

EPIDURAL INFUSION-SCH

PRACTICE GUIDELINE[®]

DOCUMENT SUMMARY/KEY POINTS

N.B. The “Sapphire” pump setup instructions in this document can also be used for all regional block infusions

- **Applicable to all clinical areas of SCH**
- Continuous Epidural infusions must be prescribed by a Medical Officer
- Continuous Epidural infusions must be prescribed on the approved Sydney Children's Hospital Continuous Epidural Infusion Chart.
- Only those Registered Nurses who have been assessed as competent in Drug Calculation and completed CSK 13109 Continuous Epidural Infusions can change or supervise the changing of an epidural bag
- Registered Nurses assessed as competent in Intravenous Drug administration may administer bolus doses and intravenous naloxone as per prescribed criteria.
- Naloxone must be available whenever an opioid infusion is in progress.

CHANGE SUMMARY

- Updated document, rescinds previous version.
 - Clarification for calculation of Volume To Be Infused (VTBI) in intermittent mode
 - Recommendation that patients receiving an epidural infusion have an indwelling urinary catheter

READ ACKNOWLEDGEMENT

- Clinical Nurses should read and notify local manager that they have read this document.
- Other staff as determined by local manager should read this document.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1 st March 2017	Review Period: 3 Years
Team Leader:	Clinical Nurse Consultant	Area/Dept: Chronic Pain Service SCH

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1 Introduction

Epidural analgesia can provide good to excellent pain relief with minimal sedation and is especially useful in major surgery. Central local anaesthetic blocks allow blockade of the afferent and efferent sympathetic pathways at relatively low doses resulting in profound suppression of hemodynamic and stress responses to surgery¹. Complications related to epidural infusions are relatively low and so it is a safe and effective method of providing analgesia to children.²

Epidural analgesia provides post-operative pain relief by infusing local anaesthetic and/or opioid drugs into the epidural space following lower limb, pelvic, abdominal or occasionally thoracic surgery.

The epidural space lies between the dura mater, which covers the spinal cord and the ligamentum flavum within the vertebral column. A catheter can be inserted into this space and may be placed in the thoracic, lumbar or caudal regions. Local anaesthetic or opioids injected into this space block the pain impulses travelling from the periphery to the brain.



2 Standard

- The first line managers of epidural infusions are the Acute Pain Service (APS). However the initial and overall responsibility of any given patient with an epidural infusion is the Consultant Anaesthetist who inserted or supervised the insertion of the epidural catheter. If the APS is not available and the responsible Consultant is not available, the Paediatric Anaesthetic Registrar (on call) should be contacted as required.
- Only accredited registered nurses may commence a properly prescribed epidural infusion (usually commenced in Paediatric Recovery).
- Registered nurses who have been assessed as competent may care for a patient with an epidural infusion, change epidural infusion bags or give boluses as per the prescription/guideline.
- Registered nurses who have been assessed as competent may remove epidural catheters in the presence of another registered nurse.
- Medical officers (MO) of the Department of Anaesthesia and Pain Management or Palliative Care Service can prescribe epidural infusions.
- Naloxone must be available on the ward whilst epidural infusions that contain an opioid are in progress.
- The epidural line must be clearly identified with an epidural label as per http://www0.health.nsw.gov.au/policies/pd/2012/pdf/PD2012_007.pdf
- The epidural infusion bag must be changed at least once every 24 hours.

- Verbal consent from either the patient or parents must be obtained prior to epidural insertion, by the responsible anaesthetist and documented on the anaesthetic chart or in the patient's notes.

3 Outcomes

- Continuous Epidural Infusions administered in a safe, effective manner by accredited Registered Nurses
- Patient achieves an optimal level of analgesia.

4 Guidelines

- The decision that the patient is a suitable candidate for continuous epidural infusion should be made pre-operatively in consultation with medical, nursing staff and the patient/parents.
- The patient/parents should receive pre-operative information on continuous epidural analgesia and explanation of the need for nurses to attend to specific observations at regular, selected intervals.
- All patients with continuous epidural infusion must have intravenous access.
- Chronic pain patients who are receiving a long term epidural infusion, after consultation with the Acute Pain Service (APS) and assuming they are stable may have their cannula removed after 2-3 days.
- It is recommended that patients receiving an epidural infusion have an indwelling urinary catheter
- No drugs except the prescribed local anaesthetic +/- opioid mixture are to be injected into the epidural catheter. In specific cases alpha receptor agonists such as clonidine may be added to the infusion.
- A bacterial filter is to be insitu at the end of the epidural catheter at all times.
- Clean ports using standard ANTT procedure and ensure ports are dry before reconnecting. Standard 2% chlorhex. in 70% alcohol wipes are satisfactory
- No other opioid is to be administered to the patient whilst they are receiving epidural opioids, except as specifically ordered for ventilated patients in the Intensive Care Unit.
- Some patients may occasionally require Oxygen be delivered via nasal prongs until the morning after surgery (to be prescribed by the Anaesthetic Consultant as required).
- All patients with continuous epidural infusions will require observations as per "patient monitoring and observations".
- All prescriptions must be recorded on the approved Area epidural/regional infusion chart.
- Only standard epidural extension sets without injection ports are to be used.

- The insertion site for the catheter must be checked once a shift and prior to bolus administration for any signs of leakage, infection or bleeding. Notify Acute Pain Service if any problems arise and document the findings in the medical record.
- Epidural dressing is to be left intact, if the dressing becomes loose the dressing should be **reinforced and not removed (unless heavily soiled in which case contact APS)**.
- Epidural analgesia is to be administered as a continuous infusion via the designated epidural infusion pump (Hospira Sapphire).

5 Monitoring

Patient monitoring and documentation will be as follows:

- Respiratory rate
 - Saturations
 - Pulse rate
 - Pain score (appropriate tool for age)
 - Sedation Score (see prescription chart)
 - Rate of Infusion/Cumulative total
 - Temperature and Blood Pressure 4 hourly
- Every hour for the duration of the infusion
- *"Clinically significant decreases in blood pressure are seldom seen in children younger than 8 years of age"*³
 - Epidural insertion site should be checked each shift and whenever the patient is moved/turned in bed.
 - Motor Block Level (see prescription chart)
 - Hourly for first eight (8) hours then 4th hourly if score ≥ 4 (Motor block must be assessed 1 hour after clinician-initiated bolus/stat bolus)
 - If score = 1: STOP INFUSION. Call for **BTF Clinical Review**
 - If score = 2: STOP INFUSION. Reassess after 1 hour. If no improvement after 1 hour, call for **BTF Clinical Review**. If Motor Block Score ≥ 3 after 1 hour, restart infusion.
 - If score = 3: Monitor hourly.
 - If score ≥ 4 : Continue usual monitoring as above.
 - Palliative care patients may only require 2-4 hourly documentation of observations or as appropriate to circumstances

Note: Pain/Sedation scores & Infusion totals to be recorded on Pain Management Continuation charts. All other Observations to be recorded on age appropriate SPOC.

6 Standard Orders

(As per the epidural infusion prescription chart)

6.1 Ordering

(By a MO from the Department of Anaesthesia and Pain Management only)

The prescriber must:

- Place the patient's identification label onto the epidural infusion chart and sign
- Complete the prescription for the infusion and bolus doses
- Sign and date prescription for Normal Saline fluid challenge and Naloxone
- Anti-emetics are to be ordered on the hospital medication chart
- Order systolic blood pressure limits and insert contact page numbers.

6.2 Standard Continuous Epidural Infusion Prescription For Children

6.2.1 Ropivacaine 0.2% (2mg/mL) WITH or WITHOUT Fentanyl 2microg/mL ⁴

Infants and Children 0 – 18 years:
Starting rate: 0.2mL/kg/hr
Maximum rate: 0.4mL/kg/hr
Bolus usually 0.2mL/kg (or current infusion rate)

6.2.2 Clonidine

- May be prescribed in selected cases and added to the above solutions in the concentration of 0.75 micrograms per mL.^{5,6}
- Each 1 mL ampoule of clonidine contains 150 micrograms.
 - Therefore 0.5 mL or 75 micrograms should be added to a 100 mL polybag of ropivacaine or ropivacaine/fentanyl epidural infusion solution.
 - This addition must maintain an aseptic technique.

6.3 Adjunctive Analgesia

Patients receiving a continuous epidural infusion may also require additional analgesia:

- Ketamine infusions may be administered via the IV or Sub-Cut route with all epidural infusion solutions.

- Intravenous and enteral opioids can only be administered when the epidural infusion solution **DOES NOT CONTAIN FENTANYL (OR ANY OTHER OPIOID)**.
- Paracetamol can be administered via either the intravenous and enteral routes with all epidural infusion solutions.
- NSAIDs can be administered during an epidural infusion, but is not recommended if the patient is receiving any other anti-thrombotic therapy such as Low-Molecular Weight Heparin or Warfarin. ⁷

7 Complications

7.1 Respiratory Depression

A fall in respiratory rate is a late sign of respiratory depression. Strict hourly monitoring of patient as per protocol is essential to detect this sign of respiratory depression.

- **Management:** Determined by respiratory rate.
 - If respiratory rate ≤ 8 in patients aged 10 years and older
 - If respiratory rate ≤ 14 in patients aged <10 years
 - If respiratory rate ≤ 20 in patients aged < 1 year
- **Action: Stop infusion**
 - **Give oxygen**
 - **Activate BTF Clinical Review call**
- **Increase frequency of Observations to every 5 minutes until medically assessed and/or respiratory rate improves.**
 - If respiratory rate ≤ 5 in patients aged 10 years and older
 - If respiratory rate ≤ 10 in patients aged < 10 years
 - If respiratory rate ≤ 15 in patients aged < 1 year
- **Action: Stop Infusion**
 - **Check vital signs**
 - **Give oxygen by mask**
 - **Activate Between the Flags Rapid Response call**
- **If there is an Opioid in the Epidural Solution then:**
 - **Administer IV Naloxone 5 micrograms/ kg to a maximum of 4 doses (as per Epidural Chart).**
 - **If no response to first dose reassess vital signs for need of CPR.**
- **REASSESS and REPEAT THIS DOSE EVERY 5 MINUTES UNTIL RESPIRATORY RATE GREATER THAN 10.**

- **Increase frequency of Observations to 5 minutely until patient has been medically assessed even if Respiratory rate improves.**
- **Note: *Naloxone has a relatively short half-life respiratory rate may drop again even though infusion has been ceased.***

7.2 Over Sedation

A decreasing level of consciousness develops gradually with opioid overdose and may provide earlier warning of impending overdose than the respiratory rate.

- **If sedation score \geq 4:**
 - **Stop infusion**
 - **Check vital signs and increase frequency of observations**
 - **Give oxygen**
 - **Activate Between the Flags Rapid Response call**

7.3 Dense Motor Block

- **Motor block Score (Modified Bromage Scale)**
 - If score = 1: **STOP INFUSION.** Call for **BTF Clinical Review**
 - If score = 2: **STOP INFUSION.** Reassess after 1 hour. If no improvement after 1 hour, call for **BTF Clinical Review.** If Motor Block Score \geq 3 after 1 hour, restart infusion.
 - If score = 3: Monitor hourly.
 - If score \geq 4: Continue usual monitoring.

7.4 Facial Numbness or Facial Twitching

- **Stop infusion Administer Face Mask Oxygen, activate Between the Flags Clinical Review call, and where possible sit the patient up.**

7.5 Large amount of Leakage of Blood or Fluid at Insertion site

- **Contact APS/ Anaesthetist on-call.**

7.6 Urinary Retention

- **Activate Between the Flags Clinical Review call.**

(note: most patients receiving epidural infusions will need an in-dwelling urinary catheter)

7.7 Nausea or Vomiting

- **Give prescribed anti-emetics (as per NIMC) if none prescribed or vomiting persists activate BTF Clinical Review call.**

7.8 Inadequate Pain Relief

- **Assess the level of the block**
- **Assess motor function**
- **Give clinician initiated bolus dose** (if prescribed- refer to [Section 8.5 Clinician Initiated Bolus Dose](#))
- **Reassess Pain, Block and Motor function 15mins after bolus**

7.9 Unwitnessed disconnection

- If disconnection occurs below bacterial filter (i.e. yellow infusion tubing only becomes disconnected and bacterial filter remains attached to epidural catheter):
 - Change bacterial filter using standard ANTT and replace line and infusion bag as per Section 8 Commencement of Continuous Epidural Infusion
 - Replacement lines and bacterial filters are stored in Paediatric Recovery Department
- If disconnection occurs above bacterial filter (i.e. epidural catheter is disconnected from bacterial filter)
 - Epidural **must be ceased and catheter removed** to prevent infection
 - Notify APS or Anaesthetics
 - Alternative analgesia or optimisation of current IV/PO analgesia may be required

8 Commencement of Continuous Epidural Infusion

- All Epidural infusions are to be administered using the Hospira Sapphire Pump
- Position the pump in an upright position by attaching the pump to an IV pole using the lock box cradle
- 100 mL polybag of Ropivacaine 0.2% +/- Fentanyl 2microg/mL is checked by two Registered nurses and connected to the epidural giving set
 - Open the sterilized administration set package
 - Close the clamps and the Anti-Free Flow Valve to block the administration set (see picture showing AFFV in closed position)
 - Spike the administration set into the container
 - Make sure there is no leakage from the container, and that the spike is firmly attached to the container.



Turning on the Pump

- The pump is turned on by pressing the On/Off hard key, at the lower right corner of the pump (red circle in picture to left).

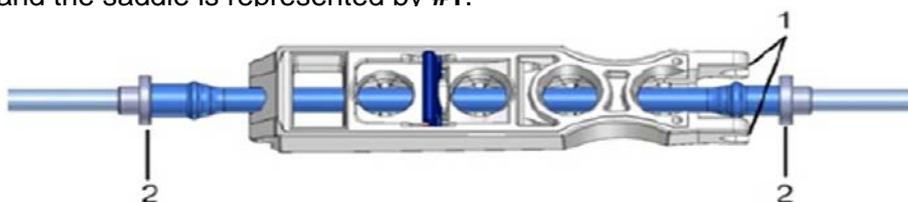
Opening the Door

- Opening the safety door involves pressing down on the gray button while simultaneously pulling the safety door open.
- Using your thumb, press the gray button inwards
- While maintaining pressure on the gray button, swing the safety door outwards.

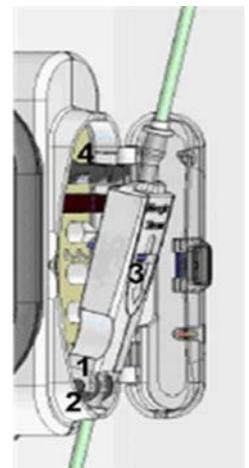


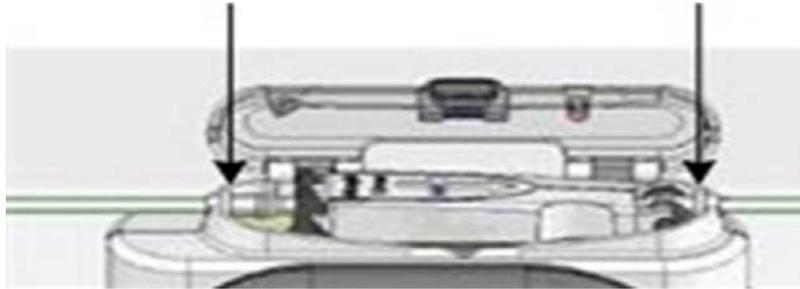
8.1 Inserting the Administration Cassette

- Inserting the administration cassette into the pump involves positioning the cassette in the proper direction, and ensuring that all portions of the cassette, including the flanges, are secured inside the administration cassette's housing.
- In the Figure below the flanges (one on either end of the cassette) are represented by **#2**, and the saddle is represented by **#1**.



- Insert the administration cassette at an angle, by placing the saddle (**#1**) on the round metal anchor (**#2**) in the cassette's housing.
- Make sure that the arrow on the cassette (**#3**) is pointing toward the bottom of the pump.
- Clip the upper end of the administration cassette into the metal locker (**#4**).
- Make sure the flanges are positioned on both sides of the administration cassette, and are inside the administration cassette housing.



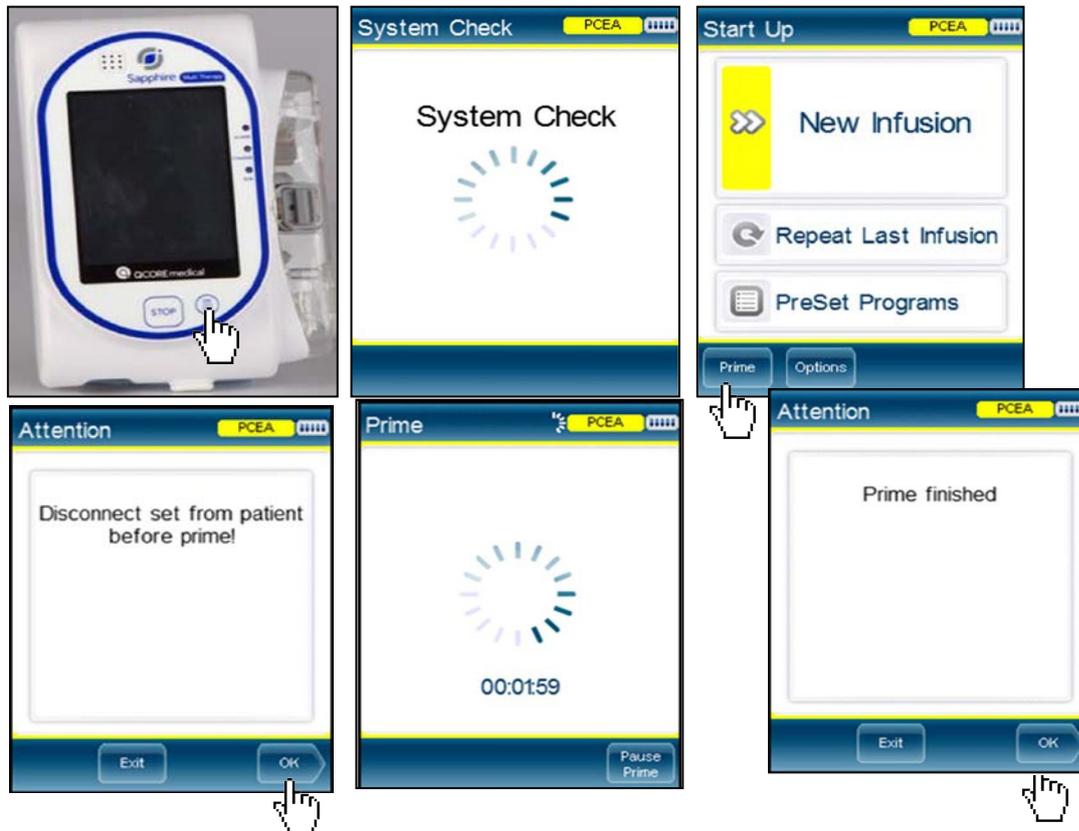


- Close the safety door over the administration cassette
- Ensure that the safety door clicks upon closure.
- **Before commencing infusion setup, the administration set needs to be primed**
 - Priming expels all the air from the administration set, and fills it with the infusion liquid.
 - A fully primed administration set is a set filled with infusion liquid (from which all the air was removed).

8.2 Priming the set

- Priming with the pump can be initiated from the following screens
 - Start Up
 - Start
 - Paused (infusion or bolus)
 - Air in Line Alarm
- Before using the pump for priming, ensure that
 - The administration set clamp is open.
 - The Q Core administration cassette is properly connected to the pump.
 - The safety door is closed.
- **Before priming, verify that the administration set is disconnected from the patient.**
- From the toolbar of the Start Up, Start, Air in Line Alarm, or Paused screen, press **Prime**.
 - **Verify that the administration set is disconnected from the patient**
 - Then, from the Attention screen, press **OK**. Priming begins
 - While the pump is priming, a progress circle appears on the screen, with a time countdown displayed.
 - The default priming time is 2 minutes
- During priming with the pump, air and occlusion detection alarms are inactivated
- While priming, check that the supply line is open and that there is no occlusion
- Ensure that liquid, not air, enters the administration set during priming.
- The pump automatically indicates when priming is finished

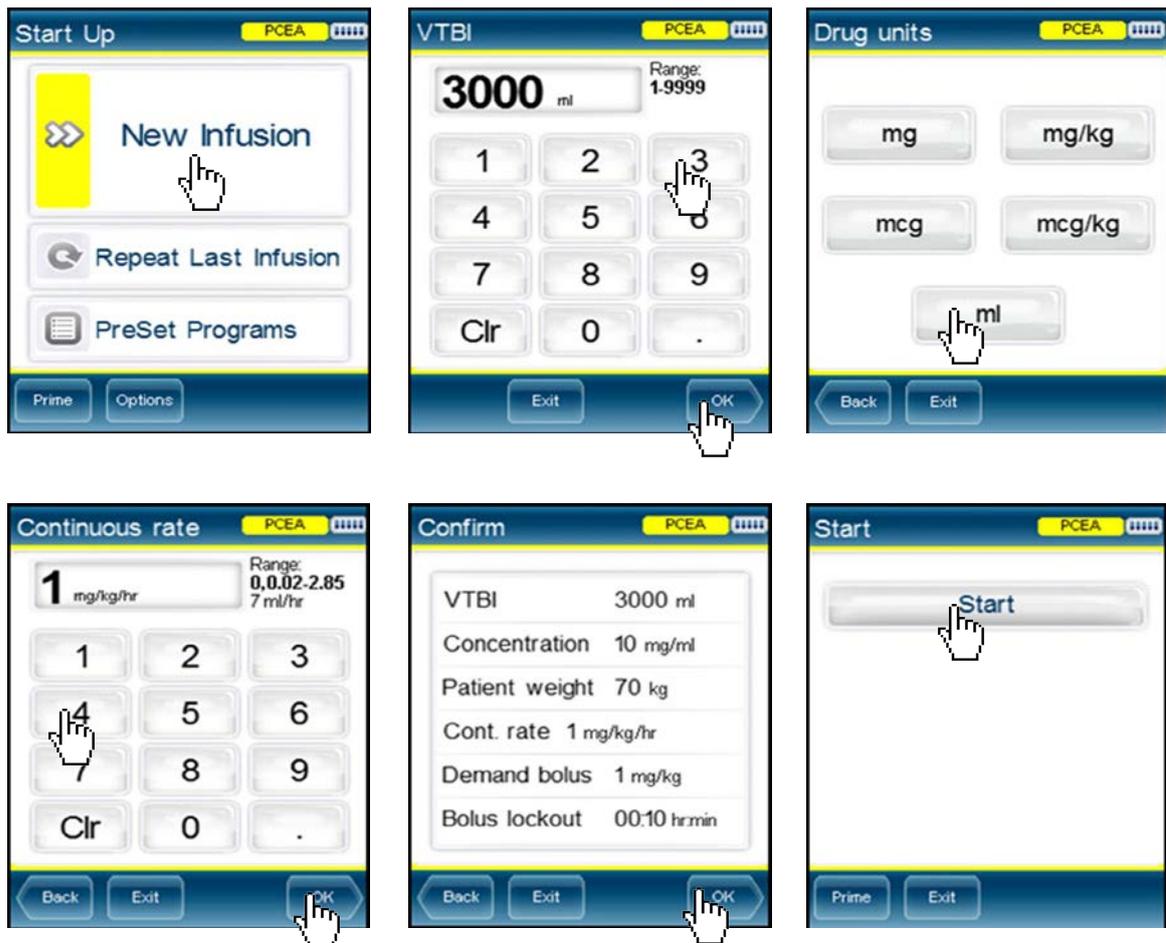
- Clean ports using standard ANTT procedure and ensure ports are dry before reconnecting. Standard 2% chlorhex. in 70% alcohol wipes are satisfactory



8.3 Programing the Pump

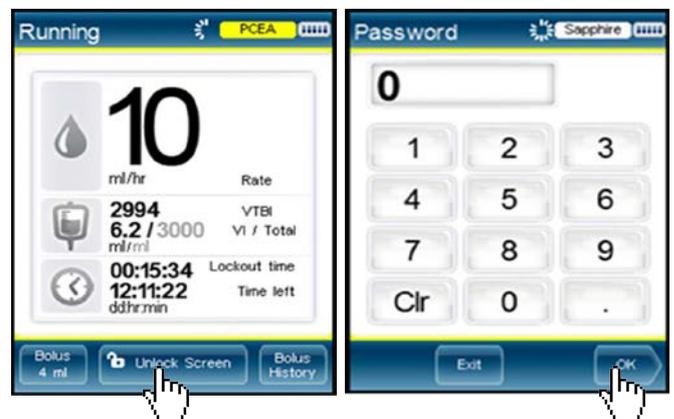
Once the pump has finished its prime:

- Select new infusion
- Enter volume to be infused (ie the size of the bag that you are hanging)
- **Recommended VTBI=95mL this will prevent the bag fully emptying and letting air into the set**
- Select ml on the Drug Units Screen
- Enter infusion rate as per prescription
- Check program is correct on confirm screen
- Connect set to the epidural catheter at the filter
- Open all clamps
- Select start
- Once Start is pressed the Pump will automatically lock



8.4 To Unlock the Pump

- The pump is automatically locked when started
- To set or change the infusion rate, an access code is required to unlock the pump
- Press to Unlock Patient
- Enter code 7770
- OK
- Authorization set to high level- OK

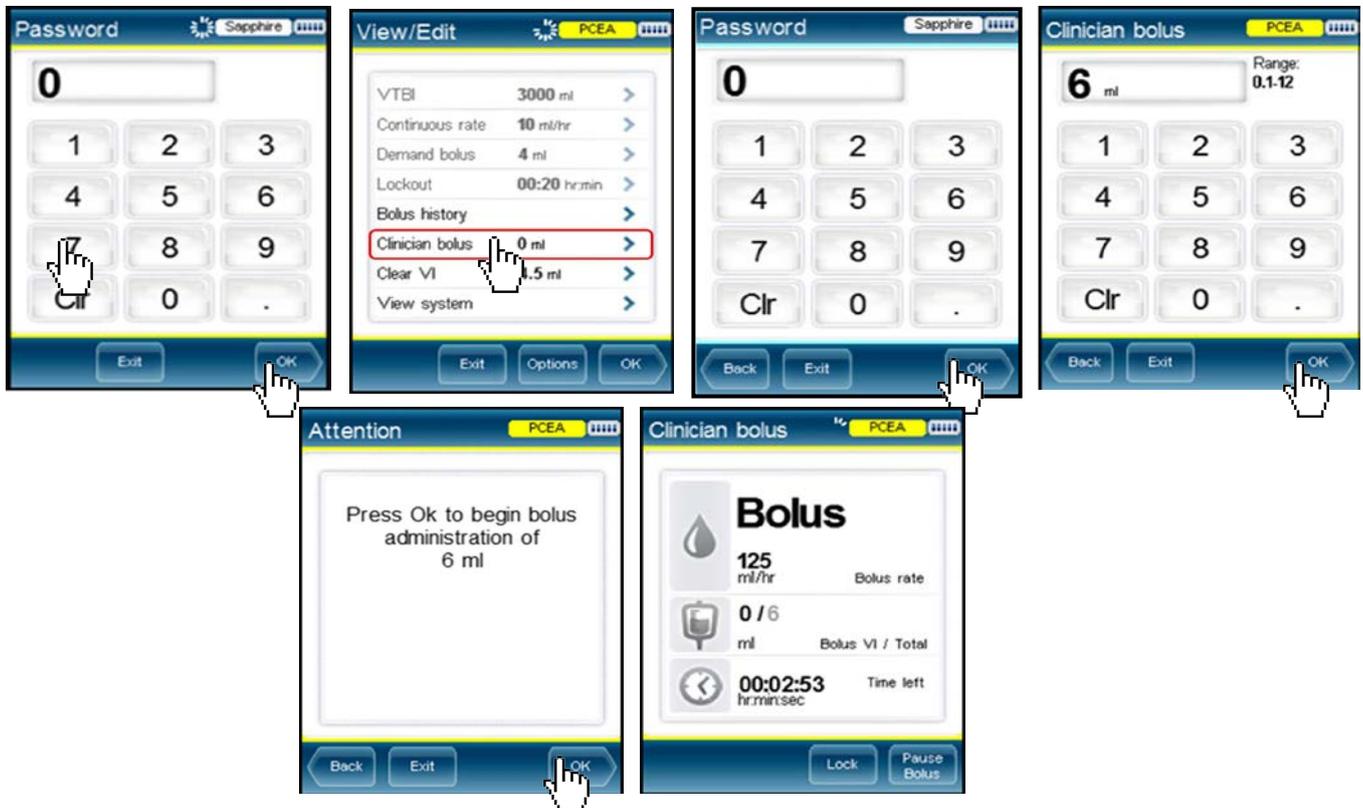


8.5 Clinician Initiated Bolus Dose

If the patient's pain control is inadequate patient then appropriately trained staff can give a bolus via the epidural infusion pump

- Unlock the Pump
- From the “Running” screen select View/Edit
- Select Clinician Bolus

- Enter the password (same as for lock screen)
- Enter volume to be given as per prescription
- Press OK at confirmation screen after checking the dose is correct
- Pump will return to the infusion program at the end of the bolus (about 5 seconds)
- Please note some screenshots may vary slightly from the pump screen layout



8.6 Changing the Program

If the epidural rate is too low i.e. the patient has required 2 or more bolus doses in the previous 3 hours, then, after consultation with the APS or anaesthetist the rate can be increased up to a maximum of 0.4mL/kg/hr (0.2% Ropivacaine). **This change requires the prescription to be altered by the prescribing doctor and should not happen as a telephone consult or order.**

- Unlock the Pump
- From running screen select Pause Button
- Press ok to pause
- Can press STOP hard key to pause
- On the pause screen touch the rate panel
- Alter rate as per new prescription
- OK
- Continue
- Press OK to Continue

"STOP" hard key





8.7 Changing the Bag

When infusion complete (bag is empty)

- Pump will alarm 10 minutes before end of infusion (VTBI)
- Pump will alarm and stop infusing once VTBI is reached
- Press Mute
- Open Lock Box using grey handle
- Change Bag
- Close Lock Box
- Unlock Pump
- Repeat Last Infusion
- Confirm Program-OK
- Start

8.8 When 24 hours is up and VTBI has not been reached

- Unlock Pump
- Pause
- Press Ok to Pause Delivery - OK
- Quit
- Warning Screen - OK
- Repeat last infusion
- Confirm program- OK
- Start

8.9 Turning off the pump at end of use

- Unlock Pump
- Pause
- Quit
- Warning Screen - OK
- On/Off hard key
- Off
- Remove set and dispose of appropriately

9 Intermittent Mode

- Intermittent mode allows for the prescriber to administer bolus doses at a set interval e.g. every 4 hours this can be done with or without a background or KVO rate. This is most commonly used with paravertebral or TAP blocks but can be used with epidurals as well.

9.1 Calculating total dose for Ropivacaine

Range for Ropivacaine 0.2% is 0.2-0.4 mls/Kg/Hr
To calculate dose divide total bolus dose by hourly interval and divide by weight to get mls/Kg/Hr

Eg a 10kg child receiving 12ml bolus every 4 hours
 $(12 \div 4) \div 10 = 0.3 \text{ mls/Kg/Hr}$

NB: if there is a background KVO rate this will need to be included in the calculation.

To calculate dose multiply the KVO by the hourly interval and add to the bolus dose, divide this total by hourly interval and divide by weight to get mls/Kg/Hr

E.g. a 10kg child receiving 12ml bolus every 4 hours with 1ml/hr KVO rate
 $((1 \times 4) + 12) \div 4 \div 10 = 0.4 \text{ mls/Kg/Hr}$

9.2 Calculating Volume to be Infused (VTBI)

Without background KVO rate

Note: To ensure the infusion bag does not empty mid-bolus the VTBI must not exceed the maximum number of whole boluses in 90mls

Step 1) Calculate the number of whole boluses in 1 bag

$$\frac{90\text{mls}}{\text{Bolus Volume (a)}} = \text{Number of boluses in 1 bag (b)}$$

(*must be a whole number, round **down** if a decimal)

Step 2) Calculate VTBI = bolus volume (a) x number of whole boluses (b)

e.g. A child prescribed 12ml Bolus every hour =

Step 1)

$$\frac{90}{12} = 7.8 = 7 \text{ whole boluses}$$

Step 2) **VTBI** is 12 x 7 = **84mls**

With background KVO rate

Note: To ensure the infusion bag does not empty mid-bolus the VTBI must not exceed the maximum number of whole boluses + KVO volume/hr in 90mls

Step 1) Calculate total hourly volume = hourly bolus (a) + KVO (h)

If boluses are prescribed >1 hourly
(h) = KVO x interval duration

Step 2) Calculate the number of whole hours volume in 1 bag

$$\frac{90\text{mls}}{\text{Hourly Volume (a + h)}} = \text{Number of boluses + KVO in 1 bag (b)}$$

(*must be a whole number round **down** if a decimal)

Step 3) Calculate VTBI = hourly volume (a+ h) x number of whole boluses (b)
VTBI = (a + h) x (b)

e.g. A child prescribed 12ml Bolus every hour with KVO of 1mL/hr =

Step 1) 1x1 = 1 (h)

Step 2)

$$\frac{90}{(12+1)} = \frac{90}{13} = 6.9 = 6 \text{ whole boluses (b)}$$

Step 3) **VTBI** is 13 x 6 = **78 mls**

9.3 Intermittent Mode Setup

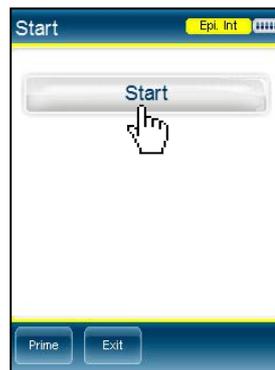
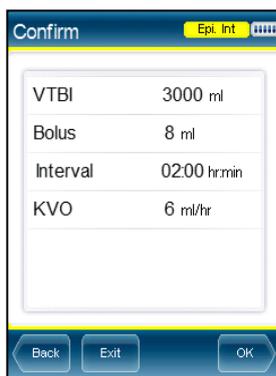
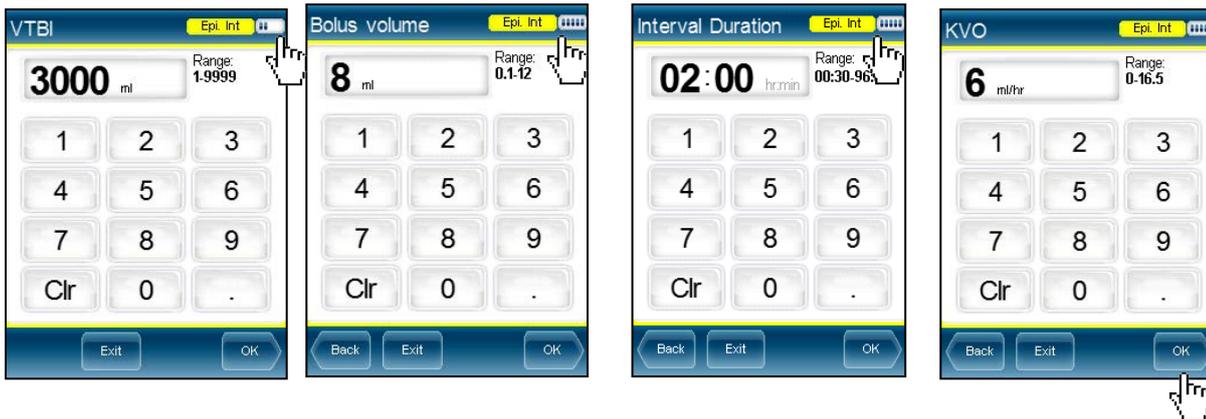
- Turn on pump and insert set and prime as per sections 8-8.2 above
- Once the pump has finished its prime select Options
- Select Delivery Mode
- Enter Pass Code 7770



- Select Epidural Mode
- Select Intermittent Mode
- Select New Infusion



- Program the VTBI (Volume to be Infused) See Calculations above
- Program the Bolus Volume as prescribed
- Program the Interval Duration as prescribed
- Set KVO rate (if any)
- Confirm
- Press Start



Note: If a manual bolus is being given at commencement of the infusion, you may set a time delay for the delivery of the first automated bolus.

- To change bag or change program or end Intermittent Infusion
- To change Bag when VTBI has been reached see section 8.6
- When 24 hours is up and VTBI has not been reached see section 8.7
- To change Program see section 8.8 to unlock pump then follow section 9.3 instructions
- To end infusion see section 8.9

10 Removal of Epidural - Procedure

- If the patient has been receiving any form of anti-coagulant therapy (for example: Warfarin, Clexane or Heparin) the timing of epidural catheter removal is critical.
 - Please check with the Acute Pain Service
- The epidural can only be removed by an accredited RN after instruction by a member of the Acute Pain Service
- Identify correct patient for removal of catheter
- Give clear and relevant explanation to patient/parents
- Request assistance of another registered nurse
- Wash hands and wear non-sterile protective gloves
- Position patient on side with spine slightly flexed

- Turn epidural infusion pump off (as above)
- Remove all tape and dressings
- Inspect catheter site for leakage, infection or bleeding
- Gently withdraw epidural catheter until completely removed
- Catheter should slide out easily - any more than slight resistance **STOP** and call a member of the Acute Pain service/Anaesthetics
- Clean insertion site with an antiseptic swab if dried blood or soiled. Apply adhesive strip
- Inspect catheter tip for intactness with a second Registered nurse
 - There should be a blue tip on the catheter
 - If in any doubt catheter to be kept and a member of the Acute Pain Service notified
- Dispose of catheter and dressings
- Record catheter removal and intactness on approved Hospital Continuous Epidural Chart

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