

Extended Reality for Neuraxial Procedures: A Scoping Review

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49th Annual Regional
Anesthesiology and Acute
Pain Medicine Meeting

March 21-23, 2024 | San Diego, CA

ASRA PAIN
MEDICINE



| Introduction

Extended reality technology, encompassing augmented reality, mixed reality, and virtual reality, has the potential to enhance the teaching and performance of neuraxial procedures. The diverse applications of extended reality include immersive simulations and novel modes of procedural navigation.

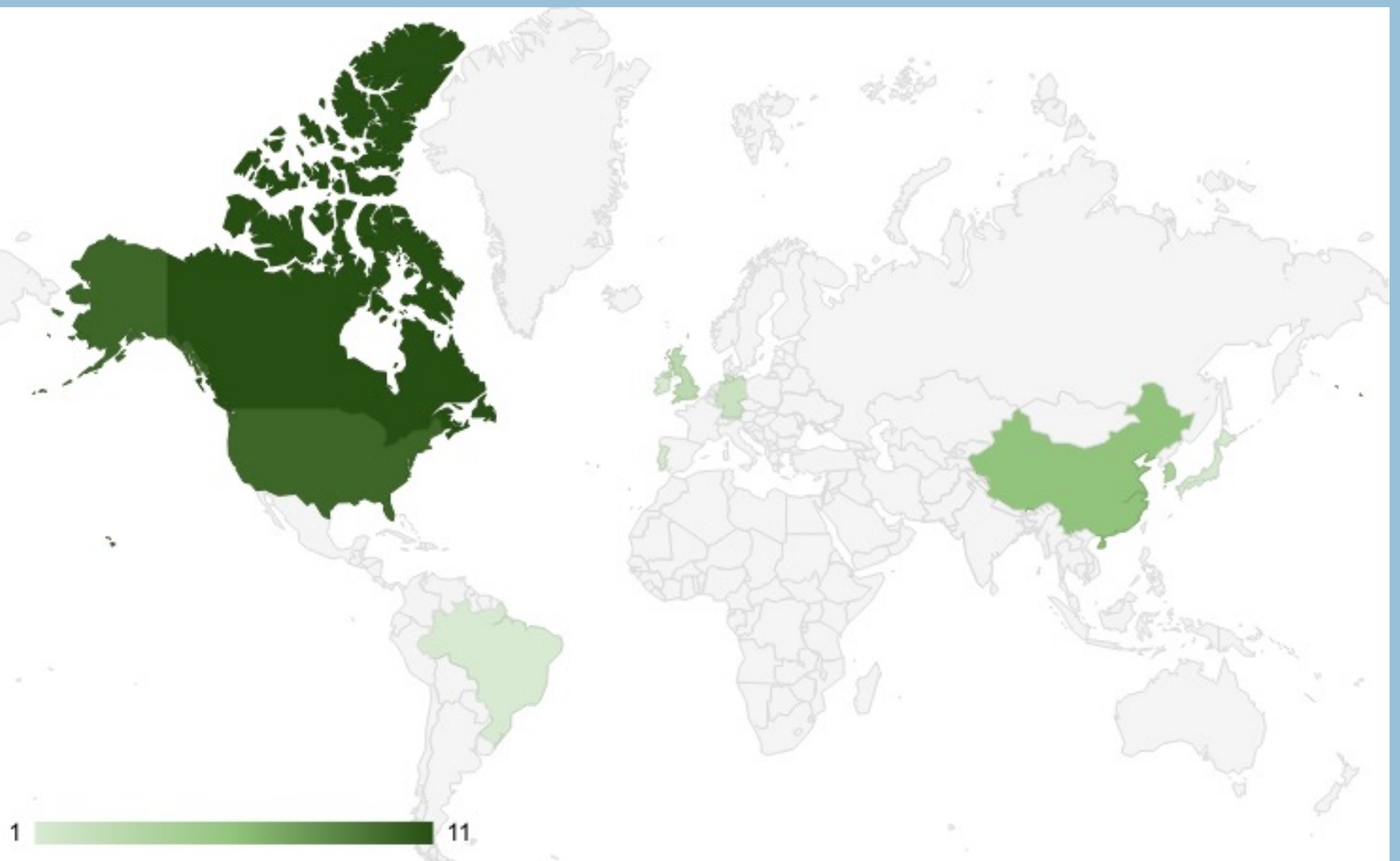
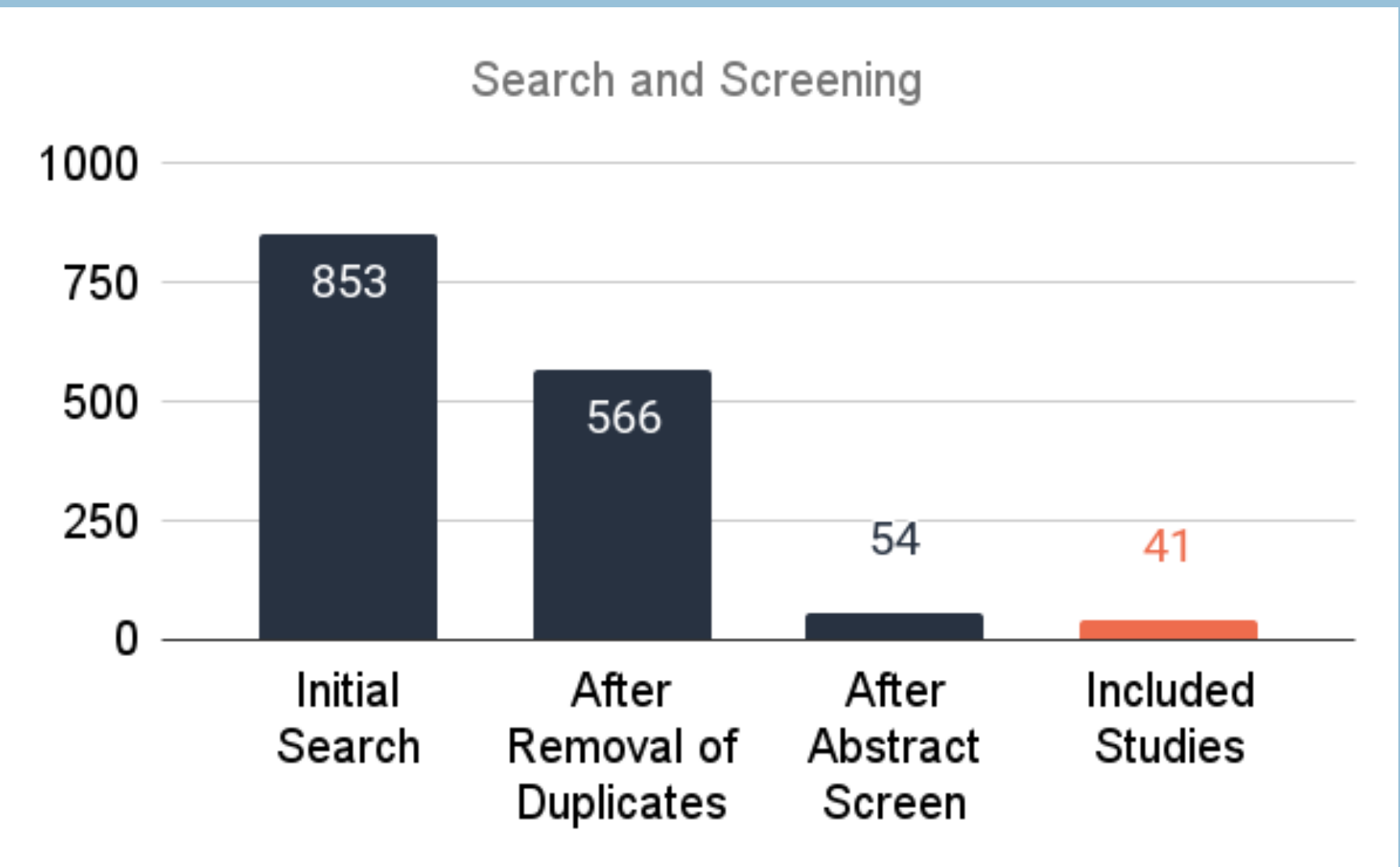
| Methods

After pre-registration [1], a scoping review was performed to provide insight into the clinical and educational applications of XR for neuraxial procedures. A search for the following keyword was performed across five databases :

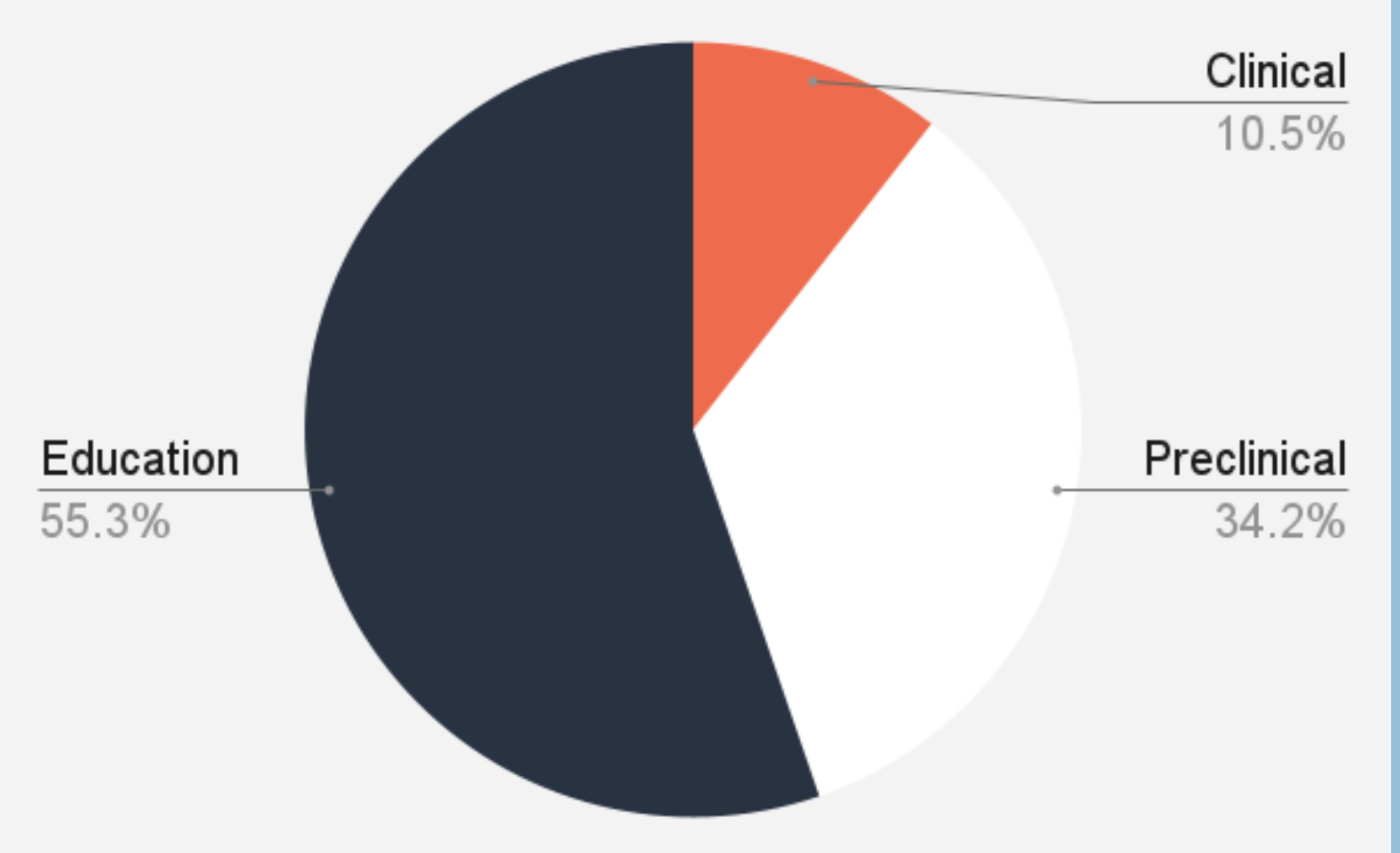
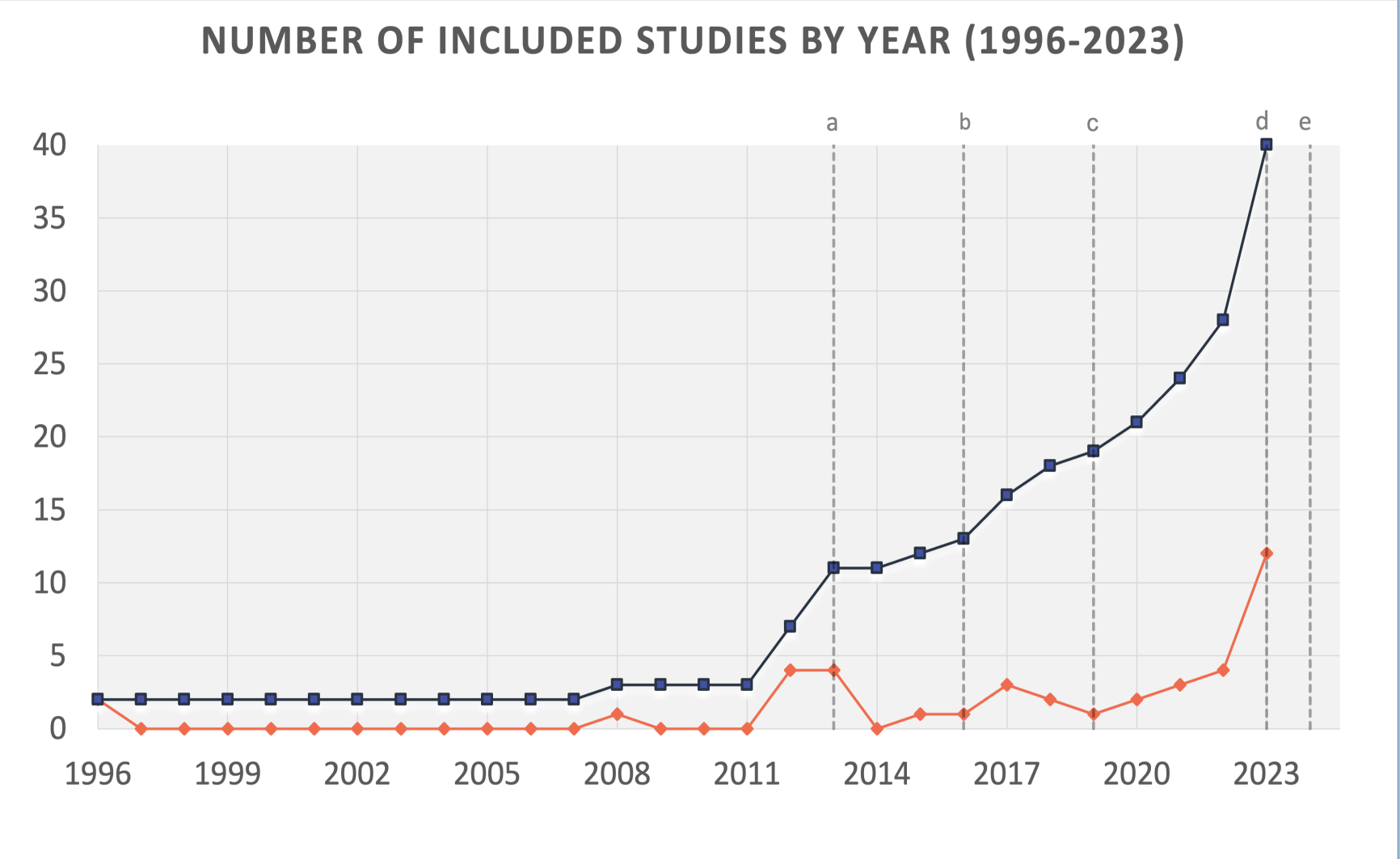
((augmented OR extended OR mixed OR virtual)
AND reality)
AND
(epidural OR peridural OR intrathecal OR
spinal OR neuraxial)
AND
(anesthesia or pain)



| Key Findings



- Authors from Canada, the United States, China, and South Korea have contributed significantly to the published studies, reflecting global interest in XR.



- Nearly half of the included records were published after 2020, reflecting accelerating research as commercial XR devices become more accessible.
- Patient-facing use of XR in neuraxial procedures remains uncommon, with only four published studies (one RCT [2]) describing its use for direct patient care.

| Discussion

While the published studies demonstrate significant progress, cost remains a substantial barrier to widespread adoption in education, and the challenge of achieving accurate image registration hinders routine clinical use. Addressing these limitations and developing a low-cost, reliable XR neuraxial navigation system will be a crucial step in advancing clinical care and education in this field.

| Reference and Disclosures

- Cho J, Thaker D. Extended Reality for Neuraxial Anesthesia and Pain Procedures: A Scoping Review Protocol. doi:10.17605/OSF.IO/5U7ZS.
- Wiegelmann J, Choi S, McHardy PG, Matava C, Singer O, Kaustov L, Alam F. Randomized control trial of a holographic needle guidance technique for thoracic epidural placement. Reg Anesth Pain Med. 2024 Jan 11:rapm-2023-104703. doi: 10.1136/rapm-2023-104703. Epub ahead of print. PMID: 38212048.

This work is unfunded. Neither author has any financial conflicts of interest.

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