Pain – Patient Controlled Intravenous Analgesia (PCIA) – Adult

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• Directorate(s)	All directorates
• Department(s)	All adult clinical areas
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• Used by which staff?	All clinicians (excluding those in Child Health)
• Excluded	Child Health
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1. Purpose of policy

The purpose of this policy is to ensure the safe and effective care of a patient with a patient controlled intravenous analgesia (PCIA) within Auckland District Health Board (Auckland DHB).

Once prescribed, in accordance with the Auckland DHB Medications - Prescribing policy, all medication should be administered and documented in accordance with the Auckland DHB Medication Administration policy (see Associated documents).

2. Definitions

The following terms are used within this document:

Term	Definition
Auckland DHB	Auckland District Health Board
APS	Acute Pain Service
Basal rate	A continuous infusion of the medication via the pump (e.g. 1 mL/h)
History	Enables checking of the programme and a summary of the doses demanded and received in the previous hour, 24 hours or from the time the pump was commenced
IV	Intravenous
Loading dose	A nurse/anaesthetist-programmed and -administered stat dose
Lockout interval	The pre-set time period during which no further bolus dose will be delivered by the machine (usually five minutes)
PCIA	Patient controlled intravenous analgesia
PCIA bolus	The dose that is delivered following patient pressing and releasing the demand button

3. Policy statements and cautions

A patient can titrate their pain relief according to their own needs.

A pre-set dose of analgesic drug is administered intravenously. This dose should be sufficient to relieve the patient's pain, but small enough to minimise side effects.

Risk of overdose is minimised by a timer in the device called the 'lockout'. This prevents the administration of a further dose during a pre-set time period.

Only the patient may press the demand button. The risk of overdose is minimised, as they must be alert enough to do so.

The drug and dose selection for the opioid-naive patient must correspond to doses in Pain - Opioids - Intravenous in Adults (see Associated documents). The lockout will commonly be five minutes. The hourly limit is not routinely used.

Pharmacokinetic and pharmacodynamic variability contributes to the difficulty in predicting the analgesic requirements of an individual patient, along with consideration of their physical and psychological situation and cultural background.

Individualisation of analgesic therapy is essential to provide effective pain relief.

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3.1 Patients with hepatic impairment

In patients with hepatic impairment, most analgesia medicines have reduced clearance and increased oral bioavailability. Doses may need to be adjusted, particularly when multiple doses are used. Additionally, patients with cirrhotic liver disease may have renal impairment despite a normal serum creatinine.

See table below for dosing advice with patients with hepatic impairment.

IV opioid	Hepatic considerations	Dosage recommendations
Morphine	Hepatic impairment does not appear to have a significant effect on morphine due to a large hepatic reserve for glucuronidation, but increased bioavailability due to reduced first-pass effect	• Caution with repeated doses • Prescribe smaller doses and consider a longer dosing interval • Seek advice in severe hepatic impairment or choose alternative opioid
Oxycodone	Reduced clearance in mild-to-moderate hepatic impairment	• Prescribe smaller doses (e.g. 30-50 per cent of the usual dose) and at a longer dosing interval • Seek advice in severe hepatic impairment
Tramadol	Reduced clearance in severe hepatic impairment	• Prescribe smaller doses at a longer dosing interval • Seek advice in severe hepatic impairment or if unsure
Fentanyl		• No dose adjustment required

3.2 Patients with renal impairment

Renally excreted drugs and/or their metabolites will accumulate as renal function deteriorates. Doses will need adjusting. In renal impairment, fentanyl is the opioid of choice. See table below for dosing advice.

IV opioid	Renal considerations	Dosage recommendations
Morphine	May have prolonged duration of effect and accumulation in patients with renal impairment	• Avoid in severe renal impairment • Prescribe smaller doses at a longer dosing interval in mild-to-moderate renal impairment
Oxycodone	Reduced clearance in mild-to-moderate renal impairment	• Prescribe smaller doses (e.g. 30-50 per cent of the usual dose)
Tramadol	Reduced clearance in severe hepatic and renal impairment	• Avoid in severe renal impairment • Prescribe smaller doses at a longer dosing interval (max daily dose 100 mg/day in severe renal failure)

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IV opioid	Renal considerations	Dosage recommendations
		• Seek help from the Pain Service or clinical pharmacist if unsure
Fentanyl		• No dose adjustment required

4. Responsibility

Only midwives/registered nurses working for Auckland DHB can take responsibility for the management of PCIA and the supervision of a patients' care once they have:

- Intravenous (IV) certification;
- Completed the appropriate training:
  - PCIA workbook/self-learning modules
  - Pain study day
  - PCIA pump competency.

Note: This practice excludes enrolled nurses and health care assistants.

5. Benefits

- Individualised pain control superior to other conventional methods.
- Lower pain scores when compared to nurse administered boluses, especially in areas with low nurse to patient ratios.
- High patient acceptance and satisfaction.
- Reduced midwifery/nursing time required.

Few respiratory arrests have been reported when using PCIA alone and correctly. An additional continuous infusion rate can potentially result in the known risks of opioid overdose. A patient on PCIA requires careful monitoring as outlined in the following pages.

6. Pre-commencement of PCIA

- Each patient needs an explanation of the device and its underlying principles during the visit by the anaesthetist either in hospital or in the pre-operative clinic. The nurse initiating the PCIA should explain how to use the pump upon commencement.
- The patient/family/whānau must be able to understand the principles, benefits and safety issues of PCIA.
- The patient must be physically capable of using the PCIA demand button if it is not a nurse-controlled PCIA.
- The anaesthetist or pain registrar prescribes the PCIA on the PCIA prescription form (see Clinical forms), the referral form which is pages 3 and 4 of the prescription must be removed and placed in the appropriate referral area so that the APS are made aware of the patient; this ensures safe follow up on the wards.

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- PCIA is to be commenced once the patient's pain is manageable. The use of Opioids – Intravenous in Adults (see Associated documents) is often needed to achieve this.
- Standard settings do not apply to all patients and have to be adapted to the individual by the anaesthetist or pain registrar.
- Certain patients may require a basal rate and a bolus option; this will be decided by the prescribing anaesthetist.

7. Prescription

The following describes the stages in the management of PCIA. Follow the steps below to ensure that PCIA is administered safely and effectively:

Step	Action
1.	Ensure that the analgesia is prescribed by an anaesthetist on the PCIA prescription form CR8675 (see Clinical forms) and includes: • Patient's name, date of birth, national health index (NHI) number and patient weight • Medical alerts and any drug allergies.
2.	Ensure medicine and patient checking procedures are followed as per Medication Administration (see Associated documents).
3.	Ensure oxygen is administered if prescribed.
4.	Ensure 'Specialised analgesia' box is ticked on the front of the National Medication Chart.
5.	If a patient is physically or cognitively unable to use the demand button, the APS will prescribe nurse controlled intravenous analgesia. In this situation, the nurse/midwife is able to press the demand button using the assessment criteria in Opioids – Intravenous in Adults guideline (see Associated documents).

8. Equipment – CADD-Solis pump and tubing

PCIA is administered via a CADD-Solis pump and dedicated tubing.

The CADD-Solis pumps are sourced from the equipment pool via the intranet.

The key to unlock the pump and lockbox is kept with the controlled drug keys.

Pumps need to be kept plugged into power when not in use or when with a patient, and when it is suitable and safe to do so in order to minimise battery drain.

PCIA tubing is especially designed for PCIA. The safety features include:

- Minibore tubing
- Luer locking
- No Y side port
- One-way check valve.

Ensure tubing is:

- Correct for PCIA – Smiths Medical CADD administration set with bag spike, clamps, one-way check valve with female Luer and male Luer.
- Ensure that the tubing is clamped when disconnected from the CADD-Solis pump to prevent free flow of the medicine.
- Always connected directly to the central or peripheral line via an IV Luer bung (no additional extension tubing or three-way-taps).
- Labelled with date and time.
- Labelled with a patient label where the tubing exits the lockbox.
- The line must be changed a minimum of every 96 hours according to the policy Intravenous Catheters – Peripheral – Adults and Children (see Associated documents).

9. Checking and safety

Two registered nurses/midwives must check the programme against the prescription:

- When taking over care of the patient
- When the patient is returning to the ward
- After programming and before commencing PCIA – **with another registered nurse/midwife**
- After a bag or line change.

Checkpoints:

- PCIA pump is programmed according to the PCIA prescription.
- Bag contains the prescribed medicine, correct concentration and has not passed the expiry date.
- There is no obvious discrepancy with the bag i.e. the contents are clear and does not look to have been tampered with.
- PCIA line is not disconnected unless the tubing is being replaced or the PCIA is being discontinued in order to decrease the risk of infection and error.
- Medicine bag is labelled with date of opening and signature of two registered nurses/midwives.
- PCIA line (closer to CADD-Solis pump lockbox) should have patient identification adhesive label, date and time of line change.

Note: Patient must not leave designated clinical premises (i.e. ward) while the therapy is in progress, unless accompanied by a staff member of Auckland DHB.

10. PCIA medicine, concentration and expiry

Some pre-mixed PCIA medicine bags are commercially available and can be ordered from pharmacy via the Controlled Drug requisition book:

- Morphine 100 mg/100 mL (1 mg/mL)

- Fentanyl 1000 microgram/100 mL (10 microgram/mL)
- Oxycodone 100mg/100 mL (1mg/mL)

There may be a need to make some bags on the ward as per PCIA prescription (e.g. Tramadol 10 mg/mL).

The CADD-Solis pumps have a pre-programmed drug library using the following concentrations:

- Morphine 1 mg/mL
- Fentanyl 10 microgram/mL
- Oxycodone 1 mg/mL
- Tramadol 10 mg/mL.

Each medicine has a standardised prescription programme attached for ease of programming and reduce the risk of errors.

Expiries:

- Pre-mixed bags of Morphine 1mg/1mL (100mL bag), Fentanyl 10 micrograms/mL (100mL bag) and oxycodone 1mg/mL (100 mL bag) can hang for 96 hours and must then be discarded/renewed.
- Non-premixed PCIA bags (made on the ward, e.g. Tramadol) can only hang for 24 hours and must then be discarded/renewed.

11. Monitoring

Monitor and document vital signs on the adult observation chart form CR5826 (see Associated documents): 30-minute intervals for the first four hours. If stable, observations are to be completed every four hours thereafter:

- Blood pressure
- Heart rate
- Respiratory rate (taken for one whole minute)
- Rousability
- Pain scores at rest, on activity and when deep breathing (contact the pain registrar if pain is not manageable despite PCIA use)
- Nausea.

At night, if the patient is sleeping normally, respiratory rate and cumulative dose are all that is required.

12. Complications and side effects

Ensure naloxone is available on the ward/unit. If naloxone is required, refer to the naloxone guidelines for administration (see Associated documents).

Sedation is the most reliable indicator of opioid toxicity.

Respiratory rate of < 8 per minute and the patient is rousable:

- Maintain rousability
- Encourage deep breathing
- Administer oxygen at 4 L/min via Hudson mask
- Check oxygen saturation
- Reassess use of PCIA
- Inform Acute Pain Service (APS).

Respiratory rate of < 8 per minute and the patient is unrousable:

- Implement basic life support measures
- Call for immediate medical assistance (Code Red or 777)
- Inform APS once patient is stable.

Nausea and vomiting:

- Manage nausea and vomiting with prescribed antiemetics
- If ineffective call APS.

Constipation:

- Monitor and treat appropriately as guided by patient's primary team.

13. Selecting an IV line to connect to the PCIA

- PCIA can be attached to either a central or PICC line if no peripheral line is available.
- If concurrent medicines or fluids are required, they may be administered through a bifurcated Y-connector with an anti-siphon and anti-reflux valve.

14. Changing the medicine bag and tubing

Due to the opioid contents in the bag, extreme care must be taken when changing the bag:

- Always clamp the tubing before removing bag from the pump.
- Attach the new bag to tubing before inserting into the pump. It is necessary to reconfirm the programme as per the prescription before recommencing use.
- Place the bag in the pump with the medication label visible to enable clear identification of the drug and the concentration.
- Attach a patient label to the tubing where the line leaves the lockbox.
- Attach a label containing date and time of tubing change.
- Unclamp tubing and connect to patient using aseptic technique.
- Ensure that you complete the date and time that the bag is opened using the allocated area on the medicine bag or on the 'medication added' label.

15. Adjunctive medications

Ensure:

- IV rescue bolus is included on the PCIA prescription. You may administer IV rescue bolus if required, please contact the APS if you need to do so.
- No other opioids must be given unless discussed with the APS or the anaesthetist. Patient's primary-team doctors are to ensure that this suggestion is considered prior to prescribing other opioids.
- Adjunctive medicines are administered as prescribed by the patient's primary team (i.e. laxatives, non-opioid medicines). Discuss use of night sedation with the pain registrar or anaesthetist.

16. Effectiveness

PCIA is not always effective at relieving severe pain but is usually effective at keeping pain under control once an acceptable pain score for the patient has been achieved.

In general, changes are made following patient observation and using the information found in the PCIA pump history plus information as follows:

- If the patient reports inadequate pain relief from a bolus (the patient requires bolus injections at frequent intervals, e.g. > 5 /hour), the bolus dose may need to be increased by the anaesthetist.
- If the patient experiences sedation or dizziness after a bolus injection, the dose/drug may be changed by the APS/anaesthetist.
- If there are frequent demands recorded in the history, the patient may need another explanation of the underlying principles or have their pain management reviewed.
- All patients with a PCIA receive a daily assessment from the APS; if a patient has not been assessed by midday, please contact the APS.

17. Discontinuation of PCIA

PCIA is to be discontinued only after discussion with a member of the APS:

- Ensure successful transition to an alternative analgesic regime (usually oral) by assessing pain and analgesic side effects regularly.
- Unused opioids are to be discarded as per the Intravenous Medications and Infusions Administration policy (see Associated documents).
- Ensure you place the pump in the appropriate pick-up location in your area so that it can be collected by equipment pool.

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18. Supporting evidence

- Macintyre, P. E., Scott, D. A., Schug, S. A., Visser, E. J., & Walker, S. M. (Eds.). (2010*). Acute pain management: scientific evidence* (Vol. 491). Melbourne: Australian and New Zealand College of Anaesthetists.
- Hudcova, J., McNicol, E. D., Quah, C. S., Lau, J., & Carr, D. B. (2006). Patient controlled opioid analgesia versus conventional opioid analgesia for postoperative pain. *Cochrane Database of Systematic Reviews*, (4).
- McCaffery, M., & Pasero, C. (1999). *Pain: clinical manual.* (2nd Ed.). St Louis: Mosby 248-253.
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- McIntyre, P. E. (2001). Safety and efficacy of patient-controlled analgesia. *British Journal of Anaesthesia, 87(*1), 36-45.
- Australian Commission on Safety and Quality in Healthcare (2019): Guidelines for the Prevention and Control of Infection in Healthcare – Intravascular access devices 3.5.2.2 pg 170

19. Associated documents

- DCCM - Central Venous Catheter (CVC) Care for an Adult - Addendum
- Short Term Central Venous Access Device (CVAD) Care in Adults
- Hand Hygiene - Infection Prevention
- Intravenous Catheters - Peripheral - in Adults and Children
- Intravenous Medications and Infusions Administration – CVICU
- Medication Administration
- Medications - Allergies & Adverse Drug Reactions (ADRs) Identification, Documentation & Reporting
- Medications - Prescribing
- Naloxone Adult Medication Administration Guideline
- Opioid Analgesia for Women in Labour
- Pain - Opioids - Intravenous in Adults
- Remifentanil Patient Controlled Analgesia (PCA) for a Woman in Labour

Clinical forms

- CR5826 Adult National EWS or Vital Signs Chart
- CR8675 Acute Pain Service Patient Controlled Intravenous Analgesia

20. Disclaimer

No guideline can cover all variations required for specific circumstances. It is the responsibility of the health care practitioners using this Auckland DHB guideline to adapt it for safe use within their own institution, recognise the need for specialist help, and call for it without delay, when an individual patient falls outside of the boundaries of this guideline.

21. Corrections and amendments

The next scheduled review of this document is as per the document classification table (page 1). However, if the reader notices any errors or believes that the document should be reviewed ***before*** the scheduled date, they should contact the owner or Document Control without delay.