SESLHD PROCEDURE COVER SHEET

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FUNCTIONAL GROUP(S)	Medicine Surgery, Perioperative and Anaesthetic
KEY TERMS	regional analgesia, peripheral nerve analgesia, paravertebral infusion, wound site infusion
SUMMARY	This document refers to Regional Analgesia, excluding epidural and intrathecal analgesia. Peripheral Nerve infusions are administered for pain control including post-operative pain management.

Pain Management – Peripheral Nerve Analgesia (PNA)

SESLHDPR/372

1. POLICY STATEMENT

This document outlines the management for patients receiving Peripheral Nerve Analgesia (PNA).

It aims to guide the safe and effective administration of local anaesthetic to peripheral nerves for pain control.

2. BACKGROUND

Peripheral Nerve Analgesia (PNA) refers to a technique where local anaesthetic is administered percutaneously adjacent to a peripheral nerve, plexus or plane. Local anaesthetic is delivered as a single bolus dose and/or through a catheter to provide analgesia.

Indications for PNA include treatment of acute postoperative pain, traumatic injuries eg. rib fractures, severe ischaemic pain, chronic pain conditions and cancer related pain.

Compared with opioid analgesia, a PNA can provide better pain control, with the added benefit of reducing opioid use and reducing opioid-related side-effects.

Categories of PNA include but are not limited to:

- **Thoracic abdominal wall blocks for example:**
  - Erector Spinae Plane
  - Serratus Anterior Plane
  - Transversus Abdominis Plane
  - Intercostal
- **Upper extremity block for example:**
  - Interscalene Brachial Plexus
  - Infraclavicular Brachial Plexus
  - Supraclavicular Brachial Plexus
  - Axilliary Brachial Plexus
- **Lower limb extremity block for example:**
  - Fascia Iliaca Plane
  - Femoral
  - Saphenous (Adductor Canal)
  - Sciatic
- **Wound site infusion -** including use of disposable elastomeric infusion device e.g. 'PainBuster' (refer to section 5.3.2)

Thoracic Paravertebral analgesia[15] differs from peripheral nerve analgesia whereby local anaesthetic is injected alongside the thoracic vertebrae close to where the spinal nerves exit from the intervertebral foramen. The thoracic paravertebral spaces on either

side of the thoracic vertebra also communicate with each other through the epidural and prevertebral space. The block is usually unilateral but can be contralateral to the site of injection due to epidural or prevertebral spread (occurs in 10% of patients). Due to the risk of epidural spread or unintentional intrathecal injection into a dural sleeve, patients should be monitored using the same vigilance and methods as those employed for epidural technique (see section 5.5 Clinical Observations).

3. DEFINITIONS

Local Anaesthetic - A medication that blocks pain sensation through sodium channel deactivation, without loss of consciousness

Nerve Block – Analgesia achieved through the application of local anaesthetic near a nerve, nerve plexus or plane to block the transmission of pain sensation.

4. RESPONSIBILITIES

My Health Learning has a module on Peripheral Regional Infusions (course code 425285164). This module should be undertaken if caring for a patient who has a peripheral nerve infusion.

Registered Nurses:

- Develop an understanding, through education and/or training to safely manage patients with peripheral nerve analgesia.
- Prepare, administer, and discard prescribed solution of local anaesthetic
- Observations, management of adverse effects, appropriate escalation of care if required and documentation.
- A patent intravenous cannula must remain insitu for the duration of peripheral nerve analgesia.

Medical staff:

- Patient selection
- Prescribing
- Catheter insertion
- Management of adverse effects
- Documentation.

Pain Management Service: (If no Pain Management Service available, may be undertaken by Anaesthetist)

- Daily review of patients
- Regular auditing of regional analgesia charts
- Review relevant IMS+.

Pharmacist:

- Review patient's medications and medication charts
- Dispense local anaesthetic

Line Managers:

- Supervise adherence to policy and take action when required
- Review relevant IMS+.

5. PROCEDURE

5.1 Single injection peripheral nerve block[17]

This is a onetime nerve or plexus block. The duration and density of the block depends upon the dose, concentration, and pharmacology of the chosen local anaesthetic; clinically effective duration may last from less than an hour to 24 hours or more. A clinical decision must be made regarding the location of block insertion, level of sterility and if it can be done on the ward. Intravenous access must be available as well as equipment for resuscitation. In addition to monitoring for any specific patient needs, monitoring should include frequent and regular blood pressure measurement, respiratory rate, and level of consciousness assessed. An electrocardiograph and pulse oximeter should be available. Monitoring should be continued for at least 30 minutes or until the patient's vital signs are stable. In general monitoring should include regular assessment of heart rate, blood pressure, sedation, pain, and motor block as indicated by the clinical circumstances.

5.2 Continuous peripheral nerve infusion

- Peripheral nerve infusion catheter must be inserted in the operating room or in a critical care area e.g. ICU/HDU that provides the use of full surgical-type aseptic technique i.e. gown, gloves, mask, cap, sterile sets and access to cardiac monitoring.
- Catheter insertion success can be higher using ultrasound guidance compared with electrical stimulation for most insertion sites requiring less time for placement, induces less procedure-related discomfort and carries a lower risk of vascular penetration.
- Using electric current to supplement ultrasound guidance for difficult to visualise (e.g. deep) or ambiguous neural targets may prove beneficial in challenging cases.
- Consider tunnelling, if the catheter is planned to be used for an extended duration
- Sterile skin glue can decrease leakage at the catheter site by a factor of 10.
- To prevent displacement of the catheter, firm fixation of the catheter to skin is recommended.

5.3 Prescribing an infusion

- The infusion must be prescribed on the approved Peripheral Nerve Infusion (Adult) chart SMR130.023, in accordance with NSW Ministry of Health Policy Directive PD2020_032 - Medication Handling and clearly identified as Regional / Peripheral Nerve Analgesia.

- Infusion Prescription Options:
  Continuous Infusion (CI) +/- Rescue Bolus Dose
  - A continuous infusion (CI) program delivers an uninterrupted infusion of local anaesthetic solution at an hourly rate.
  - A prescribed rescue bolus dose may be administered when a patient is experiencing inadequate analgesia (refer to section 5.4.2 Administration of a Rescue Bolus Dose).
  - The rate of the continuous infusion may be increased by 1 to 2 mL/hr within prescription limits if frequent bolus doses are required to maintain analgesia.

  Programmed Intermittent Bolus (PIB)
  - A PIB setting requires the pump to deliver a prescribed bolus dose at regular set intervals. A continuous low dose (non-therapeutic) rate of 1 or 2 mL/hr may be set to maintain infusion line patency.
  - A limit must be set to ensure safety from local anaesthetic toxicity. This limit may be hourly, four hourly or 24 hourly and is dependent on device used at each hospital site.

  Patient Controlled Regional Analgesia (PCRA) with Background Infusion
  - A continuous infusion delivers a constant rate of local anaesthetic to the patient with the additional capacity for the patient to self-administer a prescribed dose of local anaesthetic within specified lockout intervals.
  - A limit must be set to ensure safety from local anaesthetic toxicity. This limit may be hourly, four hourly or 24 hourly and is dependent on device used at each hospital site.

- Settings and limits:
  - Devices used vary between sites, as does the limit setting mechanisms e.g. hourly, four hourly or 24 hourly.
  - Staying below the limit of Ropivacaine 0.4 mg/kg/hour ensures safety from local anaesthetic systemic toxicity. **NOTE** this is a total body dose limit. Should 2 or more regional catheters be running, this dose must be divided between all catheters. i.e. 0.4 mg/kg/hour for both catheters combined.
  - Use lean body weight in high BMI patients. (BMI > 35).
  - Consider a reduced dose of local anaesthetic in patients with impaired hepatic function as increased free ropivacaine levels may result. Also consider a reduction of dose by 10 to 20% in uraemic patients, elderly patients, severe heart failure, those with a severe metabolic disturbance and patients using CYP1A2 inhibitors (e.g. fluvoxamine, cimetidine, ciprofloxacin, verapamil).
  - Prolonged ropivacaine infusions, even at relatively high doses > 40 mg/hr, have an extraordinarily low incidence of inducing toxicity signs, symptoms, or plasma levels.
  - There is no evidence-based 'ideal' delivery regimen. Virtually all randomised controlled trials providing patient-controlled boluses report a lower local anaesthetic requirement.

5.4 Equipment

- All Peripheral Nerve Infusions must be clearly labelled according to National Standard for User-applied Labelling of Injectable Medicines, Fluids and Lines.

5.4.1 Infusion via electronic pump / delivery device

- Only use designated infusion pumps that are easily distinguishable from those used for intravenous and other types of infusions within individual hospitals.
- The infusion can only be commenced and managed by Registered Nurses who are familiar with using the specific pump / delivery device. Education and training should be provided to achieve this.
- Two Registered Nurses must program the pump according to the parameters prescribed on the Peripheral Nerve Infusion (Adult) chart.

5.4.2 Infusion delivered via disposable elastomeric device, e.g. PainBuster

- The infusion is usually set at a fixed rate.
- As the device does not have any alarms it needs to be checked regularly.
- The reservoir should not be refilled once empty. Inaccuracies in the rate of delivery have been reported in refilled elastomeric pumps.
- The manufacturer's directions must be followed for each individual device.

5.5 Clinical Observations[7,8]:

- The observations are intended for concurrent use with the Between the Flags (BTF) Observation Chart in eMR or other approved speciality observation charts.

OBSERVATIONS	FREQUENCY
Pain Score at rest and with relevant movement	Hourly for the first six hours and 2nd hourly thereafter or more frequently if patients clinical condition warrants
Infusion rate and total volume infused	Hourly for six hours, then 2nd hourly
Pump check	Commencement of each shift, on patient transfer and when bag is changed
Catheter site check	Every eight hours - preferably at shift change check for integrity of dressing, signs of leakage and signs of inflammation
Check for early signs and symptoms of local anaesthetic toxicity such as: light-headedness, numbness of mouth and tongue, tinnitus, visual disturbance, and late signs and symptoms such as muscular twitching, convulsions and cardiovascular collapse.	Hourly for the first six hours and 2nd hourly thereafter or more frequently if patients clinical condition warrants

SPECIFIC OBSERVATIONS FOR DIFFERENT BLOCKS	FREQUENCY
Upper limb block Check if the patient can raise the shoulder, move arm ,flex arm and perform hand grip	Every four hours and document in progress notes
Lower limb block Use Bromage scale to check motor block (Refer to Appendix A)	Every four hours and prior to mobilisation
Paravertebral block Use sensory dermatome assessment (Refer to 5.5.1 and appendix B) Bromage scale to check for motor block (refer to appendix A)	Every four hours and prior to administration of a rescue bolus dose or more frequently if specified by Anaesthetics/APS.

- In the event of any other acute changes refer to NSW Ministry of Health Policy Directive PD2020_018 - Recognition and Management of Patients who are deteriorating.

5.5.1 Sensory Testing (Dermatome Level Check) for paravertebral infusions:

- Place ice on an area well away from the possible dermatome cover (e.g. face or forearm) and ask the patient to tell you how cold it feels to them
- Apply ice to an area likely to be blocked on the same side of the body and ask the patient "does this feel as cold as your face / arm or different?"
- Apply ice to areas above and below this point until it's clear at which level the top and the bottom of the block is
- Repeat the procedure on the opposite side of the body (note: blocks may be uneven or unilateral)
- Document the blocked dermatomes on the NSW Health Peripheral Nerve Infusion Adult form SMR130.023 on the Sensory Dermatome Assessment section. Record both the upper and lower limits of the block on the relevant area: e.g. R T5- T9.

5.5.2 Administration of a Rescue Bolus Dose:

- A rescue bolus dose should be administered, as prescribed, when a patient is experiencing inadequate analgesia
- Prior to administration check the peripheral infusion delivery device and administration set for faults, kinks or disconnection and perform a full set of observations including motor and sensory level of block assessments
- Check catheter insertion site for catheter position or signs of leakage
- Identify a prescription for RESCUE BOLUS DOSE on the NSW Health Peripheral Nerve Infusion Adult form SMR130.023
- An RN who has been educated and trained in this procedure can administer a rescue bolus dose and increase the rate. The dose must be checked and witnessed by a second RN

- Give prescribed rescue bolus dose and increase rate by 1 to 2 mL/ hour within prescription limits.
- The RN and witnessing RN must record and initial any clinician rescue bolus dose in the 'Infusion Delivery' section on the NSW Health Peripheral Nerve Infusion Chart Adult form SMR130.023
- Perform clinical observations after the rescue bolus dose - as per section 5.5.2. If pain persists and observations are stable give another rescue bolus dose if at the minimum interval between rescue doses (hours or minutes) as charted on the approved NSW Health Peripheral Nerve Infusion Adult form SMR130.023
- Increase the infusion rate in accordance with the prescription if the maximum rate has not been reached and if not contra-indicated
- Continue to monitor as per section 5.5
- If pain continues to persist contact the APS or if after hours page the on-call Anaesthetic Registrar / Anaesthetist
- If complications occur see section 5.5.3.

5.5.3 Management of complications[7,8,11]

COMPLICATION	ACTION / MANAGEMENT
Pain score 7 and above	• Check the delivery device and connections • Check site for excessive leaking and / or displacement of catheter • Consider giving bolus dose / rate increase if prescribed • Give systemic analgesia if prescribed • Contact admitting team or Acute Pain Service if above strategies ineffective • Document in patient's notes.
Sensory and Motor block	• If numbness occurs, take care with positioning of the numb limb to avoid pressure areas and nerve compression. Take precautions to avoid patient injury e.g. touching hot items • Increasing Motor block or any developing leg weakness – contact the Acute Pain Service / Anaesthetist • Document in patient's notes.
Leakage of blood or fluid, haematoma, abscess or oedema at insertion site	• Contact admitting team and Acute Pain Service / anaesthetics • Document in patient's notes.
Inadvertent disconnection of catheter	• Do not reconnect • Stop the infusion • Cover catheter with sterile cap • Contact Acute Pain Service or Anaesthetics immediately

Local anaesthetic toxicity **Yellow zone** (early signs): Numbness and tingling around mouth and tongue Metallic taste Tinnitus Dizziness	• Stop infusion immediately • Apply oxygen • Activate **Clinical Review** • Contact admitting team and Acute Pain Service or Anaesthetics immediately • Document in patient's notes.
Red zone (late signs): Muscular twitching Convulsions Cardiovascular collapse	• Stop infusion immediately • Apply oxygen • Activate **CODE BLUE** • Contact admitting team and Acute Pain Service or Anaesthetics immediately • Document in patient's notes.

6. Removal of catheter for deep plexus/deep peripheral techniques (e.g., lumbar sympathetic, lumbar plexus, and paravertebral)[3,4,9]

- The order to remove the catheter must be documented by the relevant medical officer
- To prevent bleeding[9] the catheter should be removed if:
  - The patient has NOT RECEIVED unfractionated subcutaneous Heparin:
    - ≤ 5000 IU dose within the previous six (6) hours
    - > 5000 IU dose within the previous twelve (12) hours
  - The patient has **NOT RECEIVED a prophylactic dose** of low molecular weight heparin (LMWH) e.g. dalteparin or enoxaparin within the previous twelve (12) hours.
  - The patient has **NOT RECEIVED therapeutic dose** of:
    - Rivaroxaban within the previous twenty-six (26) hours
    - Apixaban within the previous thirty (30) hours
    - Dabigatran within the previous thirty-six (36) hours
    - Low molecular weight heparin (LMWH) within the previous twenty-four (24) hours'
- The patient on warfarin has a documented INR of < 1.5
- The anaesthetist must leave clear instructions about catheter removal and administration of any anticoagulants that are not discussed in this document
- No prophylactic doses of anticoagulants are to be administered for at least four (4) hours following the removal of the peripheral nerve catheter unless specified by APS / Anaesthetist / Anaesthetic Registrar.

Procedure

- Wash hands and organise equipment
- Remove the dressing covering the catheter site
- Observe entry site - you may need to dislodge a clot or scab with gauze soaked in sterile saline solution

- Grasp the catheter close to the skin and gently pull the catheter, it should be easy to remove and not painful
- Do not apply additional tension if the catheter begins to stretch. Do not cut or forcibly remove the catheter. If resistance is encountered, stop and advise Pain Team / Anaesthetist
- Examine catheter after removal and confirm with a second RN that the catheter tip is intact
- Cover the puncture site with an occlusive dressing, which can be removed after 24 hours.
- Document in the patient's notes.

7. DOCUMENTATION

Peripheral Nerve Infusion (Adult) chart SMR130.023
Patient medical records (including eMR)

8. AUDIT

Patients receiving Peripheral Nerve Analgesia (PNA) will be regularly reviewed by Pain Management / Anaesthetic / RMO clinicians.
IMS+

9. REFERENCES

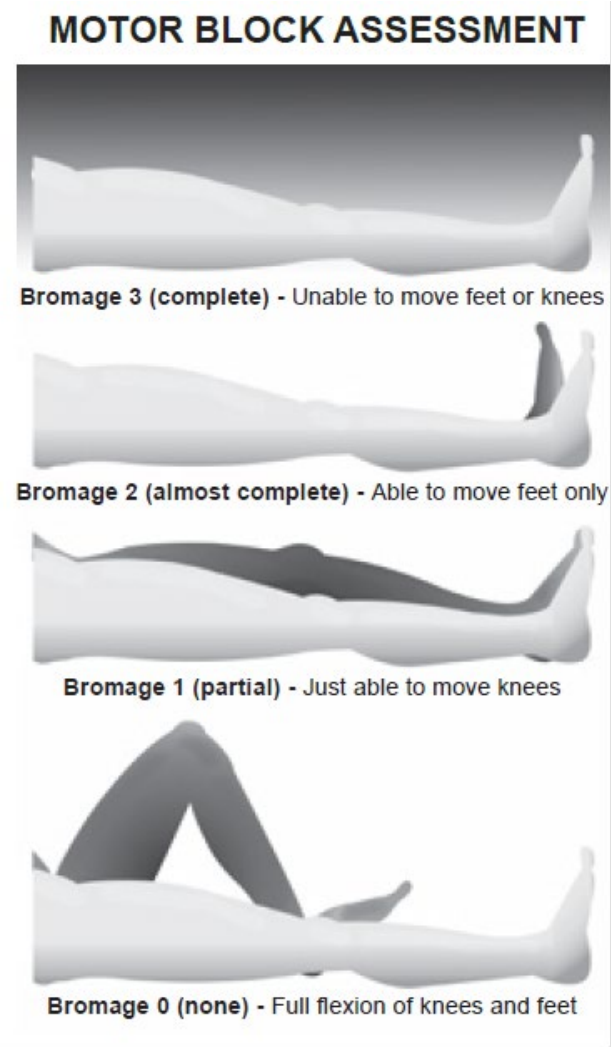
	Reference
1	Ilfield,,B.,(2011). *Continuous peripheral nerve blocks: A review of the published evidence.* Anaestheia and Analgesia 113*(4)*904-25
2	Cowlishaw,P.,Scott,D and Barrington,M (2012) *The role of regional anaesthesia techniques in* the *management of acute pain.* Anaesthesia and Intensive Care 40(1),33-45
3	Harrop-Griffths,W ,Cook,T,Gill,H. et al (2013). *Regional anaesthesia and patients with abnormalities of coagulation.* Anaesthesia 68 (9): 966-72
4	Horlocker TT, Vandermeuelen E, Kopp, S. et al (2018) Regional anaesthesia in patients receiving antithrombotic or thrombolytic therapy: American Society of Regional Anaesthesia and Pain Medicine evidence – based guidelines (4th ed). Reg Anasth Pain Med 43: 263-309).
5	NSW Ministry of Health Policy Directive PD2020_032 - Medication Handling
6	National Standard for user applied labelling of injectable medicines, fluids and lines
7	NSW Ministry of Health Policy Directive PD2020_018 - Recognition and Management of Patients who are deteriorating
8	NSW Health Peripheral Nerve Infusion (Adult) chart SMR130.023
9	SESLHDPR/324 - Pain Management - Epidural Analgesia (Adult) non obstetric

	Reference
10	Schug SA, Palmer GM, Scott DA, Alcock M, Halliwell R, Mott J. APM:SE Working Group of the Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine (2020), Acute Pain Management: Scientific Evidence (5th edition), ANZCA & FPM, Melbourne.
11	Warren L, Pak A. Local anesthetic systemic toxicity. In: Maniker R editor. UpToDate; 2022.
12	Rosenberg PH, Veering BT, Urmey WF. Maximum recommended doses of local anaesthetics: a multifactorial concept. RAPM 2004; 29:564-575.
13	Ilfield B. Continuous Peripheral Nerve Blocks: An Update of the Published Evidence and Comparison With Novel Alternative Analgesic Modalities. Anaesthesia and Analgesia 2017; 124(1):308-335.
14	Macintyre, PE & Schug, SA 2021, *Acute Pain Management: A Practical Guide,* 5th edn, CRC Press, Boca Raton
15	New York School of Regional Anesthesia, NYSORA 2022, Thoracic and lumbar paravertebral block- landmarks and nerve stimulator technique.
16	Jeng, C. and Rosenblatt, M. Overview of peripheral nerve blocks In: Maniker R editor. UpToDate. 2022.
17	Australian and New Zealand College of Anaesthetists/ Faculty of Pain Medicine. Guideline for the management of major regional analgesia PG03 (A), 2014.

8. REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
December 2014	0	Grazyna Jastrzab, Nurse Manager, Department of Pain Management, POWH
May 2018	1	Minor review approved by Executive Sponsor
June 2018	1	Endorsed by SESLHD Quality Use of Medicine Committee
August 2022	2	Minor review. Title changed and additional information added. Approved by Executive Sponsor. To be tabled at Quality Use of Medicines Committee (QUMC).
September 2022	3	Approved at QUMC with minor amendments.

Appendix A - Motor Block Assessment for lower limb blocks and paravertebral infusions (Bromage Scale)



Appendix B – Dermatomes for paravertebral infusions only