

Short title: Major regional anaesthesia and analgesia BP

1. Purpose of review

Major regional techniques are commonly employed for multiple purposes including postoperative analgesia, surgical anaesthesia, obstetric analgesia, and for relief of acute non-surgical pain such as following trauma. Including obstetrics, central neural blockade accounts for almost 70 per cent of all major regional blocks and although complications are relatively uncommon they may have serious consequences.¹ In the non-obstetric population, the use of continuous and single-shot peripheral nerve blocks and fascial plane blocks has significantly decreased the frequency of postoperative epidural infusions in all but major abdominal and thoracic surgery.

Since the 2014 review of ANZCA professional document *PG03 Guideline for the management of major regional analgesia* there has been increasing clinical knowledge, changes in attitudes, changes in management of anticoagulants^{2, 3}, management of local anaesthetic toxicity, and advances in technology especially with the availability of ultrasound guidance techniques. The guidelines have consequently been updated to ensure that they remain contemporaneous with regard to the management of major regional analgesic and anaesthetic techniques and their potential complications.

The Faculty of Pain Medicine has, in 2020, produced *PS11(PM) Procedures in pain medicine clinical care standard* which governs interventional pain medicine procedures for the diagnosis or treatment of chronic pain including regional analgesia provided by specialist pain medicine physicians for refractory cancer pain or palliative-care pain including epidural, intrathecal, plexus, perineural or fascial-plane catheter techniques. Where such procedures involve regional techniques within the scope of *PG03 Major regional analgesia*, the relevant technical safety principles in should also be applied.

2. Background

This professional document is intended to apply to all techniques involving central neuraxial blockade, use of catheters for intermittent administration or infusion of analgesics, and/or administration of local anaesthetic where potentially toxic doses could be inadvertently administered intravascularly or where absolute doses approach or exceed the recommended upper dose limits. This includes local anaesthetic wound catheter infusions.

Ultrasound is now widely used and is becoming the standard of care for most non-neuraxial blocks. Its availability combined with an understanding of sonoanatomy allows accurate localisation of anatomical structures and correct needle placement.

3. Process of review

The Document Development Group (members below) was formed following the process outlined in *CP24 Professional document process* and included representatives from the Regional Anaesthesia SIG (Australian and New Zealand Regional Anaesthesia (ANZRA)) and the Faculty of Pain Medicine. The DDG met virtually on two occasions in 2026 to undertake this review.

A literature review was conducted for international guidelines and relevant reviews related to the safe practice of regional techniques. Key search terms are in Appendix 1. Other references were derived from these or

from the DDG. Additional sources included a search of incidents reported to WebAIRS, and feedback received since the last review of *PG03 Major regional analgesia*.

4. Specific comments

Skin preparation. An incident in 2010 involving the inadvertent epidural administration of topical antiseptic chlorhexidine solution highlighted the ongoing need to address the potential for such.

Informed consent is guided by *PS26(A) Informed consent*. Although the vast majority of regional techniques are uncomplicated, the consequences of complications, including nerve injury, may be serious. Following neuraxial regional techniques, serious injury (death or paraplegia) is very rare and has been estimated at an incidence of 0.7 to 1.8 events per 100,000, with other complications (including epidural haematoma requiring laminectomy, or other permanent harm) from 1 in 5,800 to 1 in 12,200.¹ For peripheral nerve blocks, there is a time-related recovery from transient neurological injury, predominantly over 12 months. The incidence of permanent neurological injury is difficult to determine because of the contribution surgical and other factors, but may be approximately 1.5 to 3 per 10,000.^{4, 5} Other complications include local anaesthetic systemic toxicity (see below); infection and failed block. Accordingly, these risks should be discussed with patients where relevant although the challenges associated with the provision of informed consent in the labour ward or post anaesthesia care unit are recognised.⁵

Infection prevention. The potential for infection is a recognised risk with serious consequences especially in association with techniques including epidural and spinal analgesia. Guidance is provided in *PG28 Infection prevention and control*, which includes reference to the proper management of ultrasound transducers and equipment.

Anticoagulation. Patients receiving anticoagulation medications or the presence of coagulopathies pose increased risks of major sequelae resulting from haematoma, particularly with epidural and spinal blocks, but also from retroperitoneal haematoma associated with lumbar plexus blocks. Patients with coagulopathies or receiving anticoagulant medication require special consideration and adherence to strict protocols based on published guidelines wherever possible.^{2, 3} Where possible, provision of appropriate alerts built into the patient's Electronic Medical Record is recommended. Consideration should also be given to the duration of effect of any reversal of anticoagulation. The effect of newer anticoagulant medications may not necessarily be evident on standard coagulation tests. Drug specific assays are increasingly able to be obtained and should be considered. If a traumatic neuraxial puncture occurs, consideration may be given for delayed postoperative dosing. This should be discussed in an interdisciplinary setting. In general, for anticoagulants the consensus internationally is for the interval between anticoagulant administration and regional anaesthesia techniques to be guided by drug pharmacology, patient factors (eg renal impairment), laboratory results (where relevant), and the risk of the regional procedure.^{2, 6}

Stop before you block. In recognition of the importance of preventing a wrong site block, the guidelines include the requirement to perform a block “time out” or “pause moment”. The true incidence of wrong site block is unknown. The incidence of wrong sided blocks has been said to be at least 7.5 per 10,000 procedures⁷, however this is likely to reflect under-reporting. The incidence in Australia and New Zealand is estimated at 0.04% (seven events from a denominator of 19,268 procedures).⁸

Factors that have been shown to increase the risk of performing a block on the incorrect side include a significant time delay between patient “check-in” and performance of the block, time pressure, distraction in a busy environment, turning the patient and covering marks in an attempt to keep the patient warm. The “Stop Before You Block” campaign (SBYB) has been widely adopted in the UK and is in the public arena for education purposes and has recently had updated recommendations.⁹ It is strongly recommended that a check be performed to confirm that the block being undertaken is on the correct side. ANZCA, in conjunction with ANZRA has developed an SBYB safety resource with background paper that is available on-line.¹⁰ The use of a cognitive aid tool is recommended, such as the ANZCA SBYB resource or one based on “PrepCheck” principles.¹¹ The final check should be made, with another clinician, after patient positioning and immediately

prior to prepping the block site. It should feature a three-step process of stopping, verifying patient identity and side/site, and checking the marking already placed.

Monitoring and observation. Monitoring is essential during the initiation of a major regional block as well as during the maintenance of the block. The spread of local anaesthetic can be unpredictable (especially in the epidural and subarachnoid spaces) leading to extensive sympathetic blockade with consequent hypotension; intercostal weakness; and impaired conscious state associated with absorption of local anaesthetic, hypotension, or total spinal. Also, the proximity of vessels and nerves gives rise to the problem of local anaesthetic absorption leading to toxicity. As circulation, ventilation and conscious state changes can occur quickly, appropriate monitoring is required.

Local anaesthetic systemic toxicity (LAST). The onset of side effects and toxicity can be unpredictable and delayed, and dependent on the site and method of administration of the medication, the nature of the medication, and the volume being administered. Practitioners need to be present until such time that these risks have diminished. Handover to a responsible practitioner may proceed in accordance with *PS53(A) Position statement on the handover responsibilities of the anaesthetist*.

Specific mention of the role of lipid emulsions and adrenaline in conjunction with advanced cardiac life support is warranted.

Lipid emulsion is a recommended adjunct to standard advanced life support measures in the specific setting of suspected LAST. Lipid emulsion should be given early in the resuscitation sequence as the natural progression of LAST from central nervous system toxicity to cardiovascular collapse is rapid.¹² ANZCA supports the Association of Anaesthetists (AAGBI) LAST management guidelines as published in their Quick Reference handbook, with the exception of the dose recommendation for adrenaline in cardiac (circulatory) arrest.¹³

Adrenaline in cardiac arrest. The AAGBI, ASRA, and the European Resuscitation Council have recommended a lower dose of adrenaline in an arrest setting (less than or equal to 1mcg/kg as initial dose).¹³⁻¹⁵ However, these recommendations are based on limited animal studies¹⁶, therefore ANZCA and the Australian and New Zealand Committee on Resuscitation (ANZCOR) do not support routine use of reduced-dose adrenaline for cardiac arrest associated with LAST (ie circumstances requiring CPR) in this specific circumstance at this time. Instead, we continue to recommend the standard higher ALS dose of 1mg intravenously every two cycles of CPR, as per the International Liaison Committee on Resuscitation and the ANZCOR guidelines.^{17,18} In resuscitation of moderate to severe circulatory depression (not circulatory arrest) associated with LAST, a clinical decision to use lower initial doses of adrenaline may be appropriate.

Epidural blood patch. It is recognised that the placement of an epidural blood patch for treatment of dural CSF leakage should be undertaken with the same resources and in the same environment as that for placing an epidural catheter to ensure asepsis.

Equipment for regional techniques. Beyond the use of real-time ultrasound where indicated, it was not considered to be in the scope of this document to include specific recommendations for techniques of individual regional procedures to avoid direct trauma to blood vessels, nerves or other tissues (eg lung or pleura) during insertion.

Pressure monitoring devices. There is no recommendation for pressure monitoring of injection as there is insufficient evidence of clarity of interpretation of high injection pressures.⁴

Wrong drug errors. The implementation of NRfit connector devices is recommended to minimise the risk of injection or infusion of drugs or liquids not intended for regional anaesthesia or analgesia. It is recognised that implementation is complex and requires a carefully planned and communicated institution-wide approach. Advice for implementation can be found on the ANZCA website.¹⁹ NRfit connectors do not eliminate the need to ensure the correct medication in the correct dose is being drawn up and administered.

Inadvertent neuraxial administration of tranexamic acid. A Therapeutic Goods Administration alert has been issued for the accidental administration of tranexamic acid neuraxially, with all known cases occurring outside of Australia and New Zealand.²⁰ As of 15 June 2026, no cases of inadvertent neuraxial administration of tranexamic acid had been reported to webAIRs. Caution should be exercised given the potentially catastrophic consequences of this identified drug error.

Additives to local anaesthetics. Off-label use of adjuncts in perineural injections may be considered by the individual practitioner, in the specific context of widespread accepted practice, published efficacy data, and absence of safety concerns.²¹

Subsequent management of major regional analgesic boluses or infusions in the ward demand the elimination of the risk of incorrect catheter identification. There are numerous means available including clearly labelling the tubing, the use of NRfit connector systems, colour coding the tubing (cognisant of colour blindness issues), standardisation of different sized connections for each specific application (intravenous versus epidural), and the absence of injection ports on giving sets used for major regional blocks. Regional block anaesthetic medications should be stored away from those intended for intravenous use.

Infusion pumps have been the source of complications with particular concern about the ability to limit the maximum volume within a specified time period.

Clinical management of analgesia. Optimisation of pain relief requires assessment of pain, which is enhanced in patients from whom feedback may be obtained. In the absence of the ability to provide such feedback, for example in small children or cognitively impaired or patients who are unable to be assessed (eg anaesthetised or deeply sedated), tools are available to assist the assessment of pain control. Assessment is not only central to pain control but also to diagnose the development of a new physical problem, such as compartment syndrome.²² Similarly the presence of indwelling catheters may lead to complications including epidural abscess, epidural haematoma, and spinal cord or nerve compression. The generation of protocols for the recognition and early diagnosis should be encouraged to facilitate urgent assessment and management. Likewise, the development of protocols for catheter removal in anticoagulated patients should be promoted as noted above.

5. Community management of continuous regional analgesia infusions

Continuous peripheral nerve and other regional analgesic infusions in the community setting may provide benefit, including reduced hospital length of stay. However, these techniques may be associated with serious complications. Appropriate patient selection, education, monitoring, and access to clinical support are therefore essential.²³

Prior to discharge to the home or community setting, patients and/or their carers should receive appropriate verbal and written instructions from the proceduralist, or other responsible managing service. Explicit instructions for duration of infusion and catheter removal (including timing and technique) should be provided. Documentation should be comprehensive and include descriptions of symptoms of infusion site infection, compartment syndrome, local anaesthetic systemic toxicity and prolonged blockade.

Hospitals and institutions providing community-based regional analgesia services are encouraged to develop standardised documentation and protocols addressing criteria around patient safety, catheter follow-up and removal, and escalation pathways in the event of suspected complications or queries.

Consideration should also be given to the patient's cognitive status, language proficiency, social supports, geographical isolation, and willingness and ability to comply with instructions when determining suitability for community management.

Patients discharged with continuous regional analgesia infusions must have access to a continuously available contact for urgent advice and assistance. This may be the responsible anaesthetist or a designated regional analgesia or pain service.

Follow up recommendations include a process for auditing outcomes for ongoing assessment of safety and patient acceptability.

6. Summary

The provision of major regional analgesia services continues to increase, having afforded patients considerable benefits. Some of the risks accompanying regional analgesic techniques have been mitigated through changing technology, especially with the increased application of ultrasound guidance. However, when complications do arise they can have serious consequences. Guidelines are provided to enhance awareness of the potential problems, educate practitioners and staff involved in caring for patients receiving regional analgesia with regards to recognition and management of complications, and to encourage the establishment of the necessary protocols in hospitals.

See further below for Appendix 1 – Literature search strategy.

Related ANZCA documents

PS26(A) Position statement on informed consent for anaesthesia or sedation

PG28 Guideline on infection control in anaesthesia

PS53(A) Position statement on the handover responsibilities of the anaesthetist

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Appendix 1: Key search terms

Search Strategy (Medline):

#	Searches	Results
1	*Anesthesia, Conduction/	7334
2	*Anesthesia, Spinal/	11369
3	*Anesthesia, Epidural/	10613
4	*Analgesia, Epidural/	7678
5	*Injections, Spinal/	1183
6	*Injections, Epidural/	872
7	regional an?esth*.ti,ab.	12801
8	neuraxial.ti,ab.	4504
9	epidural an?esth*.ti,ab.	9982
10	epidural analges*.ti,ab.	9269
11	spinal* an?esth*.ti,ab.	14169
12	spinal* analges*.ti,ab.	925
13	subarachnoid block*.ti,ab.	738
14	spinal block*.ti,ab.	1130
15	perineural block*.ti,ab.	29
16	(fascial adj2 block*).ti,ab.	556
17	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16	61400
18	limit 17 to english language	50477
19	limit 18 to yr="2014 -Current"	21947
20	(Animals/ or Models, Animal/ or Disease Models, Animal/) not Humans/	5421334
21	((animal or animals or canine* or dog or dogs or feline or hamster* or lamb or lambs or mice or monkey or monkeys or mouse or murine or pig or pigs or piglet* or porcine or primate* or rabbit* or rats or rat or rodent* or sheep* or veterinar*) not (human* or patient*)).ti,ab.	3673926
22	20 or 21	6211553
23	19 not 22	21311
24	limit 23 to (guideline or practice guideline)	80

#	Searches	Results
25	from 24 keep 1, 5-6, 10-12, 22-24, 30, 33...	29
26	guideline*.ti.	110311
27	23 and 26	168
28	27 not 24	120
29	from 28 keep 1, 4-7, 19, 21, 23, 26...	35
30	ANZCA.in,ti.	28
31	"Australian & New Zealand College of Anaesthetists".in,ti.	2
32	"Australian and New Zealand College of Anaesthetists".in,ti.	81
33	"Association of Anaesthetists".in,ti.	126
34	"Regional Anaesthesia United Kingdom".in,ti.	0
35	"RA-UK".in,ti.	9
36	"European Society of Regional Anaesthesia".in,ti.	22
37	ESRA.in,ti.	9792
38	" European Society of Anaesthesiology and Intensive Care".in,ti.	119
39	"European Society of Anaesthesiology & Intensive Care".in,ti.	4
40	ESIAC.in,ti.	0
41	"American Society of Regional Anesthesia".in,ti.	88
42	ASRA.in,ti.	648
43	30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42	10880
44	23 and 43	126
45	44 not 24	105
46	45 not 28	81
47	from 46 keep 4, 7, 9, 15, 17, 19-21...	26
48	*Equipment Safety/ or *Safety/ or *Patient Safety/ or *Safety Management/	41868
49	*Medical Errors/	12639
50	safety.ti,ab.	908418
51	system issue*.ti,ab.	674

#	Searches	Results
52	complication*.ti,ab.	1346878
53	pressure monitoring equipment*.ti,ab.	11
54	pressure monitoring device*.ti,ab.	334
55	local an?esth* systemic toxicit*.ti,ab.	459
56	LAST.ti,ab.	593613
57	adrenaline dos*.ti,ab.	132
58	(wrong side* adj3 block*).ti,ab.	23
59	stop before you block.ti,ab.	10
60	prep stop block.ti,ab.	2
61	stop block.ti,ab.	4
62	wrong site block*.ti,ab.	8
63	48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62	2690980
64	23 and 63	7222
65	64 not 24	7186
66	65 not 28	7146
67	66 not 46	7117
68	limit 67 to "systematic review"	408
69	from 68 keep 2, 7, 15-17, 19-20, 22, 24-25...	62
70	55 or 56	593891
71	57 and 70	6
72	58 or 59 or 60 or 61 or 62	41
73	from 72 keep 1-2, 5-7, 9-10, 12, 14, 16-34	28
74	supervision.ti,ab.	45250
75	23 and 74	43
76	from 75 keep 1, 4, 7, 11, 17, 19...	11
77	trainee*.ti,ab.	45425
78	23 and 77	137

#	Searches	Results
79	78 not 75	128
80	from 79 keep 1, 4, 6-8, 11-12, 14, 23...	21
81	painbuster*.ti,ab.	17
82	from 81 keep 5-7, 9	4
83	catheter based.ti,ab.	5909
84	23 and 83	23
85	from 84 keep 3-4, 6-7, 10, 12, 15	7
86	handover*.ti,ab.	2739
87	83 and 86	0
88	23 and 86	5
89	from 88 keep 1, 3-5	4
90	blood patch*.ti,ab.	2007
91	23 and 90	225
92	from 91 keep 3, 5-6, 12, 16, 44, 51-52...	26
93	25 or 29 or 47 or 69 or 73 or 76 or 80 or 82 or 85 or 89 or 92	252

252 Results:

- 19 papers extracted in full text for further consideration.
- Additional references contributed from DDG and bibliographies.