



Short title: Major regional anaesthesia and analgesia

1. Purpose

These guidelines aim to facilitate the safe and effective management of major regional blocks including epidural, subarachnoid, plexus, perineural and fascial plane blocks, and to reduce the likelihood of adverse outcomes and complications which may be associated with such blocks. Complications include, but are not limited to, cardiovascular collapse, seizures, hypotension, allergic reactions, ventilatory impairment, impaired consciousness, haematoma, infection, abscess and nerve damage. These guidelines also outline practices to minimise the risk of wrong site block.

2. Scope

This document is intended to apply to 'regional techniques' which are single-shot and longer-term catheter-based local anaesthetic techniques. These include central neuraxial blocks and all other techniques where a catheter is inserted and left in situ, or where a significant dose of local anaesthetic is administered, for procedural anaesthesia, post-operative analgesia, analgesia in labour or following trauma. A significant dose of local anaesthetic is one such that systemic toxicity may occur due to absorption or inadvertent intravascular injection. It is not primarily intended to include single-injection distal peripheral nerve blocks such as facial or digital nerve blocks, or low volume local anaesthetic procedures such as small areas of skin infiltration, although many of the principles may still apply.

This document is not intended to apply to interventional pain management techniques for chronic pain diagnosis or treatment which are supported by *PS11(PM) Procedures in pain medicine clinical care standard*, however some of the principles may still apply.

3. Background

Major regional techniques may be initiated for pain management alone, such as providing analgesia in labour or following trauma, or for the provision of perioperative analgesia. This may be combined with, but is distinct from, regional anaesthesia which is initiated to enable surgical interventions to be performed and which therefore requires continual presence of an anaesthetist during the procedure, (see *PG18 Anaesthesia monitoring* and *PS53(A) Handover*) with appropriate handover to a Post Anaesthesia Care Unit (see *PS04 PACU*). In many instances, analgesia may be expected to follow on from anaesthesia as a continuation of the regional anaesthetic technique.

4. General principles for the management of major regional analgesia

- 4.1 Major regional techniques require the skill and expertise of a medical practitioner, with training and experience in the technique, or trainees under the supervision of such a practitioner. An understanding of the relevant anatomy (including sonoanatomy where relevant), physiology, pharmacology, and equipment used is necessary for the safe conduct of these procedures. Knowledge of the potential complications of the particular procedure and their management is essential, as is an understanding of the contraindications to its use. Prompt treatment of side effects or complications may be critical.

- 4.2 Complications of major regional techniques may occur due to the physiological changes resulting from nerve blocks, adverse effects from the drugs administered (local anaesthetic, opioid and adjuvant medications), infection, or physical problems associated with placement of the needle and/or catheter. Such problems include nerve injury, and trauma to adjacent structures including blood vessels and pleura.

Complications may also occur as a result of accidental injection of an incorrect drug or substance such as antiseptic solutions used to prepare the skin, or a contaminated substance such as local anaesthetic drugs contaminated by antiseptic. It is critical that systems and protocols are in place to eliminate these possibilities.

Inadvertent wrong site block may have consequences in addition to unnecessary patient discomfort: local anaesthetic toxicity, delay in care, complications of performing a second block, inability to provide optimal analgesia and the possibility of proceeding to wrong site surgery.

- 4.3 Informed consent from the patient consistent with *PS26(A) Informed consent for anaesthesia or sedation* should be obtained prior to the institution of any regional techniques. Recognising different regional techniques, different settings, and different patients have variable risk profiles, this discussion needs to be adapted for individual circumstances but should include, where relevant, risks such as nerve injury, drug toxicity, haemodynamic changes, bleeding or bruising, infection, failed or incomplete analgesia or post-dural puncture headache. It is recognised that the timing of obtaining consent in some circumstances may not be ideal (for example, pain relief in the post anaesthesia care unit (PACU) or in labour ward (see item 6.2 below)), however, it can often be facilitated by appropriate prior discussion with the patient. Documentation of such consent, consistent with *PS26(A) Informed consent*, is recommended.
- 4.4 The services of a qualified interpreter, who is not a family member, should be engaged wherever possible, when necessary to assist with consent (as per *PS26(A) Informed consent*). In addition, an interpreter may be required to assist in communication between the proceduralist and the patient during the performance of the procedure. Similar principles apply where other communication issues exist such as impaired cognition or hearing.
- 4.5 Initiation of major regional techniques require appropriate assistance. This assistance should be in accordance with *PS08 Assistant for the anaesthetist*, or in the case of a delivery suite, a suitably trained registered midwife.
- 4.6 Initiation of major regional techniques needs to be undertaken in an environment consistent with *PS55(A) Minimum facilities*.
- 4.7 Infection control measures to be followed, including the use of a sterile field, facemask, gloves and gowns where appropriate, are stated in *PG28 Infection prevention and control*. It is essential that skin preparation is conducted in such a manner that agents used for skin preparation are unable to contaminate drugs or equipment used for neural blockade (see *PG28BP Infection prevention and control – Background Paper (Section 5.9.2)*).
- 4.8 Clinical assessment of the patient's risk of coagulation abnormalities, antiplatelet and anticoagulant medications is required in all circumstances as many regional analgesic techniques may have serious complications in the presence of a increased bleeding risk, eg. epidural hematoma following neuraxial techniques, and retroperitoneal haematoma from lumbar plexus blocks. Laboratory investigations should be undertaken where indicated, however it should be noted that potent antiplatelet medications, direct thrombin inhibitors and anti-factor Xa drugs are of particular concern because their effects are not readily reversible nor always evident on standard coagulation tests. Drug specific assays are increasingly available and should be considered.^{1, 2}

- 4.9 If blood is seen in the needle or in the catheter, this may represent vessel puncture. Consideration should be given to the possibility of increasing the time interval to the next dose of anticoagulation. This should be done in an interdisciplinary setting where the risk of thrombosis and the pharmacological activity of the anticoagulant are amongst the factors discussed.
- 4.10 Intravenous access should be obtained prior to commencement of major regional techniques and in most circumstances maintained for the duration of administration of medication for ongoing analgesia.
- 4.11 In addition to monitoring for any specific patient needs, monitoring during establishment of major regional techniques should include frequent and regular blood pressure measurement, respiratory rate, and conscious state evaluation. An electrocardiograph and pulse oximeter should be available. Oxygen should be administered along with appropriate monitoring in the presence of sedation (*PG09 Procedural sedation, PG18 Monitoring*). This level of monitoring should be continued for at least 30 minutes following the block or until the patient's vital signs are stable. Subsequent monitoring depends on the regional technique and drugs used and the clinical circumstances. Institutional protocols must be applied. In general, this should include regular assessment of heart rate, blood pressure, sedation, pain, and motor block as indicated by the clinical circumstances.
- 4.12 Prior to performing a regional block, a "Stop Before You Block" step must be performed³. This is in addition to the earlier 'check in' moment from the surgical safety checklist. The 'Stop Before You Block' step requires verification of the site and side of the proposed block with another clinician (nurse/anaesthesia technician or medical practitioner) prior to performing the block. This verification should be done after the patient has been positioned and immediately before the skin is prepped. It requires identification of the patient and check of the surgical consent form, identification of a surgical site mark, and discussion with the patient (when possible). There should be a pause before each new block site if patient position is changed or the blocks are separated in time. Cognitive aids such as posters should be utilised.^{3, 4}
- 4.13 After initiating the regional block, it is the responsibility of the proceduralist to remain immediately available until a satisfactory block has been achieved, the patient is stable, and the potential for immediate complications has passed. If the technique has been instituted for procedural anaesthesia as well as subsequent analgesia, appropriate monitoring must be continued, and the anaesthetist must be present for the duration of that surgical procedure (as per *PG18 Anaesthesia monitoring*) or until handover (temporary or permanent) to another practitioner in accordance with *PS53(A) Handover* has occurred.
- 4.14 Major regional techniques remain the responsibility of the initiating proceduralist who may delegate subsequent management of the patient to another medical practitioner, health practitioner, registered nurse, acute pain service team, or registered midwife, provided that these personnel have received the required training, ongoing education and reaccreditation. Institutions offering major regional analgesia services should provide competency-based teaching, and accreditation or reaccreditation programs for staff involved in management of patients undergoing continuous epidural analgesia. The proceduralist must ensure that the environment for ongoing care of the patient complies with college guidelines.
- 4.15 A record of the technique, including method (eg needle localising technique), drugs and dose used, complications or problems encountered should be documented in the patient's medical record by the proceduralist. In addition, instructions for the subsequent management of the patient should be provided. This should be in accordance with *PG06 Anaesthesia record*. These include drug orders and monitoring requirements. Prescription of all analgesic drugs, unless appropriately delegated, is the responsibility of the proceduralist.

- 4.16 Written protocols and procedures should be in place for the continued management of each technique, its side effects and common complications. Formal institutional protocols and guidelines for each technique are recommended.

5. Specific principles for the continued management of major regional analgesia in hospital wards

In addition to the general principles listed above, the safe and effective management of major regional analgesia, using repeated intermittent bolus doses or continuous infusions of analgesic drugs via a catheter, requires the following:

- 5.1 Catheters or giving sets used for continuous maintenance of analgesia should be clearly labelled so as to be unambiguously identifiable, minimising the risk of mistaken connection or drug administration errors. Tubing colour should be specific for regional analgesic infusions wherever possible. Regional block anaesthetic medications should be stored away from those intended for intravenous use.
- 5.2 Where feasible, to minimise the risk of an incorrect drug or infusion being administered by a regional technique, NRFit (ISO 80369-6) connectors should be utilised, if facilitated by local institutional policies.⁵ NRFit connectors do not eliminate the need to ensure the correct medication in the correct dose is being drawn up and administered.
- 5.3 When infusion pumps are utilised, they should be dedicated to use for regional analgesia infusions only and clearly marked as such. In order to minimise the risk of inadvertent delivery of excessive amounts of analgesic drug the maximum rate of infusion, and the maximum size of bolus dose that can be delivered by the pump should be limited according to the specific dosage limits for each technique. An infusion pump designed for regional analgesic infusions, in particular with a maximum infusion rate limit, should be used wherever possible.
- 5.4 Tailoring of analgesic regimens to the individual patient requires that regular assessments of adequacy and adverse effects of analgesic drugs or techniques are performed and documented.
 - 5.4.1 Monitoring and recording may include a selection from the following parameters: blood pressure, heart rate, temperature, respiratory rate, pain scores, sedation score, oxygen saturation, sensory levels and motor function.
 - 5.4.2 Optimal assessment and control requires patient feedback, use of self-reported measures, frequent assessment of pain intensity and the effect of interventions. Tools are also available to help assess pain in unconscious or sedated patients, cognitively impaired or young children. Where feasible, pain is best evaluated when assessed both at rest and during activity. This should be in keeping with *PS41 Acute pain*. Pain severity before (where relevant) and then after the regional procedure should also be documented. Unexpected levels of pain, or pain that suddenly increases, may signal the development of a new physical problem such as compartment syndrome, for example. In the case of epidural or intrathecal analgesia, back pain or nerve root pain may signify the presence of an epidural abscess or haematoma (see also item 5.4.4).
 - 5.4.3 Protocols for the recognition and treatment of adverse effects, whether pharmacological or physiological, resulting from the use of analgesic drugs including local anaesthetic, opioid, or adjuvant medication, should be available.
 - 5.4.4 Protocols for the recognition and management of complications resulting from dural puncture and the use of indwelling catheters should be available. In the case of epidural or intrathecal analgesia, these complications may include post dural puncture headache

(PDPH), epidural abscess, epidural haematoma and spinal cord or nerve root compression. Any unexpected neurological deficit should be investigated promptly because in the latter cases, urgent management is essential for optimal outcomes. Should imaging be required, magnetic resonance imaging is preferable to a computed tomography scan. It should be remembered that epidural abscess may present some days after the procedure. In continuous peripheral nerve block techniques, suspected leaking or infected catheters should be removed and cultured.

- 5.4.5 If an epidural blood patch is to be undertaken for PDPH, then the procedure environment and aseptic precautions should be as described for epidural catheter insertion (see *PG28 Infection prevention and control*).
- 5.4.6 The presence of epidural catheter insertion site infection and systemic pyrexia indicate a need for heightened consideration of the possibility of epidural space infection.
- 5.5 The proceduralist or delegate, whether a suitably trained health practitioner or an acute pain service representative, should review patients on a daily basis and more often if clinically indicated. Such a review may include an assessment of neurological function, and inspection of the catheter insertion site for signs of inflammation/infection. It should also include a review of the patient's medications, especially with regard to anticoagulants. The proceduralist, or delegate, should remain available for consultation or management of complications at all times.
- 5.6 Termination of an ongoing regional analgesic infusion, should involve communication with the patient, an agreed plan for transition to non-regional analgesic pain management strategies, and follow-up assessment as indicated.
- 5.7 A protocol for catheter removal that relates the timing of removal to the timing of administration of anticoagulant medication, or in the presence of a coagulopathy, should be available (see below for management of an infusion catheter following discharge from hospital). A registered nurse, midwife, or other staff member, with the necessary training, may remove the catheter on the orders of the proceduralist or delegate. Details of the removal of the catheter, the date, time, and state of the catheter and its tip, as well as the state of the insertion site, should be documented in the patient's record. For catheters being removed after discharge, see *section 7.2.2*.
- 5.8 Surgical and/or other medical staff caring for the patient should be aware of the analgesic technique used, its potential complications and any specific implications for the surgery performed or other management issues for the patient. The need for appropriate consultation with specialised pain management staff should be communicated to other medical staff.
- 5.9 Adequate ongoing analgesia should be planned and prescribed for patients and consideration should be given to ensuring that pharmacological interactions are avoided such as systemic opioids given shortly after subarachnoid morphine causing late respiratory depression.

6. Specific principles for regional anaesthesia and analgesia in obstetrics

In addition to the principles listed above, safe regional techniques in labour and for Caesarean section require adherence to the following principles:

- 6.1 Epidural and subarachnoid anaesthesia and analgesia have the potential to change many of the normal physiological processes of labour and delivery. From the time that regional analgesia is instituted, it is essential that the woman is under the care of a medical practitioner with obstetric training who can assess her as necessary and rapidly effect delivery of the baby by whatever technique is indicated.

- 6.2 The proceduralist establishing regional analgesia is required to establish that the parturient has consented to the procedure. The extent and duration of the consent is individualised depending on the distress that the person is experiencing. Whenever possible consent should include being informed about advantages, disadvantages including possible complications, and alternatives. Ideally information about pain relief options for labour, including regional analgesia should be part of antenatal education for the woman.
- 6.3 The services of a qualified interpreter, who is not a family member, should be engaged wherever possible, when necessary to assist with consent (as per *PS26(A) Informed consent*). In addition, an interpreter may be required to assist in communication between the proceduralist and the patient during the performance of the procedure, assessment of the procedure, and any subsequent management issues related to the regional analgesia
- 6.4 Skilled staff and monitoring equipment are required throughout regional analgesia in labour and delivery, including instrumental delivery, to ensure care for both woman and fetus, and for management of any complications arising.
- 6.5 For regional analgesia that is extended to operative anaesthesia (for operative delivery or caesarean section) follow PS08 and PG18 for staffing and monitoring the in operating room
- 6.6 Following delivery of the baby, the parturient should continue to be monitored until all effects of the block have subsided. Follow up the day after a neuraxial procedure is recommended. Protocols should be in place for follow-up post regional techniques.

7. Specific principles for regional anaesthesia and analgesia in paediatrics

In addition to the principles listed elsewhere in this document, safe regional techniques in paediatric patients should follow the principles outlined below:

- 7.1 Age-appropriate consent should be obtained. Older children should be involved in the decision-making process (see also *PS26 Informed consent*).
- 7.2 Regional anaesthesia in children must be supported by appropriate institutional protocols, with systems, environment, equipment and staffing being age and procedure appropriate (see also *PG29 Anaesthesia in children*).
- 7.3 Strategies to ensure correct sided block must take into account that children are often unable to participate in verification processes. This includes ensuring that the surgical site is marked by the surgeons pre-operatively in agreement with a carer.
- 7.4 Before performing a block, the maximum intended local anaesthetic dose should be calculated recognising that local anaesthetic dosing is weight-based and there is a narrower margin for error in children. Infants under the age of 6 months have a higher risk of local anaesthetic systemic toxicity than older children.⁶
- 7.5 Note that motor blockade may have greater practical implications in children who may be unable to understand the significance of a weak or numb limb/s. This can result in accidental injury from falls, pressure or heat. This is of particular relevance in ambulatory surgery.

8. Post-discharge management

- 8.1 Patients who are discharged home from hospital with persistence of the effects of regional techniques should be given advice on the safe management of an insensate area, expectations for recovery, and contact details for advice if needed.

- 8.2 Patients who are discharged with ongoing regional perineural or fascial plane analgesic infusions (eg high-pressure flow-restricted ambulatory infusion pumps) should be:
 - 8.2.1 provided with sufficient information that they are informed and consent to the analgesic infusion plan including duration of infusion and warning symptoms of serious complications, such as LAST, infection, or compartment syndrome (if relevant).
 - 8.2.2 given detailed instructions and resources to cease the infusion and safely remove the catheter (this may require attendance at a medical practice or a home visit by a nurse)
 - 8.2.3 given detailed instructions for the process of responding to unplanned health care needs related to the infusion or its removal should be provided. A continuous form of contact for escalation should be provided.
 - 8.2.4 considered for review during or within 24h following cessation of the infusion and removal of the catheter, to ensure a safe outcome including block resolution.
 - 8.2.5 Noting that post-discharge infusions require a specialised combination of clinical knowledge and procedural skill, and involve ongoing management outside the supervised nature of a hospital setting, practitioners new to home regional anaesthetic infusions should prospectively audit their clinical outcomes to ensure that acceptable standards of proficiency and safety are being met.

9. Equipment and staffing

- 9.1 It is recommended that equipment to assist nerve and needle location, including by ultrasound where indicated, be available if appropriate, for example, ultrasound and/or peripheral nerve stimulator, consistent with *PS55(A) Minimum facilities*.
- 9.2 Protocols and resources for the management of local anaesthetic systemic toxicity (LAST) must be immediately available wherever there is a risk of toxicity from a bolus dose or infusion. This includes the availability of lipid emulsion, which may be effective in resuscitation of circulatory collapse due to local anaesthetic toxicity, used in conjunction with advanced cardiac life support. For the management of cardiac arrest associated with suspected LAST in adult patients, in addition to the use of lipid emulsion, ANZCA supports the Australian and New Zealand Committee on Resuscitation (ANZCOR) Advanced Life Support guidelines which includes adrenaline dosing (1 mg intravenously per two cycles) as for other causes of cardiac arrest requiring CPR.⁷ This recommended adrenaline dose differs to, and is higher than, that suggested in other LAST guidelines.⁸ The lower adrenaline dose is not endorsed in LAST circumstances requiring CPR by ANZCA at the present time. (Refer to *PG03 Background paper* for more detail).
- 9.3 Equipment and staffing of the area in which the patient is being managed should satisfy the requirements as stated in section 4.4 and 4.5 above.

This document is accompanied by a background paper (PG03BP) which provides more detailed information regarding the rationale and interpretation of the Guideline.

Related ANZCA documents

PS02 Position statement on credentialling and defining the scope of clinical practice in anaesthesia

PS04(A) Position statement on the post-anaesthesia care unit

PG06 Guideline on the anaesthesia record

PS08 Position statement on the assistant for the anaesthetist

PG09 Guideline on procedural sedation

PS11(PM) Procedures in pain medicine clinical care standard

PG18 Guideline on monitoring during anaesthesia

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

PG28 Guideline on infection control in anaesthesia

PG41 Position statement on acute pain management

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

PS55 Position statement on minimum facilities for safe administration of anaesthesia in operating suites and other anaesthetising locations

References

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