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REVIEW ARTICLE

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Testing of pre-operative peripheral nerve blocks in randomised controlled trials: A scoping review protocol

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Abstract

Background: Peripheral nerve blocks are widely used for anaesthesia in upper or lower limb surgery, but the methods used to assess their success vary substantially across randomised controlled trials. Standardised reporting of how peripheral nerve blocks are tested and how success is defined is essential for ensuring the validity and comparability of clinical research and correct clinical implementation of nerve blocks. This scoping review aims to map existing research practices and assess the extent to which trials provide reporting on peripheral nerve block evaluation.

Methods: This scoping review will adhere to guidelines from the Joanna Briggs Institute and the Preferred Reporting Items for Systematic and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR). A comprehensive search will be conducted on the PubMed database for trials published in peer-reviewed journals of anaesthesia from 2014 onward. An online tool will be used for screening and data extraction. Outcomes include the proportion of trials that report whether peripheral nerve blocks were tested, describe testing methods, define successful blocks, and report success rates.

Results: The results of the review will be presented descriptively and with tables where appropriate.

Conclusion: This protocol outlines a review exploring variability in the reporting of methods used to test peripheral nerve blocks. It aims to assist with the interpretation of clinical trials and possibly guide future research to facilitate comparison of findings between clinical trials.

KEYWORDS

block success rates, block testing, peripheral nerve blocks, regional anaesthesia, scoping review

1 | INTRODUCTION

Heterogeneity in outcome measurement is a commonly cited issue when performing systematic reviews.[1] When testing procedural interventions in randomised clinical trials (RCTs), it is imperative to ensure that the procedure is conducted and performed according to a set standard. Peripheral nerve blocks (PNBs), in which local anaesthetics are injected perineurally to anaesthetise a target area, are a commonly used anaesthetic technique. Numerous clinical trials have investigated the effects of different local anaesthetics and doses, as well as adjuvants, in various PNBs.[2–5] However, in order to ensure the validity of results, it is crucial that the blocks are systematically and preferably uniformly tested and that success rates are reported and discussed.[6] Success rates of PNBs vary according to factors including nerve localisation technique, block type and operator experience; a Cochrane review comparing ultrasound to other methods of nerve localisation for PNBs reported block success rates ranging from 60.6% to 100%.[7]

The success of PNBs can be defined in several ways and there is significant variability in the way blocks are tested, both in clinical practice and research.[8] Simple sensory and motor function assessments using graded scales remain the most used in clinical practice given their ease of use.[8,9] In the context of research, even trials assessing blocks using the same measurement tool may do this differently.[10] Detailed descriptions of how PNBs are tested and deemed successful and the rates of successful blocks are therefore essential to allow valid comparisons between trials, to perform meta-analysis of results and for clinical applicability of results.

1.1 | Aim of the study

This review aims to determine the proportion of RCTs published since 2014 involving PNBs in the peri-operative anaesthetic management of upper or lower limb surgery that describe how PNBs are tested. It also aims to explore the proportion of RCTs that define a successful block and the reported success rates of blocks. To our knowledge, no reviews have been conducted investigating how commonly RCTs describe the testing method of PNBs and how a successful PNB is defined.

2 | METHODS

Following guidance from the Joanna Briggs Institute (JBI), this protocol was developed to define the review's aims and ensure transparency of the resulting review.[11] The protocol was made available on Open Science Framework before data collection.[12] The subsequent scoping review will follow guidance from the JBI Manual for Evidence Synthesis on scoping reviews and will adhere to the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR).[13,14] A scoping review is an effective tool to explore existing literature, clarify common definitions and assess how research in a given field is conducted and was therefore chosen as the most appropriate methodology to answer the research questions.[13]

2.1 | Eligibility criteria

2.1.1 | Population

- Studies on adults (as defined by trialists) receiving a pre-operative, non-fascia plane PNB as part of or as the sole anaesthetic management for upper or lower limb surgery. Truncal and fascial plane blocks were not included due to the high variability of local anaesthetic spreading pattern and the lack of consensus on how these blocks should be assessed and tested.[15–17]

2.1.2 | Concept

- PNBs of isolated nerve structures or nerve plexuses with a well-defined innervation area suitable for specific testing of success. If combined with other forms of anaesthesia that would make testing unfeasible (e.g., spinal or general anaesthesia), the PNB must be performed prior to this.

2.1.3 | Context

- PubMed-indexed RCTs published in peer-reviewed journals of anaesthesia.
- Publication date from 2014 onwards.
- Published in English.

2.2 | Outcomes

1. The proportion of RCTs that state that PNBs were tested.
2. The proportion of RCTs describing how the PNBs were tested.
3. The proportion of RCTs using sensory function to test PNBs.
4. The proportion of RCTs using motor function to test PNBs.
5. The proportion of RCTs describing how PNB success is determined.
6. The proportion of RCTs reporting PNB success rates.
7. The success rate of PNBs is reported by trialists.
8. The proportion of RCTs that describe how unsuccessful PNBs are managed.

2.3 | Information sources and search strategy

A search string adapted to the PubMed database was developed with a medical librarian experienced in database literature searches. The search was narrowed to journals listed under the "Anesthesiology" category on Web of Science that primarily focus on general perioperative or regional anaesthesia and publish in English.[18] This was

TABLE 1 List of selected journals.

- Anesthesiology
- British Journal of Anaesthesia
- Anaesthesia
- Regional Anesthesia and Pain Medicine
- Journal of Clinical Anesthesia
- Best Practice & Research Clinical Anaesthesiology
- Anesthesia & Analgesia
- European Journal of Anaesthesiology
- Korean Journal of Anesthesiology
- Anaesthesia Critical Care & Pain Medicine
- Canadian Journal of Anesthesia
- Minerva Anestesiologica
- Journal of Anesthesia
- BMC Anesthesiology
- Current Opinion in Anesthesiology
- Journal of Clinical Monitoring and Computing
- Acta Anaesthesiologica Scandinavica
- Anaesthesia and Intensive Care

determined using the journals' overview, aims and scope and by screening publications from the last 24 months from the journals. Table 1 lists the journals included in the search.

The developed search string can be found in Appendix A.

2.4 | Source selection and data charting process

All studies found will be screened by two independent authors. Disagreements will be resolved via discussion between the screening authors and, where necessary, involvement of a third and senior author. Two independent authors will extract data, with consensus provided by the review's first author. Covidence, a systematic review software, will be used for trial screening and data extraction.[19] A PRISMA 2020 flow diagram will be used to illustrate the screening process.[20]

2.5 | Data items

Data for each trial will be collected regarding trial information (e.g., year of publication, publishing journal, trial size), anaesthetic management (e.g., type of PNB, surgery performed under PNB only or combined with other anaesthetic techniques) and this review's outcomes as stated above.

An extraction form was made using Covidence's data extraction tool, shown in Appendix B. Two authors piloted the data extraction form on five randomly selected full-text articles to ensure the data collected effectively fulfils the review's objectives. The suitability of a testing method for a given PNB lies outside this review's scope and will therefore not be assessed.

2.6 | Synthesis of results

Data will be presented in narrative form or using tables. We will present proportions with corresponding 95% confidence intervals. Continuous variables will be presented as means with corresponding standard deviations. Subgroup analysis will be performed on the following outcomes:

1. The proportion of RCTs that state that PNBs were tested.
2. The proportion of RCTs describing how the PNBs were tested.

Subgroup analysis will be performed based on the following criteria:

- Publishing journal in the 50th percentile of Impact Factor (yes vs. no)
- Published within the last 5 years (yes vs. no)
- PNB as the sole peri-operative anaesthetic management (yes vs. no)
- Trials with over 100 participants (yes vs. no)
- Trials with a pre-published, publicly accessible protocol (yes vs. no)
- Trials with a PNB as intervention or comparator (yes vs. no)

Chi-square or Fisher's statistic tests will be used to compare between subgroups.

3 | DISCUSSION

The protocolised review aims to provide an overview of the reporting of nerve block tests in recent RCTs. It will also assess the reporting of criteria used to determine PNB success and the reporting of success rates. This review's strengths include its pre-defined, published protocol and its adherence to the JBI and PRISMA-ScR guidelines. A limitation of the scoping review methodology is the absence of a quality-of-evidence assessment of included trials. However, this scoping review will provide an overview of current regional anaesthesia research, identifying key themes and evaluating methodological approaches.

4 | CONCLUSION

This protocol presents a scoping review that will investigate variability in how methods for testing PNBs are reported. This will assist clinicians in interpreting RCTs and identify potential methodological gaps in trial design. Prioritising and standardising these gaps will facilitate future trial comparisons and improve the quality of evidence.

AUTHOR CONTRIBUTIONS

All authors met the recommendations for authorship defined by The International Committee of Medical Journal Editors.

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No financial funding is received for this scoping review.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

No data were generated or analysed in this study protocol; thus, data sharing does not apply to this article.

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APPENDIX A: Search string

Domain 1: Nerves and plexuses	Domain 2: Nerve blocks/local anaesthesia	Domain 3: Journals	Domain 4: RCTs
("brachial plexus"[MeSH Terms] OR "cervical plexus"[MeSH Terms] OR "lumbosacral plexus"[MeSH Terms] OR "thoracic nerves"[MeSH Terms] OR "femoral nerve"[MeSH Terms] OR "intercostal nerves"[MeSH Terms] OR "median nerve"[MeSH Terms] OR "obturator nerve"[MeSH Terms] OR "peroneal nerve"[MeSH Terms] OR "tibial nerve"[MeSH Terms] OR "radial nerve"[MeSH Terms] OR "sciatic nerve"[MeSH Terms] OR "superior cervical ganglion"[MeSH Terms] OR "sural nerve"[MeSH Terms] OR "ulnar nerve"[MeSH Terms] OR "brachial plexus"[Title/Abstract:~3] OR "cervical plexus"[Title/Abstract:~3] OR "lumbosacral plexus"[Title/Abstract:~3] OR "femoral nerve"[Title/Abstract:~3] OR "femoral nerves"[Title/Abstract:~3] OR "intercostal nerve"[Title/Abstract:~3] OR "intercostal nerves"[Title/Abstract:~3] OR "median nerve"[Title/Abstract:~3] OR "median nerves"[Title/Abstract:~3] OR "obturator nerve"[Title/Abstract:~3] OR "obturator nerves"[Title/Abstract:~3] OR "peroneus nerve"[Title/Abstract:~3] OR "peroneus nerves"[Title/Abstract:~3] OR "tibial nerve"[Title/Abstract:~3] OR "tibial nerves"[Title/Abstract:~3] OR "radial nerve"[Title/Abstract:~3] OR "radial nerves"[Title/Abstract:~3] OR "saphenous nerve"[Title/Abstract:~3] OR "saphenous nerves"[Title/Abstract:~3] OR "sciatic nerve"[Title/Abstract:~3] OR "sciatic nerves"[Title/Abstract:~3] OR "sural nerve"[Title/Abstract:~3] OR "sural nerves"[Title/Abstract:~3] OR "ulnar nerve"[Title/Abstract:~3] OR "ulnar nerves"[Title/Abstract:~3] OR "cervical ganglion"[Title/Abstract:~3]) OR (("Sciatic Nerve"[MeSH Terms] OR "Femoral Nerve"[MeSH Terms]) AND "Nerve Block"[MeSH Terms]) OR ("psoas compartment block*"[Title/Abstract] OR	((((("local anesth*"[Title/Abstract] OR "local anaesth*"[Title/Abstract] OR "anesthesia, local"[MeSH Terms] OR "nerve block"[MeSH Terms] OR "nerve block*"[Title/Abstract]) OR ("nerve block"[Title/Abstract:~3])) OR ("nerve blockade"[Title/Abstract:~3])) OR ("plexus block"[Title/Abstract:~3])) OR ("plexus blockade"[Title/Abstract:~3])	((((((((((((((((((((("Anaesthesia"[Journal]) OR ("British journal of anaesthesia"[Journal])) OR ("Anesthesiology"[Journal])) OR ("Journal of clinical anesthesia"[Journal])) OR ("Anesthesia and analgesia"[Journal])) OR ("Anaesthesia Critical Care & Pain Medicine"[Journal])) OR ("Regional anesthesia and pain medicine"[Journal])) OR ("Best Practice & Research-Clinical Anaesthesiology"[Journal])) OR ("Canadian journal of anaesthesia Journal canadien d'anesthésie"[Journal])) OR ("European journal of anaesthesiology"[Journal])) OR ("Minerva anestesiologica"[Journal])) OR ("Korean journal of anesthesiology"[Journal])) OR ("Journal of anesthesia"[Journal])) OR ("Current opinion in anaesthesiology"[Journal])) OR ("BMC anesthesiology"[Journal])) OR ("Journal of clinical monitoring and computing"[Journal])) OR ("Acta anaesthesiologica Scandinavica"[Journal])) OR ("Anaesthesia and intensive care"[Journal]))	("Randomized Controlled Trials as Topic"[Mesh]) OR ("comparative study"[Publication Type] OR "randomized controlled trial"[Publication Type] OR "random*"[Title/Abstract] OR "comparative"[Title/Abstract])

(Continues)

Domain 1: Nerves and plexuses	Domain 2: Nerve blocks/local anaesthesia	Domain 3: Journals	Domain 4: RCTs
"adductor canal block*"[Title/Abstract] OR "saphenous nerve block*"[Title/Abstract] OR "saphenous block*"[Title/Abstract] OR "femoral nerve block*"[Title/Abstract] OR "femoral block*"[Title/Abstract] OR "sciatic nerve block*"[Title/Abstract] OR "sciatic block*"[Title/Abstract]) OR ("axillary brachial plexus block*"[Title/Abstract] OR "axillary plexus block*"[Title/Abstract] OR "axillary nerve block*"[Title/Abstract] OR "infraclavicular brachial plexus block*"[Title/Abstract] OR "infraclavicular plexus block*"[Title/Abstract] OR "infraclavicular nerve block*"[Title/Abstract] OR "supraclavicular brachial plexus block*"[Title/Abstract] OR "supraclavicular plexus block*"[Title/Abstract] OR "supraclavicular nerve block*"[Title/Abstract] OR "interscalene brachial plexus block*"[Title/Abstract] OR "interscalene plexus block*"[Title/Abstract] OR "interscalene nerve block*"[Title/Abstract]))			

APPENDIX B: Extraction form

General information

Study ID

Surname of first author and year of publication

Title

Year of publication

Publishing journal (and impact factor)

- Anaesthesia (10.7)
- British Journal of Anaesthesia (9.8)
- Anesthesiology (8.8)
- Journal of Clinical Anesthesia (6.7)
- Anesthesia & Analgesia (5.9)
- Anaesthesia Critical Care & Pain Medicine (5.5)
- Regional Anesthesia and Pain Medicine (5.1)
- Best Practice & Research Clinical Anaesthesiology (4.8)
- Canadian Journal of Anesthesia (4.2)
- European Journal of Anaesthesiology (3.6)
- Minerva Anestesiologica (3.2)
- Korean Journal of Anesthesiology (2.9)
- Journal of Anesthesia (2.8)
- Current Opinion in Anesthesiology (2.5)
- BMC Anesthesiology (2.2)
- Journal of Clinical Monitoring and Computing (2.2)
- Acta Anaesthesiologica Scandinavica (2.1)
- Anaesthesia and Intensive Care (1.5)

Corresponding author contact details

Country(ies) in which the study was conducted

Characteristics of included studies

Number of patients included

Is a pre-published, publicly accessible protocol available?

- Yes
- No

Methods

Primary outcome

Secondary and explorative outcomes

Is the PNB the study's intervention or control?

- Yes
- No

Type of PNB

- Interscalene brachial plexus block
- Supraclavicular brachial plexus block
- Infraclavicular brachial plexus block
- Axillary brachial plexus block
- Femoral nerve block
- Fascia iliaca block
- Lateral femoral cutaneous nerve block
- Obturator nerve block
- Saphenous (subsartorial/adductor canal) block
- Sciatic nerve block
- Popliteal sciatic block
- Other

Type of PNB: other

Peri-operative anaesthetic management

- PNB only
- PNB + other anaesthetic management

PNB + ...

- General anaesthesia
- Neuraxial anaesthesia
- Sedation (post-nerve block)

Review outcomes

Does the article state that PNBs were tested?

- Yes
- No

Does the article provide a description of how PNBs were tested?

- Yes
- No

Does the article report sensory function testing?

- Yes
- No

Does the article report a graded scale/quantifiable measure was used for sensory testing?

- Yes
- No

Sensory testing: comments

Does the article report motor function testing?

- Yes
- No

Does the article report a graded scale was used for motor testing?

- Yes
- No

Motor testing: comments

Additional testing comments

ex. if PNBs tested in other ways than sensory/motor (thermography, perfusion index, etc.)

Is a definition of "successful PNB" provided?

- Yes
- No

Is a description of how unsuccessful PNBs were managed provided?

- Yes
- No

Is PNB success rate provided?

- Yes
- No

PNB success rate

n/N (%)