BJA British Journal of Anaesthesia

Volume 130, Number 5, May 2023

British Journal of Anaesthesia, 130 (5): 497–502 (2023)
doi: 10.1016/j.bja.2023.01.012
Advance Access Publication Date: 10 February 2023

EDITORIALS

Erector spinae plane block: the ultimate 'plan A' block?

Amit Pawa[1,2], Christopher King[1], Christopher Thang[3,4,5] and Leigh White[3,4,*]

[1]Department of Theatres, Anaesthesia and Perioperative Medicine, Guy's and St Thomas' NHS Foundation Trust, London, UK, [2]Faculty of Life Sciences and Medicine, King's College London, London, UK, [3]Department of Anaesthesia and Perioperative Medicine, Sunshine Coast University Hospital, Sunshine Coast, Australia, [4]School of Medicine & Dentistry, Griffith University, Brisbane, QLD, Australia and [5]Faculty of Medicine, University of Queensland, Brisbane, QLD, Australia

*Corresponding author. E-mail: leigh.white2@health.qld.gov.au

Summary

The erector spinae plane block (ESPB) is one of seven 'Plan A' blocks proposed by Regional Anaesthesia UK, covering the key areas of commonly encountered surgeries and acute pain. Unlike the other six blocks, the ESPB can be performed at all levels of the spine and provides analgesia to most regions of the body, leading to the argument that the ESPB is the ultimate Plan A block. Current studies show a high level of evidence supporting use in thoracoabdominal surgery but a lack of benefit in upper and lower limb surgery compared with local infiltration and other Plan A blocks. Thus, there is insufficient evidence to support the claim that the erector spinae plane block is the ultimate Plan A block.

Keywords: acute pain; erector spinae plane block; nerve block; Plan A blocks; publication bias; regional anaesthesia

The erector spinae plane block (ESPB) was first described by Forero and colleagues[1] in 2016 for two patients with rib-related neuropathic pain. The ESPB involves injection of local anaesthetic in the erector spinae fascial plane, superficial to the tip of the transverse process of the vertebra and deep to the erector spinae muscle (Fig 1). The ESPB has been unparalleled in its popularity and number of publications in regional anaesthesia literature. One of the greatest measures of success of the ESPB is its inclusion as one of the seven 'Plan A' blocks. The ESPB was included for its coverage of the thoracic region. The other Plan A blocks and their indications include the interscalene block for shoulder surgery, the axillary block for upper limb surgery below the shoulder, the rectus sheath block for midline abdominal surgery, the femoral nerve block for thigh surgery, the adductor canal block for ambulatory knee surgery, and the sciatic nerve block for surgery below the knee. Unlike the other six blocks that are limited to specific anatomical locations, the ESPB can be performed at all levels of the spine and provide analgesia to most regions of the body, making the argument that the ESPB is perhaps the ultimate Plan A block.

The Plan A block concept was an expert opinion piece first proposed by Turbitt and colleagues[2] in 2020 and has subsequently been endorsed by the Regional Anaesthesia UK, designating seven regional blocks covering the anatomical locations commonly encountered in surgery and acute pain. The aim was to promote competence in a small number of nerve blocks that would integrate regional anaesthesia as a core component of perioperative care and extend its reach to the

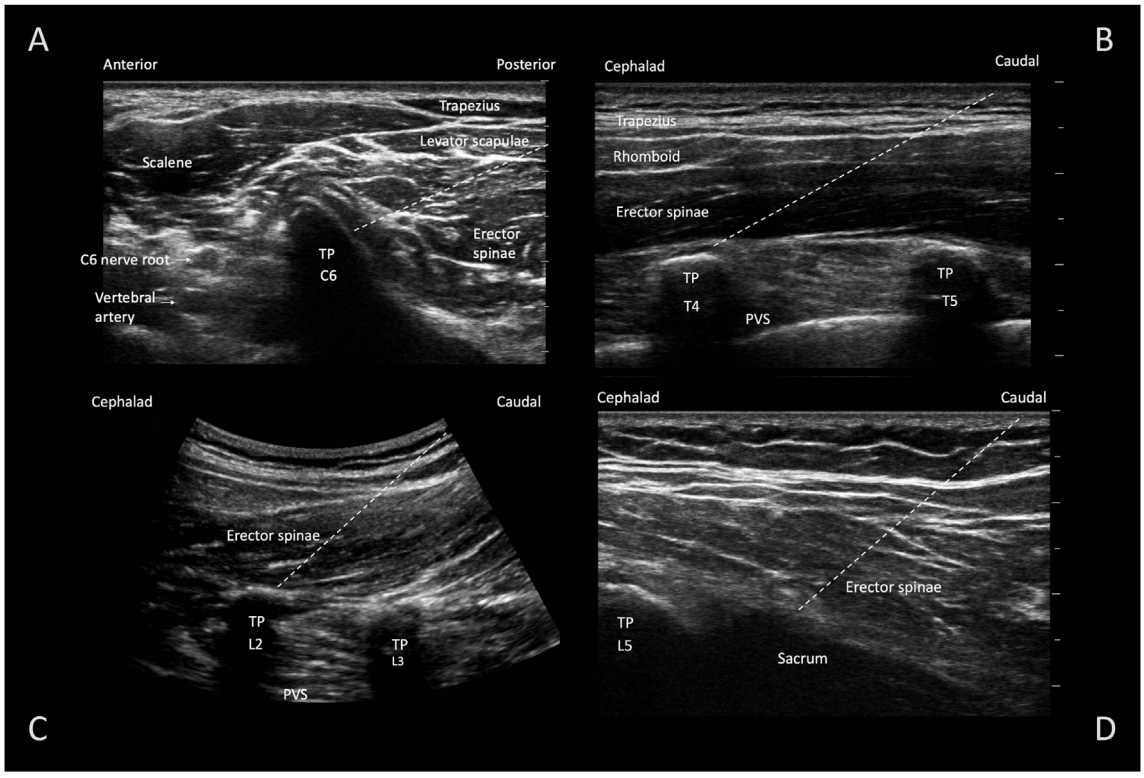

Fig 1. Ultrasound anatomy of the erector spinae plane shown for spinal levels a C6, b T4, c L2, and d sacrum. PVS, paravertebral space; TP, transverse process.

greatest number of anaesthetists and thereby patients. The updated UK Royal College of Anaesthetists curriculum lists regional anaesthesia as one of its 14 mandatory domains of training, requiring staff to be able to deliver independently 'a range of safe and effective regional anaesthetic techniques to cover the upper and lower limbs, chest, and abdominal wall'.[3] The goal of the Plan A block is to strike a balance between the range of blocks expected of the 'non-regional' anaesthetist and the issues regarding skill acquisition and fade. The ESPB was a logical choice as the Plan A block for chest wall analgesia given its comparably low-risk safety profile and the simplicity of the block.

Although the ESPB has been defined as a 'fascial plane block', the exact mechanism of action remains unclear, and its clinical effect is unpredictable. This differs from other Plan A blocks of the upper and lower limbs, which have known mechanisms through direct infiltration around defined target nerves and a highly predictable clinical effect. Hypothesised explanatory mechanisms for how anaesthetic might spread have been derived from cadaveric and imaging models, which demonstrated reliable coverage of the dorsal rami. Extension towards the ventral rami and paravertebral space is seen frequently; however, this is non-reproducible, and epidural, intercostal, and contralateral spread is least consistent.[4,5] Micro-CT imaging has demonstrated slits allowing communication between the retro-superior costotransverse ligament space and the thoracic paravertebral, intervertebral, costotransverse, and erector spinae spaces.[6]

Whilst the exact mechanism(s) of the ESPB remain elusive, what is clear is its clinical efficacy. Analgesic coverage from the back to the axillary midline is reliably produced, with frequent extension to the anterior chest wall in many, although not all, patients.[7,8] However, differential blockade of smaller A-delta and C-fibres over larger A-beta fibres could render cutaneous sensory testing in these studies less reliable. Complete block failure rates are low at <8% in studies looking at catheter ESPB performed by both experienced and non-experienced anaesthetists[9] and single expert injection.[10]

Inconsistency in injectate spread can partially explain the incidences of variable patchy sensory block. Unpredictable spread beyond the intended site can also result in unexpected adverse clinical effects, including motor block,[11–14] obtundation of muscle reflex arcs,[15] and precipitous hypotension.[13] There is also uncertainty regarding the impact of specific patient characteristics, such as morbid obesity, age, gender, and muscle mass, on the distribution of ESPB injectate.

The ESPB has been shown in several meta-analyses of varying quality, across multiple surgery types, to reduce postoperative opioid consumption and pain scores for up to 24 h compared with placebo or regular systemic analgesia.[16–18] In patients with rib fractures, performing an ESPB within 48 h of admission decreases respiratory complications and intensive care length of stay.[19]

The ESPB is considered a 'superficial block' in the latest joint guideline from the European Society of Anaesthesiology and Intensive Care and the European Society of Regional

Anaesthesia and Pain Therapy for regional anaesthesia in patients on antithrombotic drugs. As such, any haemorrhage ought to be compressible, and therefore, antithrombotic drug therapy can be continued.[20] This is in contrast to the deeper paravertebral or epidural blocks, where block-induced bleeding can be catastrophic. This position on superficial fascial plane blocks is similarly supported by the American Society of Regional Anesthesia and Pain Medicine[21] and the Canadian Anesthesiologists' Society, classifying them as 'low risk' for bleeding complications.[22] In a systematic review of ESPB in adult breast surgery, there was a 2.6% incidence of pneumothorax in patients who received paravertebral block, with none in the ESPB group.[18] Another systematic review of RCTs in patients receiving a thoracic ESPB (n=1904) identified no cases of pneumothorax, motor block, or local anaesthetic systemic toxicity.[23] Plasma concentrations of levobupivacaine have been shown to be at least two times below the toxic level when given as a single-injection ESPB at 2 mg kg^{-1},[24] and up to 20 times below using bupivacaine 2 mg kg^{-1} with epinephrine 5 μg kg^{-1}.[25] ESPB also offers an alternative for patients in whom hypotension from neuraxial block might be problematic, such as an older patient with trauma and rib fractures.

Perhaps the greatest strength of the ESPB is its simplicity. The sonoanatomy is easily appreciated with few structures to learn and identify, particularly in comparison with some other Plan A blocks. As such, the skill should be easily acquired. As a fascial plane block, catheter insertion is also more straightforward, as tip placement is more forgiving. This provides an opportunity for skill development that clinicians can then extend to catheter blocks at other more challenging sites. In a study of patients undergoing radical mastectomy, trainees were able to perform successful ESPB in less than half the time of a paravertebral block.[26] In a survey of trainee anaesthetists, of the seven Plan A blocks, ESPB was the block they felt least confident performing, with just 10% confident to do so with remote supervision.[27] One can imagine how much less confident they might feel being asked to perform deeper, more advanced thoracoabdominal blocks. Commercially available simulators are available for ESPB that will hopefully assist with future training. With more sites along the spine amenable to ESPB, its range of potential applications and clinical opportunities to perform the block is greater, facilitating skill retention.

The ESPB has a broad range of clinical applications (Table 1) and is efficacious, safe, and simple to perform. Its true mechanism(s) remain a matter of ongoing debate. Nevertheless, it has the essential properties to allow it to be performed by many non-expert regional anaesthetists and so benefit the greatest number of patients, in keeping with the aspirations of those who conceptualised the Plan A blocks.

The ESPB is an excellent analgesic option for thoracoabdominal surgery as part of a multimodal analgesic strategy. It has a favourable safety profile and is an obvious choice for inclusion as a Plan A block. Despite the unrivalled enthusiasm to extend the use of the ESPB from the cervical to sacral spine, it can be argued that there is no high-quality evidence to support it as a replacement for the upper and lower limb Plan A blocks. To establish the ESPB as the ultimate Plan A block, there would need to be conclusive evidence that the ESPB is as good as the alternative Plan A block or at least better than local infiltration by the surgeon. Additionally, the ESPB has an uncertain mechanism of action with unpredictable sensory and motor blocking profiles that further limit its suitability as the ultimate Plan A block.

Publications relating to the ESPB have seen exponential growth like no other topic in regional anaesthesia,[42] along with the rapid expansion of potential indications for its use. However, this literature explosion carries an elevated risk of positive reporting bias in relation to successful use and low complications, as the anaesthetic literature is skewed towards reporting positive study findings for interventions.[43] Although there has been a rapid rise in case reports, studies, and

Table 1 Examples of applications of the erector spinae plane block for various surgical subspecialties grouped by spinal region.

Spinal region	Surgery type	Comparator	Highest level of evidence supporting benefit over no block or as an alternative to a comparator block
Cervical	Spine[28]	No block	RCT
	Forequarter amputation[5]	None	Case report
	Shoulder[29]	Sham block	RCT
Thoracic	Breast[18]	No block, paravertebral block, and pectoralis nerve block[a]	Meta-analysis of RCTs
	Thoracic surgery[30]	No block, paravertebral block, intercostal block, and serratus anterior block	Meta-analysis of RCTs
	Laparoscopic abdominal surgery[31]	No block or TAP block	Meta-analysis of RCTs
	Open abdominal surgery[32]	Thoracic epidural	RCT
	Rib fractures[33,34]	Thoracic epidural and paravertebral	RCTs
	Cardiac[35]	Sham block	RCT
Lumbar	Lumbar spine[36]	No block or mTLIP block	Meta-analysis of RCTs
	Hip[37]	Sham block	RCT
	Pelvic[38]	None	Case report
Sacral	Anorectal surgery[39]	None	Case report
	Urogenital surgery[40]	None	Case report
	Gender reassignment surgery[41]	None	Case report

mTLIP, modified thoracolumbar interfascial plane; TAP, transversus abdominis plane.
[a] Erector spinae plane block was inferior to pectoralis nerve block in breast surgery.

enthusiasm on social networks regarding the ESPB since it was first described in 2016,[42] there are only a limited number of high-quality RCTs. A recent narrative review investigating the clinical uses for ESPB found that out of a total 23 RCTs, only seven were of high quality with the remaining 16 excluded from analysis for reasons including lack of prospective trial registration, sample size justification, blinded assessment, or discrepancies in reported sample sizes and primary outcomes.[44] This high proportion of studies with discrepancies should serve as a caution to clinicians about the possible risk of publication bias. There is a significant amount of understanding yet to be gained in relation to the mechanisms of action, optimum clinical use scenarios, and efficacy of ESPB relative to other blocks. The regional anaesthesia community will benefit from well-designed prospective trials to investigate these gaps in knowledge.

Although the use of ESPB has been reported in a broad range of applications outside of the thoracoabdominal wall region (Table 1), there is currently limited evidence evaluating ESPB in the setting of upper and lower limb surgeries. Shoulder surgery currently has the largest number of RCTs with comparisons against a sham block, periarticular local anaesthetic, and an interscalene block. Compared with a sham block and no local infiltration, ESPB resulted in significantly lower pain scores and opioid requirements.[29] However, outside the setting of localised infection, there would be few scenarios in which a patient would not receive any local anaesthetic infiltration. Therefore, the clinical relevance of this result is questionable. In comparison with periarticular infiltration, ESPB resulted in significantly higher opioid consumption and opioid-related itch.[45] Two further studies compared the ESPB with interscalene block.[46,47] In the only study powered for analgesic outcomes, interscalene block was superior in terms of pain, opioid use, and opioid-related side effects.[46]

There are no other RCTs performed in surgical locations covered by other Plan A blocks aside from the rectus sheath block. Unsurprisingly, in a clinically unrealistic scenario, the ESPB outperformed a sham block without local infiltration for hip arthroscopy.[37] Compared with periarticular infiltration for hip arthroplasty, there was no difference in any analgesic or non-analgesic outcomes.[48] Another study compared local anaesthetic infiltration with ESPB plus local infiltration and found no benefit associated with the addition of an ESPB.[49]

The varying efficacy of the ESPB at different vertebral levels has many possible causes. For example, the areas of the body innervated by the lumbar spine have more complex sensory pathways.[50] Each lumbosacral dorsal ramus splits into medial, intermediate, and lateral branches before merging with branches of other levels to form the cluneal nerves that then innervate the waist, lumbar spine, and gluteal regions.[50] This differs from the thoracic region where the dorsal rami split into lateral and medial branches, which then innervate thoracic segments. Additionally, the surface areas of the lumbar fascial planes and vertebrae are much larger, requiring double the amount of local anaesthetic to spread across one vertebral level.[50] These factors result in poorer local anaesthetic spread into the paravertebral space and less complete blockade of operative sites in the lumbar region.

One indication in which a lumbar ESPB has shown promise is simple lumbar spine surgery. Until recently, RCTs and meta-analyses have shown varying efficacy of the ESPB.[36,51,52] This is likely because of the heterogeneous nature of the patient populations, surgical interventions, concurrent multimodal analgesic strategies, and control groups. Most studies compare the ESPB with either a sham block or another type of block and various other analgesic strategies. In a recent study that was the first to compare the ESPB with wound infiltration, the ESPB resulted in significant reductions in opioid consumption and rescue analgesic requirement.[52] Unlike hip and other lower limb surgeries, simple spine surgery only requires analgesia involving a restricted number of vertebral levels. This provides an anatomical basis for performing lumbar ESPB in this situation. However, further studies are required to confirm these findings in spine surgery.

The inclusion of the ESPB as a Plan A block for thoracoabdominal surgery is not disputed. However, because of the lack of benefit associated with the use of the ESPB in upper and lower limb surgeries compared with local infiltration and other Plan A blocks, we are unable to support promotion of the ESPB as the ultimate Plan A block.

The ESPB has been rapidly adopted because of its simplicity and efficacy in thoracoabdominal analgesia, consequently being adopted as the Plan A block for analgesia of the chest wall. It has a better safety profile compared with other regional blocks, such as the paravertebral or epidural blocks, and is readily learnt by trainees with minimal experience in ultrasound-guided regional anaesthesia. As such, it succeeds as a Plan A block, as it is easily learnt by a 'non-regional' anaesthetist and with less issues regarding skill acquisition and fade. Despite this, further research will help address current limitations to the ESPB, including an unclear mechanism of action, variable sensory block, and limited robust evidence outside of the thoracoabdominal region. As the outcomes of ongoing ESPB studies become available and our understanding of the regional technique improves, it may rightfully become the ultimate Plan A block.

Authors' contributions

All authors contributed equally to all elements of the paper and should be considered first authors equally.

Declarations of interest

AP has received honoraria from GE Healthcare (Buckinghamshire, UK) and Pacira (Dublin, Ireland). The remaining authors declare that they have no conflicts of interest.

References

1. Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The erector spinae plane block: a novel analgesic technique in thoracic neuropathic pain. *Reg Anesth Pain Med* 2016; **41**: 621–7
2. Turbitt LR, Mariano ER, El-Boghdadly K. Future directions in regional anaesthesia: not just for the cognoscenti. *Anaesthesia* 2020; **75**: 293–7
3. Royal College of Anaesthetists. *Stage 3 curriculum 2021* 2021. Available from: https://rcoa.ac.uk/documents/2021-curriculum-learning-syllabus-stage-3/regional-anaesthesia. [Accessed 11 August 2022]
4. Dautzenberg KHW, Zegers MJ, Bleeker CP, et al. Unpredictable injectate spread of the erector spinae plane block in human cadavers. *Anesth Analg* 2019; **129**: e163–6
5. Chin KJ, El-Boghdadly K. Mechanisms of action of the erector spinae plane (ESP) block: a narrative review. *Can J Anesth* 2021; **68**: 387–408
6. Cho T-H, Kim SH, Jehoon O, Kwon HJ, Kim KW, Yang HM. Anatomy of the thoracic paravertebral space: 3D micro-CT

findings and their clinical implications for nerve blockade. *Reg Anesth Pain Med* 2021; **46**: 699–703
7. Byrne K, Smith C. Human volunteer study examining the sensory changes of the thorax after an erector spinae plane block. *Reg Anesth Pain Med* 2020; **45**: 761–2
8. Zhang J, He Y, Wang S, et al. The erector spinae plane block causes only cutaneous sensory loss on ipsilateral posterior thorax: a prospective observational volunteer study. *BMC Anesthesiol* 2020; **20**: 88
9. White LD, Riley B, Davis K, et al. Safety of continuous erector spinae catheters in chest trauma: a retrospective cohort study. *Anesth Analg* 2021; **133**: 1296–302
10. Selvi O, Tulgar S, Serifsoy TE, Lance R, Thomas DT, Gurkan Y. Quadrant and dermatomal analysis of sensorial block in ultrasound-guided erector spinae plane block. *Eurasian J Med* 2022; **54**: 121–6
11. Selvi O, Tulgar S. Ultrasound guided erector spinae plane block as a cause of unintended motor block. *Rev Esp Anestesiol Reanim* 2018; **65**: 589–92
12. Karaca Ö. Unexpected motor block after ultrasound-guided lumbar erector spinae plane block. *J Turk Soc Algol* 2023; **35**: 1–4
13. Kumar K, Woods M, Ludwig N, Lin C. Motor block and hypotension following a high thoracic erector spinae plane block. *J Anaesthesiol Clin Pharmacol* 2022; **38**: 678–9
14. De Cassai A, Fasolo A, Geraldini F, Munari M. Motor block following bilateral ESP block. *J Clin Anesth* 2020; **60**: 23
15. Diwan S, Nair A. Lumbar erector spinae plane block obtunding knee and ankle reflexes. *Saudi J Anaesth* 2021; **15**: 222–4
16. Cai Q, Liu GQ, Huang LS, et al. Effects of erector spinae plane block on postoperative pain and side-effects in adult patients underwent surgery: a systematic review and meta-analysis of randomized controlled trials. *Int J Surg* 2020; **80**: 107–16
17. Kendall MC, Alves L, Traill LL, De Oliveira GS. The effect of ultrasound-guided erector spinae plane block on post-surgical pain: a meta-analysis of randomized controlled trials. *BMC Anesthesiol* 2020; **20**: 99
18. Leong RW, Tan ESJ, Wong SN, Tan KH, Liu CW. Efficacy of erector spinae plane block for analgesia in breast surgery: a systematic review and meta-analysis. *Anaesthesia* 2021; **76**: 404–13
19. Mladenovic J, Erskine RN, Riley B, et al. The association between erector spinae plane block timing and reduced rib fracture related respiratory complications: a cohort study. *J Clin Anesth* 2022; **82**, 110940
20. Kietaibl S, Ferrandis R, Godier A, et al. Regional anaesthesia in patients on antithrombotic drugs: joint ESAIC/ESRA guidelines. *Eur J Anaesthesiol* 2022; **39**: 100–32
21. Horlocker TT, Vandermeuelen E, Kopp SL, Gogarten W, Leffert LR, Benzon HT. Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-based Guidelines (fourth edition). *Obstet Anesth Dig* 2019; **39**: 28–9
22. Tsui BCH, Kirkham K, Kwofie MK, et al. Practice advisory on the bleeding risks for peripheral nerve and interfascial plane blockade: evidence review and expert consensus. *Can J Anesth* 2019; **66**: 1356–84
23. Cassai AD, Geraldini F, Carere A, Sergi M, Munari M. Complications rate estimation after thoracic erector spinae plane block. *J Cardiothorac Vasc Anesth* 2021; **35**: 3142–3
24. Shigeta H, Yasumura R, Kotake Y. Comparison of plasma levobupivacaine concentrations with and without epinephrine following erector spinae plane block for breast cancer surgery: a randomized controlled trial. *BMC Anesthesiol* 2022; **22**: 86
25. Maximos S. Peak plasma concentration of total and free bupivacaine after erector spinae plane and pectointercostal fascial plane blocks. *Can J Anaesth* 2022; **69**: 1151–9
26. Moustafa MA, Alabd AS, Ahmed AMM, Deghidy EA. Erector spinae versus paravertebral plane blocks in modified radical mastectomy: randomised comparative study of the technique success rate among novice anaesthesiologists. *Indian J Anaesth* 2020; **64**: 49–54
27. Luff D, Moosa F, Sadavarte N, Pinnamaneni N, Bedforth N. 136 Which blocks can you do? An assessment of anaesthetic trainee confidence performing common peripheral nerve blocks. *Reg Anesth Pain Med* 2021; **70**: A71
28. Kanna RM, Ramachandran K, Subramanian JB, Shetty AP, Rajasekaran S. Peri-operative analgesic efficacy and safety of erector spinae plane block in posterior cervical spine surgery—a double blinded, randomized controlled study. *Spine J* 2023; **23**: 6–13
29. Ciftci B, Ekinci M, Gölboyu BE, et al. High thoracic erector spinae plane block for arthroscopic shoulder surgery: a randomized prospective double-blind study. *Pain Med* 2021; **22**: 776–83
30. Koo CH, Lee HT, Na HS, Ryu JH, Shin HJ. Efficacy of erector spinae plane block for analgesia in thoracic surgery: a systematic review and meta-analysis. *J Cardiothorac Vasc Anesth* 2022; **36**: 1387–95
31. Viderman D, Aubakirova M, Abdildin YG. Erector spinae plane block in abdominal aurgery: a meta-analysis. *Front Med (Lausanne)* 2022; **9**, 812531
32. Ragavendran S, Raghu C, Prasad SR, et al. Comparison of epidural analgesia with ultrasound-guided bilateral erector spinae plane block in aorto-femoral arterial bypass surgery. *Ann Card Anaesth* 2022; **25**: 26–33
33. Elawamy A, Morsy MR, Ahmed MAY. Comparison of thoracic erector spinae plane block with thoracic paravertebral block for pain management in patients with unilateral multiple fractured ribs. *Pain Physician* 2022; **25**: 483–90
34. Mostafa SF, Eid GM. Ultrasound guided erector spinae plane block versus thoracic epidural analgesia in traumatic flail chest, a prospective randomized trial. *J Anaesthesiol Clin Pharmacol* 2022 Oct 19: 1–8. InPress, https://journals.lww.com/joacp/Abstract/9000/Ultrasound_guided_erector_spinae_plane_block.99926.aspx
35. Athar M, Parveen S, Yadav M, et al. A randomized double-blind controlled trial to assess the efficacy of ultrasound-guided erector spinae plane block in cardiac surgery. *J Cardiothorac Vasc Anesth* 2021; **35**: 3574–80
36. Oh SK, Lim BG, Won YJ, Lee DK, Kim SS. Analgesic efficacy of erector spinae plane block in lumbar spine surgery: a systematic review and meta-analysis. *J Clin Anesth* 2022; **78**, 110647
37. Zimmerer A, Schneider MM, Sobau C, Miehlke W, Eichler F, Wawer Matos J. The erector spinae plane block in the setting of hip arthroscopy: a prospective randomized controlled clinical trial. *Arthroscopy* 2022; **38**: 65–71
38. Kilicaslan A, Aydin A, Kekec AF, Ahiskalioglu A. Sacral erector spinae plane block provides effective postoperative analgesia for pelvic and sacral fracture surgery. *J Clin Anesth* 2020; **61**, 109674
39. Kaya C, Dost B, Tulgar S. Sacral erector spinae plane block provides surgical anesthesia in ambulatory anorectal surgery: two case reports. *Cureus* 2021; **13**, e12598

40. Altinpulluk EY, Ozdilek A, Colakoglu N, et al. Bilateral postoperative ultrasound-guided erector spinae plane block in open abdominal hysterectomy: a case series and cadaveric investigation. *Rom J Anaesth Intensive Care* 2019; **26**: 83–8
41. Kukreja P, Deichmann P, Selph JP, Hebbard J, Kalagara H. Sacral erector spinae plane block for gender reassignment surgery. *Cureus* 2020; **12**, e7665
42. De Cassai A, Geraldini F, Mariano ER, Kou A, Matava C. Believe the hype? An evaluation of Twitter activity and publication trends related to the erector spinae plane block. *J Clin Anesth* 2021; **75**, 110499
43. Chong SW, Collins NF, Wu CY, Liskaser GM, Peyton PJ. The relationship between study findings and publication outcome in anesthesia research: a retrospective observational study examining publication bias. *Can J Anaesth* 2016; **63**: 682–90
44. Saadawi M, Layera S, Aliste J, Bravo D, Leurcharusmee P, Tran DQ. Erector spinae plane block: a narrative review with systematic analysis of the evidence pertaining to clinical indications and alternative truncal blocks. *J Clin Anesth* 2021; **68**, 110063
45. Shanthanna H, Czuczman M, Moisiuk P, et al. Erector spinae plane block vs. peri-articular injection for pain control after arthroscopic shoulder surgery: a randomised controlled trial. *Anaesthesia* 2022; **77**: 301–10
46. Kapukaya F, Ekinci M, Ciftci B, et al. Erector spinae plane block vs interscalene brachial plexus block for postoperative analgesia management in patients who underwent shoulder arthroscopy. *BMC Anesthesiol* 2022; **22**: 142
47. Sun LY, Basireddy S, Gerber LN, et al. Continuous interscalene versus phrenic nerve-sparing high-thoracic erector spinae plane block for total shoulder arthroplasty: a randomized controlled trial. *Can J Anaesth* 2022; **69**: 614–23
48. Chan A, Ng TKT, Tang BYH. Single-shot lumbar erector spinae plane block in total hip replacement: a randomized clinical trial. *Anesth Analg* 2022; **135**: 829–36
49. Lennon MJ, Isaac S, Currigan D, O'Leary S, Khan RJK, Fick DP. Erector spinae plane block combined with local infiltration analgesia for total hip arthroplasty: a randomized, placebo controlled, clinical trial. *J Clin Anesth* 2021; **69**, 110153
50. Tulgar S, Aydin ME, Ahiskalioglu A, De Cassai A, Gurkan Y. Anesthetic techniques: focus on lumbar erector spinae plane block. *Local Reg Anesth* 2020; **13**: 121–33
51. Avis G, Gricourt Y, Vialatte PB, et al. Analgesic efficacy of erector spinae plane blocks for lumbar spine surgery: a randomized double-blind controlled clinical trial. *Reg Anesth Pain Med* 2022; **47**: 610–6
52. Zhang Z, Zhu RL, Yue L, et al. Bilateral ultrasound-guided erector spinae plane block versus wound infiltration for postoperative analgesia in lumbar spinal fusion surgery: a randomized controlled trial. *Eur Spine J* 2022; **15**: 1–2

British Journal of Anaesthesia, 130 (5): 502–507 (2023)
doi: 10.1016/j.bja.2023.01.018
Advance Access Publication Date: 16 February 2023

Ethical considerations for theatre teams in organ donation after circulatory determination of death

Christine Lennon[1], Dan Harvey[2,3] and Peter A. Goldstein[1,4,5,*]

[1]Department of Anesthesiology, New York, NY, USA, [2]National Health Service Blood & Transplant, UK, [3]Nottingham University Hospitals NHS Trust, Nottingham, UK, [4]Department of Medicine, New York, NY, USA and [5]Feil Family Brain and Mind Research Institute, Weill Cornell Medicine, New York, NY, USA

*Corresponding author. E-mail: pag2014@med.cornell.edu

Summary

Transplant surgery is an area that gives rise to a number of ethical considerations. As medicine continues to expand the boundaries of what is technically possible, we must consider the ethical implications of our interventions, not solely on patients and society, but also on those asked to provide that care. Here, we consider physician participation in procedures required to provide patient care in the context of the ethical convictions held by the physician, with an emphasis on organ donation after circulatory determination of death. Strategies that can be used to mitigate any potential negative impact on the psychological well-being of members of the patient care team are considered.

Keywords: brain death; burnout; circulatory arrest; ethics; moral agency; organ donation; physician autonomy; well-being

Organ transplantation is a life-saving procedure. There exists a marked imbalance between the supply and demand for organs, which has necessitated development of novel strategies to increase the availability of scarce resources.[1,2] Most organ transplant procedures in the USA[3] and the EU[4] involve donation after the neurological determination of death (DNDD), which is