



# PROCEDURE

**SUBJECT:** Patient and Nurse-Controlled Analgesia

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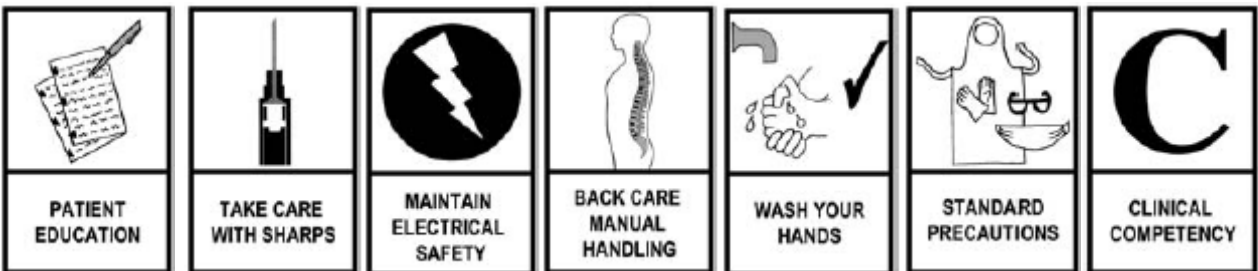
**DISTRIBUTION:**  
All areas JHCH and JHH

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Clinical Practice Committee, John Hunter Children's Hospital in consultation with the Acute Pain Service, Emergency Department and Intensive Care Unit (JHH & JHCH)

**Disclaimer**  
It should be noted that this document reflects what is currently regarded as a safe and appropriate approach to care. However, as in any clinical situation there may be factors that cannot be covered by a single set of guidelines, this document should be used as a guide, rather than as a complete authoritative statement of procedures to be followed in respect of each individual presentation. It does not replace the need for the application of clinical judgment to each individual presentation.

## SAFE WORK PRACTICE



**Risks**  
Risk of pump malfunction  
  
Risk of medication or programming error

**Controls**  
Follow biomedical electrical safety guidelines  
Two RN's to attend syringe loading, pump programming, and drug discarding

## OUTCOMES:

1. The safe and effective administration of Patient-Controlled Analgesia (PCA) or Nurse-Controlled Analgesia (NCA).
2. The minimisation of risk to patient and staff.

## OVERVIEW:

This Policy Compliance Procedure contains the following sections:

1. General
2. Initial Assessment
3. Prescription
4. Preparing the Medication Syringe
5. Programming the Pump
  - 5.1. Programming an Alaris® IVAC® PCAM® infusion system
  - 5.2. Changing a syringe in an Alaris® IVAC® PCAM® infusion system
6. Managing the Patient
7. Stopping PCA or NCA and Planning step-down analgesia

### 1. GENERAL:

This document does not aim to instruct clinicians in managing acute pain. For guidance in making clinical decisions about analgesic drugs and modalities, refer to: John Hunter Children's Hospital Guideline for Managing Acute Pain in Children ([www.kaleidoscope.org.au/docs/GL\\_acutepain.pdf](http://www.kaleidoscope.org.au/docs/GL_acutepain.pdf)) or contact the Acute Pain Service (Anaesthetist: page 2101 (24 hours) Nurse: page 2044 (8am – 430pm, Mon – Sun) )

Effective PCA/NCA delivery and monitoring will ensure serum opioid concentrations will be maintained at the optimal analgesic level for the individual patient, whilst minimizing side effects. PCA/NCA provides greater dosing flexibility and can be more effective for managing incident pain compared with intramuscular injections and continuous infusions.<sup>12</sup>

When intravenous opioid analgesia is indicated, bolus doses are used to establish analgesia. Thereafter, analgesia is usually maintained using one of 3 modalities:

- 1) **Patient-controlled analgesia (PCA)** – An infusion that allows a patient to self-administer intermittent small doses of an opioid agent as required by pressing a button attached to a pre-programmed pump. The dose and interval are prescribed and then programmed by skilled staff to ensure safety.
- 2) **Nurse-controlled analgesia (NCA)** – An infusion that allows an accredited nurse to administer pre-programmed small doses of an opioid agent by pressing a button attached to a programmable pump. The dose and interval are prescribed and then programmed by skilled staff. The nurse-administered boluses are used to supplement a background infusion as clinically indicated. NCA should only be employed in cases where the child is not developmentally or physically able to operate a PCA.
- 3) **Continuous opioid infusion** – An infusion that may be supplemented by additional opioid boluses. The additional doses are administered either from a separate syringe or by temporarily altering the setting of the infusion pump. This should only be employed when PCA and NCA are not feasible (ie. the child is not developmentally or physically able to operate a PCA and/or an Alaris IVAC PCAM pump is not available). Infusions and bolus dosing are covered in JHCH Procedure No:13.12

**Prescribers** must understand the pharmacology of the opioid used the pharmacokinetics of the delivery method and the clinical indications, contraindications, monitoring and management of adverse effects.

**Nursing staff** involved in the preparation of medication syringes, programming of pumps, administration of opioid boluses (via any means including NCA), must have:

- knowledge of pain and pain assessment in infants, children and adolescents
- completed JHCH medication competency assessment
- completed the JHCH PCA/NCA Learning Package and returned it to the Nurse Educator
- completed the JHCH PCA/NCA competency assessment and forwarded a copy to the Nurse Educator.

**Children and their parents** have to be informed about the medication and delivery method and verbally consent to same.

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## 2. INITIAL ASSESSMENT

**Before** intravenous opioid is prescribed for the maintenance of analgesia, the patient should have a full medical assessment including:

- consideration of the presenting condition
- concurrent health problems and medications
- allergies
- past adverse reactions to opioids
- level of consciousness
- airway, respiratory and cardiovascular status.

**Criteria for the selection of paediatric patients appropriate for PCA include:**

- Severity of the illness, trauma or operation causing pain best managed by intravenous opioids ([http://www.kaleidoscope.org.au/docs/GL\\_acutepain.pdf](http://www.kaleidoscope.org.au/docs/GL_acutepain.pdf) )
- Ability of the patient and family to understand the concept of PCA
- Patient's developmental age — 5 years
- Patient must be physically able to press the button
- An undertaking by the family not to press the button on behalf of their child under any circumstances.

**Criteria for the selection of paediatric patients appropriate for NCA include:**

- Severity of the illness, trauma or operation causing pain best managed by intravenous opioids ([http://www.kaleidoscope.org.au/docs/GL\\_acutepain.pdf](http://www.kaleidoscope.org.au/docs/GL_acutepain.pdf) )
- Patient or family factors that preclude the use of PCA – e.g. child too young, inability to understand PCA principles or physical incapacity.

### **SAFETY ALERT**

Do not commence an intravenous opioid infusion if the child has any signs of respiratory depression or is heavily sedated.

**During assessment of the patient and family they should receive instruction (as appropriate) on:**

- Rationale for using PCA/NCA
- Use of PCA/NCA machine
- Safety features of machine
- An estimate of how long PCA/NCA will be used for
- Explanation of need for nurses to do certain observations at selected intervals
- The symptoms and signs of relevant adverse reactions, and instruction to notify nursing staff if they have any concerns regarding their child's physical status or comfort.

### **3. PRESCRIPTION:**

**Please contact** the Acute Pain Service (APS) if prescribing or management advice is required -

Anaesthetist: page 2101 (24 hours)

Nurse: page 2044 (8am – 4:30pm) daily.

PCA and NCA are to be prescribed by a medical officer on the GNS79 B2 Acute Pain Service Paediatric PCA / NCA chart.

Prescribers must understand opioid pharmacology, the clinical indications, contraindications, monitoring and management of adverse effects in children and adults.

**The prescriber must also:**

- Ensure that the patient has had an **adequate loading dose** of opioid prior to commencing maintenance analgesia via a PCA or NCA;
- Place the correct patient identification label on the Paediatric PCA / NCA chart, print the patient's name and initial it, and document the patient's allergies and weight;
- Indicate whether the concentration being prescribed is standard (as per the Prescribing Guidelines on the GNS79 B2 form) or otherwise by ticking the appropriate box;
- Indicate the mode to be used (**either** PCA **or** NCA) by ticking the appropriate box;
- Prescribe the drug concentration (opioid drug amount, diluent volume and the resultant concentration);
- Prescribe the parameters that are to be programmed into the device: concentration in the syringe, PCA/NCA bolus dose, lock-out interval and, if needed, a continuous background infusion;
- Ensure that the standing orders, as per prescribing guidelines (see GNS79 B2), are appropriate for this patient. If additional orders are required the prescriber must highlight these on the prescription;
- Sign and date the prescription and **clearly** print name.
- **Anti-emetic medication** should be ordered for the management of nausea and vomiting on the PRN prescription.
- **Aperients** should also be charted as per M.1 Guideline Bowel Management- Opiate Induced Constipation ([http://www.kaleidoscope.org.au/docs/GL\\_Bowel\\_Kal.pdf](http://www.kaleidoscope.org.au/docs/GL_Bowel_Kal.pdf))

- The prescriber is also responsible for notifying the medical personnel who will monitor and manage the child with the ongoing PCA / NCA (i.e. notify the patient's admitting Paediatric team and/or the Acute Pain Service).

**The prescription does NOT need to be recharted each day.** It should only be recharted:

- 1) When more space is required to document syringe loading and programming (after the fourth syringe); or
- 2) If the concentration or other program parameters need to be altered by the prescriber.

**If a referral is made to the Acute Pain Service,** patients on PCA/NCA will be reviewed by Acute Pain Service staff on a daily basis, or more frequently if informed of anticipated or actual problems.

### **SAFETY ALERT**

Patients receiving intravenous opioid by PCA, NCA or infusion should not receive opioids by any other route, unless in consultation with the Admitting Paediatric Specialist or the APS.

#### **4. INFUSION PREPARATION:**

Only accredited nursing staff may prepare a PCA,/NCA (See Section 1).

- **Two RN's** must independently check the reconstitution of the syringe against the order as prescribed. At least one RN should be PCA/NCA accredited. If the order appears incorrect the prescriber should be contacted for clarification.
- The required opioid should be checked and signed out following NSW Health Policy Directive – Medication Handling in NSW Public Hospitals PD2005 206 then loaded into a 50 mL leuc-lock syringe. The syringe volume should be made up to total of 50 mL with the prescribed diluent.
- An additive label must be completed and signed by the two RN's and be secured to the syringe **ensuring** that the label and syringe markings are legible.
- All intravenous opioid infusions in JHCH are administered as a sideline infusion via a syringe pump. Only dedicated PCA administration sets that have integrated anti-siphon and anti-reflux valves are to be used.
- A maintenance infusion  $\geq$  TKVO must be infused past the anti-reflux valve when the patient is receiving an opioid infusion via syringe pump.
- Syringes should be replaced every 24 hours to ensure drug stability and sterility. Line set up and changes should be in accordance with Hunter Area Health Service policy 96/01.

## 5. PUMP PROGRAMMING:

### SAFETY ALERT

Two RNs must independently check any opioid infusion parameters when the infusion is commenced, reloaded, reprogrammed or ceased.

- The key for the syringe pumps for PCA/NCA is kept on the “DD” keys on each ward (Recovery ward carry spares).
- The preferred syringe pump for PCA/NCA in the JHCH is the Alaris® IVAC® PCAM® infusion system (as shown below).



### 5.1 PROGRAMMING AN ALARIS® IVAC® PCAM® INFUSION SYSTEM

- After priming the lines **clamp** the PCA administration set with slide clamp
- Connect Alaris® IVAC® PCAM® to the AC power supply
- **Open** the Alaris® IVAC® PCAM® pump cover by inserting the key in the lock located on the left side of the pump and turning the key clockwise. **Then remove the key.**



- **Load syringe** into the pump ensuring the syringe plunger is correctly located in the slots on the plunger holder. Squeeze the finger grips on the plunger holder and slide the mechanism until the finger flanges on the syringe barrel locate in the slot. Gently advance the syringe until the finger flanges touch the front of the slot closest to the syringe tip. This action will prevent delay at the start of the treatment. Rotate the syringe clamp anticlockwise until it locks onto the syringe barrel.
- Place key into keyhole on the front face of the pump, turn key to the **first** position (Set Mode)



- The pump will now turn on and conduct a self test
- The pump will then ask you various questions which need to be answered using the arrow keys at the bottom of the panel as indicated on the LCD screen.
- The first question is **“NEW PATIENT?”**
  - ➔ **“YES”** to reset the patient history to zero for a new patient
  - ➔ **“NO”** will retain all previous patient history-> It will ask you to **“Confirm”** before you can proceed to the next step.
- **“MODIFY PROTOCOL?”**
  - ➔ Carefully select the protocol. (**“PROTOCOL SUMMARY A”** will appear automatically).
  - ➔ Use the **“Next Protocol”** button to scroll down the protocols until the desired drug protocol appears. This is based on the drug prescribed (morphine or fentanyl) and the child’s weight. For children who weigh more than 50 kg select the relevant adult protocol.

The standard protocols are:

PROTOCOL SUMMARY	PATIENT GROUP	DRUG	DEFAULT CONCENTRATION
PROTOCOL A = ADULT MORPH	Children > 50 kg and adults	Morphine	1 mg/mL
PROTOCOL B = ADULT FENT	Children > 50 kg and adults	Fentanyl	10 microgram/mL
PROTOCOL C = ADULT HYDROM	Children > 50 kg and adults	Hydromorphone	200 microgram/mL
PROTOCOL D = MORPH 3-9kg	Children 3 - 9 kg	Morphine	30 microgram/mL
PROTOCOL E = MORPH 10-19kg	Children 10 - 19 kg	Morphine	100 microgram/mL
PROTOCOL F = MORP 20-49kg	Children 20 - 49 kg	Morphine	200 microgram/mL
PROTOCOL G = FENT 3-9kg	Children 3 - 9 kg	Fentanyl	1 microgram/mL
PROTOCOL H = FENT 10-19kg	Children 10 - 19 kg	Fentanyl	2 microgram/mL
PROTOCOL I = FENT 20-49kg	Children 20 - 49 kg	Fentanyl	3 microgram/mL
PROTOCOL J = SPEC PROG 5mg/mL	Adults only	Tramadol or high dose morphine	5 mg/mL

### SAFETY ALERT

Two RNs must independently check that the correct drug protocol is selected.

- For each protocol summary a **default** drug concentration will appear – for safety reasons this is set as the lowest dose for the lowest weight in the selected weight band. It will need to be modified for most children
  - Once you have selected the appropriate protocol select “**MODIFY PROTOCOL**”.
- To **change** the parameters of the protocol select “**MORE ↓**” until the required parameter is highlighted.
  - When the required prescribed parameter is highlighted, select “**ALTER**”
- Select the + or – button until the correct dose or unit is entered
  - Select “**CONFIRM**”
  - If you need to change any other parameter, repeat the above steps until the protocol matches the prescription
  - Once the protocol has been modified to match the prescription select “**OK**”

### SAFETY ALERT

NEVER change the drug name because the dosing units will stay as for the original drug and may result in over or under dosage

- When the displayed protocol **matches** the PCA prescription turn the key to the green position (Run Mode) and **remove** key.



- “**CONFIRM PROTOCOL**”->Two RNs must carefully review the protocol -> to do this select “**OK**”.
- “**CONFIRM SYRINGE**” The pump will default to the BD PLASTIPAK syringe type, which is the most common stock.->Select “**OK.**”
- If you are using a different type of syringe-> select “**CHANGE TYPE**” until the correct syringe appears ->select “**OK**”
- “**COVER OPEN**” will flash-> **Close** the syringe cover
- **Connect** the giving set to the patient’s IV line and secure appropriately
- **Unclamp** the PCA administration set side-clamp
- **Press** the green “**start**” button located toward the left face of the pump



- **If PCA** is prescribed; give the handpiece to the patient to begin PCA administration and **educate** the patient on it's use.  
The patient handset is suitable for all ages.  
The green light in the handset will indicate the current mode of the pump.  
The light will shine constantly when PCA/NCA doses are available.  
The light will flash when a PCA/NCA dose is being delivered successfully  
The light will be extinguished during the lockout periods after PCA/NCA doses  
The **patient ONLY** should use the handpiece for a **PCA**  
The **nurse ONLY** should use the handpiece for a **NCA**



## 5.2 CHANGING A SYRINGE IN AN ALARIS® IVAC® PCAM® INFUSION SYSTEM

### SAFETY ALERT

Two RNs must independently check any opioid infusion parameters when the infusion is commenced, reloaded, reprogrammed or ceased.

- **Press** the orange “stop” button located toward the left face of the pump



- **Clamp** the PCA administration set with slide clamp
- Obtain Alaris® IVAC® PCAM® key and open the pump cover, remove the old syringe and insert new syringe as per Section 5.1
- **“CONFIRM SYRINGE”** The pump will default to the BD PLASTIPAK syringe type, which is the most common stock -> Select **“OK.”**
- If you are using a different type of syringe -> select **“CHANGE TYPE”** until the correct syringe appears ->select **“OK”**
- **Close** the cover
- **Reconfirm** protocols with 2 RN's as per PCA/NCA prescription (if changes are required return to Section 5.1 re “MODIFY PROTOCOL”)
- **Press** the green “start” button
- **Remove** the Alaris PCAM key directly from the left side of the pump

## SAFETY ALERT

With the second RN, empty appropriately, discard the used syringe and sign the prescription

### 6. PATIENT MANAGEMENT:

Registered nurses are required to complete competency assessments as per Section 1.

- **Prior** to the patient being transferred from the Recovery Unit or ED on a **PCA** the patient should demonstrate competence using the PCA device (This is not applicable for NCA's)
- The accepting ward needs to be **notified** if the patient being transferred is on a **NCA**.

## SAFETY ALERT

The RN assuming patient's care at the beginning of each shift must check the syringe and pump settings against the prescription.

- **Hourly** patient observations are required on commencement of the PCA/NCA.
- After the first **six hours**, the observations are required only every second hour provided the patient remains stable. In the palliative care setting the frequency of observations may be reduced as ordered by the prescriber.
- Patient monitoring and documentation **includes**:
  - Rate of Infusion and Progressive total
  - Number of attempts and successful boluses
  - Sedation Score
  - Pain score (use age-appropriate scale and record the scale used in the first column of the observation section so that all nursing staff will use the same scale for that child)
  - Pulse rate
  - Respiratory rate
  - Pulse oximetry
  - Temperature 4/24
  - BP 4/24
- Patients are to receive **ongoing education** during the period of usage.
- Cannula sites and central lines should be cared for according to Hunter Area Health Service Policy 96/01 and JHCH Guideline 12.1.
- Blood/ Blood products can be infused via a three-way tap positioned at the end of the extension set and prior to the PCA set (refer to JHCH blood/blood product administration procedure number 2.7)
- PCA/NCA devices **should not be** disconnected for convenience or to facilitate showering or mobilization.



### **Pruritus**

May be a direct opioid effect or may be **secondary** to histamine release associated with opioid. Pruritus may not result in redness or a rash.

Actions:

1. Administer antipruritics if charted
2. Contact AMO or APS for medication or if unrelieved

### **Urinary Retention**

Opioids can increase sphincter tone leading to urinary retention. This is **unusual** in children.

Actions:

1. Assess patient; consider bladder scan to ascertain volume or dehydration as cause of anuria
2. Contact AMO

### **Hypotension**

Opioids may induce histamine release and cause peripheral arterial and venous dilation. A decrease in the systolic blood pressure >25% when compared to the normal for age systolic blood pressure is considered hypotension.

Actions:

1. Contact AMO
2. If hypotension is severe (shock) institute life support measures and contact the Medical Emergency Team (MET) as needed.

### **Myoclonic jerks**

Most often the pharmacological mechanisms responsible for this adverse effect are not clear but usually resolve after withdrawal of the offending drug.

Actions:

1. Contact AMO or APS
2. Consider opioid rotation

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## **7. STOPPING AN INFUSION and PLANNING “STEP-DOWN” ANALGESIA:**

- The treating team or APS can cease PCA/NCA regimens.
  - ➔ Replacement oral pain relief should be charted by the MO ceasing the infusion and **commenced** before PCA ceased.
  - ➔ For guidance in making clinical decisions about analgesic drugs and modalities, refer to:  
John Hunter Children’s Hospital Guideline for Managing Acute Pain in Children ([www.kaleidoscope.org.au/docs/GL\\_acutepain.pdf](http://www.kaleidoscope.org.au/docs/GL_acutepain.pdf) )  
or contact the Acute Pain Service  
Anaesthetist: page 2101 (24 hours) Nurse: page 2044 (8am – 430pm, daily)
  - ➔ The PCA/NCA order needs to be clearly cancelled and signed
- **On cessation** of a PCA/NCA infusion:
  - ➔ Ensure oral pain relief **commenced** before cessation of PCA/NCA
  - ➔ Two RN’s **must** witness disposal of the remaining opiate in the syringe and sign the prescription form (Any discrepancy requires reporting as per DOH Circ 01/64. A record of the discarding should be made either in the patient’s notes or on the medication chart.

- ➔ The pump needs to be cleaned and returned to Recovery Ward
- ➔ Pain assessment needs to be ongoing and documented on the 4<sup>th</sup> Hourly observation chart (HSMR46) using the age appropriate scale and the patient's progress notes
- ➔ If pain score >5 and not resolved by replacement analgesia contact the AMO or APS.

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