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Training and assessment of skills in neuraxial access—Protocol of a scoping review

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Abstract

Background: Access to the neuraxial space, including lumbar punctures and neuraxial anaesthesia, is an everyday procedure in clinical practice. Traditionally these procedures rely on manual palpation technique, but ultrasound is a useful tool when patients prove challenging. Presently, there is a lack of evidence-based guidelines for technical skills acquisition, both with and without ultrasound, and likewise, competency assessment approaches vary globally. Accordingly, we aim to assess the current evidence regarding learning and assessment in neuraxial access \pm ultrasound, for future educational recommendations.

Methods: This scoping review will be conducted in accordance with the Preferred Reporting Items for Systematic and Meta-Analysis (PRISMA) statement, together with the PRISMA Extension for Scoping Reviews. A systematic search strategy will be based on a PICO approach, focusing on physicians, medical students, or nurses being exposed to education, training, or assessment in procedural neuraxial access \pm ultrasound. No comparators are obligated, but outcomes should be assessable using the Kirkpatrick four levels of training evaluation. The search will be performed in Cochrane Library, Embase, Medline, Scopus, PubMed, and CINAHL. Independently, two authors will screen the studies and conflicts will be resolved by a third author. Relevant predefined data will be extracted and analysed using a descriptive approach. The quality of the studies will be assessed using the Medical Education Research Study Quality Instrument.

Discussion: This scoping review will contribute by presenting gathered evidence of an overview of the different approaches to achieving education and training of technical skills in neuraxial access, and how skills are tested, which could guide research and future recommendations for skills development and assessment.

KEYWORDS

assessment, education, epidural anaesthesia, lumbar puncture, neuraxial access, scoping review, spinal anaesthesia, training

1 | INTRODUCTION

1.1 | Rationale

Access to the neuraxial space is a commonly performed technique to conduct lumbar punctures and neuraxial anaesthesia. These procedures are daily used clinical tools and share similarities in terms of the anatomical location and the use of a needle to access the spinal canal and epidural space together with its surrounding structures. Traditionally the procedures are guided by manual palpation, with Tuffier's line, connecting the highest points of the iliac crests, as a surface anatomical landmark—however, its correlation is inconsistent,^{1,2} and a study found that anaesthesiologists are unable to identify the correct lumbar interspace in 71% of cases.³

A preprocedural ultrasound examination of the spine delineates the underlying relevant anatomy, which may assist in the successful insertion of the needle, especially in challenging patients where palpation of the landmarks might be difficult, such as patients with a high BMI, pregnant patients, and patients with spinal deformities or previous spinal surgery.^{4–7} Despite its benefits, the use of ultrasound in neuraxial access is not yet common practice in the anaesthesiologic departments, contrary to upper and lower limb plexus and peripheral blocks, where the present gold standard performance relies on ultrasound—perhaps due to sparse education in the technique.⁸

A survey of anaesthesiologists in the United Kingdom revealed more than 90% of the participants were not trained in the ultrasound-assisted epidural technique, despite a national guideline, supporting its use.^{9,10} Furthermore, respondents concluded, that the technique would not be useful without formal education.¹⁰

As of now, no clear evidence-based guideline or recommendation exists for training skills in neuraxial access \pm ultrasound, and no national or international evidence-based consensus on education strategies have been reached. Likewise, guidelines for the assessment of competencies have yet to be applied.

Esteemed societies such as the American Society of Anesthesiologists (ASA) and the British Pain Society provide comprehensive best practice guidelines on performing manual guided neuraxial access.^{11,12} However, they refrain from providing recommendations regarding the required training and skill acquisition necessary to perform the procedures. The Danish Society of Anaesthesiology and Intensive Care Medicine not only presents a best practice guideline¹³ but also provides descriptions of how to attain neuraxial access skills, incorporating fixed benchmarks through log-books.¹⁴ Despite this suggested approach for physicians to acquire skills and undergo assessment, it lacks support from evidence-based materials.

1.2 | Objectives

In this scoping review, we aim to provide an overview of published learning and assessment studies in neuraxial access \pm ultrasound, for future educational recommendations.

2 | RESEARCH QUESTION

- How are skills in neuraxial access \pm ultrasound trained and assessed?

3 | METHODS

This protocol has been designed following relevant guidelines, being Reporting Items for Systematic Review and Meta-Analysis Protocol (PRISMA-P), together with PRISMA Extension for Scoping Reviews.^{15,16} No registration on the International Prospective Register of Systematic Reviews is planned, given the scoping review design, but the protocol will be published in an international peer-reviewed journal.

4 | ELIGIBILITY CRITERIA

4.1 | Study design

All study designs are available for inclusion, including both quantitative, qualitative designs, and letters to the editor. Randomised clinical trials will be prioritised. Case reports, author responses, and comments will be excluded.

All languages will be eligible, due to the web-based possibilities to translate. No limitations on publication time will be set.

4.2 | Population

The population in the included literature will be physicians, medical students, and nurses. Studies also including other population groups can be included given the data of physicians or medical students can be extracted.

4.3 | Intervention

- Education, training, or assessment in procedural neuraxial access skills \pm ultrasound.

4.4 | Comparator

None obligate, but preferred comparators could be:

- No structured education, training, or assessment in the procedure.

4.5 | Outcomes

Any kind of measure, with outcomes assessable using the Kirkpatrick four levels of training evaluation, being: reaction (learners' reactions

and satisfaction with the training programme), learning (competence affected in the educational setting), impact (competence affected in the clinical setting, measuring transfer of skills), or results (clinical outcomes affected).

5 | INFORMATION SOURCES

The search will be performed on Cochrane Library, MEDLINE (Ovid), Scopus, PubMed, CINAHL (Ebsco), and EMBASE (Ovid). The reference lists of included literature will be scanned, to find further relevant literature to the review.

6 | SEARCH

A research librarian will guide the literature search. Reference lists of included literature will be scanned, to include any missing relevant literature.

6.1 | Data management

Following the literature search, every identified study will be uploaded in EndNote20[®] (Alfasoft AB, Gothenburg, Sweden) software for duplicate removal. Subsequently, studies will be uploaded in Covidence[®] (Veritas Health Innovation, Melbourne, Australia) software to secure complete duplicate removal.

7 | DATA COLLECTION AND ANALYSIS

7.1 | Selection of studies

After removing duplicates, two authors (MSN and FVI) will independently go through titles and abstracts presented by the search and assess the eligibility according to the inclusion criteria. Relevant manuscripts will be thoroughly reviewed in full text for inclusion. Should any discrepancies occur regarding inclusion or not, a third author (ACB) will assist in resolving them.

The selection process will be presented in a PRISMA flow diagram.

7.2 | Data extraction

Relevant data will be independently extracted from text, tables, or graphs by two authors (MSN and FVI). Likewise, predefined data will be collected, including characteristics of the given study, baseline characteristics of the population, setting, outcome measures, learning- and assessment methods, and other outcomes of interest.

7.3 | Quality of evidence assessment

The quality of educational studies will be assessed using the Medical Education Research Study Quality Instrument.¹⁷ A final score will be assigned, according to study design, number of institutions studied, response rate, type of data (self-assessment or objective measurements), validity of evaluation instruments, data analysis, and outcomes.

7.4 | Synthesis of results

Data will be presented in a tabular format. The format will mirror the aim of the scoping review. The outcomes and effects of various studies will be presented.

8 | ETHICAL CONSIDERATIONS

All data will be based on already published evidence, given the scoping review methodology. As reviews are exempt from requiring approval from an ethics committee, no application will be sent.

9 | DISCUSSION

This scoping review will contribute by presenting gathered evidence of an overview of the different approaches to achieving education and training of technical skills in neuraxial access, and how skills are tested, which could guide research and future recommendations for skills development and assessment.

AUTHOR CONTRIBUTIONS

MSN, ACB, LK, ABN and AMG conceived the study. MSN and ACB drafted the manuscript. FVI, ABN, AMG, and LK all provided revisions to the manuscript. All authors read and approved the final version of the manuscript.

CONFLICT OF INTEREST STATEMENT

We wish to confirm that there are no known conflicts of interest associated with this paper and there has been no financial support for this work that could have influenced its outcome.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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