensus is (not) reached.	Section 2.6
3. Study Conduct		
Informational input	All material provided to the expert panel at the outset and throughout the Delphi process should be carefully reviewed and piloted in advance to prevent bias.	Section 2.4; Section 2.5
Prevention of bias	Researchers need to take measures to avoid directly or indirectly influencing the experts' judgements. Anonymisation of responses should be ensured.	Section 2.5; Section 3
Interpretation and processing of results	Consensus does not necessarily imply the 'correct' answer. Non-consensus and stable disagreement also provide informative insights and highlight differences in perspectives.	Section 2.6 (To be fully reported in final publication)
External validation	It is recommended to have the final draft of the resulting guidance reviewed and approved by an external board or authority before publication and dissemination.	Not applicable at protocol stage; to be considered in final publication phase
4. Reporting		
Purpose and rationale	The purpose of the study should be clearly defined and demonstrate the appropriateness of the Delphi technique as a method to achieve the research aim.	Abstract; Section 1; Section 2.1
Expert panel	Criteria for the selection of experts and transparent information on recruitment of the expert panel should be provided.	Section 2.2; Section 2.3
Description of methods	The methods employed need to be comprehensible, including preparatory steps, design of survey instruments, number and design of rounds, and methods of data analysis.	Sections 2.1–2.6
Procedure / Flowchart	A flow chart to illustrate the stages of the Delphi process, including preparatory phase, Delphi rounds, interim steps of data processing, and concluding steps.	Figure 1
Definition and attainment of consensus	It needs to be comprehensible to the reader how consensus was or will be achieved throughout the process, including strategies to deal with non-consensus.	Section 2.6
Results (per round)	Reporting of results for each round separately is highly advisable in order to make the evolving of consensus over rounds transparent.	To be reported in final publication
Discussion of limitations	Reporting should include a critical reflection of potential limitations and their impact on the resulting guidance.	Section 4 (Discussion) (To be expanded in final publication)
Adequacy of conclusions	The conclusions should adequately reflect the outcomes of the Delphi study with a view to the scope and applicability of the resulting practice guidance.	To be reported in final publication
Publication and dissemination	The resulting guidance should be clearly identifiable from the publication, including recommendations for transfer into practice and implementation. A dissemination plan should include endorsement by professional associations.	Section 3 (Ethics and Dissemination)

CREDES = Conducting and REporting of DElphi Studies. DN = Dry Needling. Items marked 'To be reported in final publication' are not applicable at the protocol stage.