

WOMEN'S AND CHILDREN'S HOSPITAL

**CHILDREN'S
ACUTE PAIN MANAGEMENT
HANDBOOK**

**Acute Pain Management Service
Women's and Children's Hospital
72 King William Rd
North Adelaide, South Australia 5006
Phone (08) 8161 7231
Fax (08) 8161 7020**

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1. INTRODUCTION

The purpose of this handbook is to assist with the education of hospital staff in the commonly available methods of acute pain relief for children at the Women's and Children's Hospital.

It is intended to be a guide which medical and nursing staff can refer to when assessing pain and prescribing and managing pain relief in children. Further information can be obtained by referring to references cited in Section 6, Further Reading.

It is not intended to be exhaustive or to restrict the way individuals practice but children admitted to hospital may benefit from a more co-ordinated approach to pain management. We encourage parent teams to be involved in the management of their own patients as much as possible.

The Acute Pain Management Service is available for advice and/or management of all types of acute pain and cancer pain. Paediatric consults should be directed to the Pain Management Clinical Nurse Consultant (pager 4302) or the Duty Paediatric Anaesthetist (Page 3643).

This handbook will be updated as necessary and suggestions would be welcome. They should be addressed to the Acute Pain Management Service, Department of Paediatric Anaesthesia or the Pain Management Clinical Nurse Consultant.

2. PRINCIPLES OF PAIN ASSESSMENT AND ANALGESIC ADMINISTRATION IN CHILDREN

There are some major differences in pain assessment and methods used to treat pain in children compared with adults which may not be readily appreciated by medical and nursing staff who rotate from adult hospitals.

Some general principles apply in children:

1. Pain assessment must take into account the developmental stage and verbal ability of the individual child. The WCH Children's Pain Assessment Tool provides a flow chart and three pain assessment scales, the FLACC® Scale, Smiley Faces Scale and Visual Analogue Scale, conveniently on one chart readily available in each child's bedside medication folder. Pain assessment should be performed regularly for children according to their individual requirements as well as the analgesic technique chosen.
2. Paediatric analgesia needs to be calculated on a **mg/kg** basis and these dosages need to be rounded off to make volume and tablet calculations easy.
3. **Children don't like intramuscular (IM) injections** and they should not be used unless special circumstances exist. Problems include that IM injections are unpredictable in their absorption and onset of action, largely ineffective and many children will deny having pain to avoid injections. **Intravenous and oral** are the preferred methods of administration.
5. **Techniques** such as **Entonox, Patient-Controlled Analgesia (PCA), Intravenous Infusions, Epidural and other nerve block techniques, and Subcutaneous Infusions** are freely available and should be used if indicated.
6. Pain is best **prevented** rather than treated. Requirements for analgesics are lower if children are allowed to wake up comfortable following surgery or are **pretreated** before painful procedures.
7. **Severe pain** is best treated with **continuous** methods of analgesic administration (eg. infusions, PCA) or long acting drugs such as the slow-release morphine and oxycodone preparations. **Mild pain** can usually be controlled with intermittent intravenous opioid bolus dose administration or a combination of an oral opioid and simple analgesics.
8. **Neonates** and some premature infants (up to 52 weeks post-conceptual age) may be sensitive to opiates. Drugs such as morphine may have a considerably increased elimination half-life. If neonates require opiate analgesia, then the case should be discussed with the consultant involved **or** the Department of Paediatric Anaesthesia.
9. Hospital approved **protocols** are available for all of the common methods and are included in this handbook.

3. COMMON METHODS USED AT THE W.C.H.

3.1 Simple analgesics:

Paracetamol is a simple analgesic and antipyretic drug which is useful for all types of mild pain. Regular dosing in addition to opioids can be opioid-sparing, reducing the potential for opioid-induced side-effects.

Preparations: Tablets 500mg
Syrup 120mg/5ml
Suppositories 60, 125, 250 & 500mg
Drops 100mg/ml

Dosage: **Initial Loading dose:** Oral: 20mg/kg or rectal: 40mg/kg
Maintenance: Oral or rectal: 15-20mg/kg/dose 4hrly prn.

*** Do not exceed 90mg/kg or 4gm/24hrs (if weight > 45kg).

Nonsteroidal Anti-inflammatory Drugs (NSAIDs) also provide antipyresis and analgesia. They can be used alone for mild pain or in combination with paracetamol and/or opioid analgesics for more severe pain. Ibuprofen is most commonly used in children for post-operative analgesia.

Ibuprofen:

Preparations: Tablets 200mg and 400mg
Suspension 100mg/5ml

Dosage: 5-10mg/kg/dose 6 to 8 hourly

Naproxen:

Preparations: Tablets 250mg

Dosage: 3.5-5mg/kg/dose 12 hourly

Piroxicam:

Preparations: Capsules 10 and 20mg
Dispersible Tablets 10mg

Dosage: 0.2-0.3 mg/kg once daily

3.2 Immediate-release Oral Opioid Analgesics:

Codeine is a partial agonist opioid which can be useful as an oral analgesic. Note that it may not be effective in up to 10% of patients with genetically determined deficiency of CYP2D6 enzyme (metabolizes codeine to morphine in the liver).

Preparations: Tablets 30mg
Syrup 20mg/5ml

Dosage: 0.5 - 1.0 mg/kg/dose 4 hrly prn

*** Do not administer intravenously (may cause severe hypotension)

Oxycodone is a full agonist which is available in tablets, capsules and syrup:

Preparations: Tablets/Capsules 5mg
Syrup 5mg/5ml

Dosage: **Oral:** 0.2 - 0.3mg/kg 4hrly prn

Morphine is a full agonist which is available in tablets or syrup:

Preparation: Tablet 30mg
Syrup 5mg/ml

Dose: 0.2-0.5mg/kg/dose 4hrly prn

3.3 Slow Release (SR) Opioid Formulations

There are several oral slow release formulations of commonly used opioids now available. SR formulations are administered regularly 12 hourly, very occasionally 24 hourly. In addition, a prescription for a dose of the immediate release formulation of the same drug equal to 1/6 of the total daily SR dose, should be ordered 4 hourly as needed for breakthrough pain.

Commonly used formulations at WCH are:

OxyContin® (slow release oxycodone)

Preparation: Tablet 10, 20, 40mg

Note: consists of an outer shell of immediate release oxycodone and an inner core of slow release oxycodone. **Do not break, crush or chew.**

Do not give breakthrough immediate release oxycodone at the same time as the OxyContin dose.

Dosage: Oral: 0.6-0.9mg/kg/dose 12hrly

MS Contin® (slow release morphine):

Preparations: Sachets 20mg (do not break, crush or chew)

Tablets 5, 10, 30, 100mg

Note: no immediate release outer shell, all of dose is slow release so a breakthrough dose can be given at the same time as MS Contin dose.

Dosage: Oral: 0.6mg/kg/dose 12 hourly

*****N.B. Similarity of names: MS Contin, OxyContin and oxycodone*** Care must be taken not to mix up these drugs when prescribing and administering them**

Kapanol (slow release morphine)

Preparations: Capsules 10, 20, 50, 100mg

Note: Slow release pellets inside capsule. Capsule may be opened and pellets sprinkled on soft food. Pellets must not be chewed.

Dose: Oral: 0.6mg/kg/dose

3.4 Compound Analgesics:

Painstop Day is a combination of paracetamol and codeine.

It is useful as an oral analgesic when paracetamol alone is insufficient.

Preparation: Syrup (paracetamol 120mg/5ml and codeine 5mg/5ml)

Dosage: Calculated on paracetamol 15-20mg/kg and codeine 0.6-0.9mg/kg per dose 4hrly prn with a maximum of 5 doses per 24 hours.

3.5 Tramadol

Tramadol is a unique analgesic that exerts mild effects at opioid receptors as well as having activity at noradrenergic and serotonergic receptors. It is useful for treating moderate to severe pain as part of multimodal analgesia and as an alternative to Panadeine Forte. Use with caution in patients with history of seizures and in combination with drugs that lower the seizure threshold (increased risk of seizures) or increase serotonin levels (risk of serotonin syndrome).

Preparation: Capsules: 50mg

Capsules 50 and 100mg Slow Release tablets

Injection: 100mg/2ml

Dosage: Oral: 1-2mg/kg/dose 4 hrly to max 400mg/day (include any SR dose)

Infusion: see Protocol Section 4.2

3.6 I.V. Opioid Boluses

These are most suitable for children having **minor surgery** or who are experiencing mild to moderate pain which is expected to be short-lived. For more severe pain or for periods greater than 1-2 days, PCA or Infusions should be used. (See Protocol Section 4.1)

3.7 I.V. Infusions

IV Infusions provide suitable analgesia for children who are likely to experience moderate to severe pain such as following major surgery or who are likely to experience pain for more than 1-2 days. They are prescribed on "Intravenous Opioid Infusion" order sheets. Appropriate syringe pumps for this purpose are available on the wards or Rogerson Theatres Recovery area. (See Protocol Section 4.2)

3.8 Patient-Controlled Analgesia (P.C.A.)

PCA is suitable for the management of many types of acute pain in school-aged children (> 5 yrs). It has the advantage of involving the patient in their own care, is extremely safe and is economical with respect to medical and nursing staff time. It is prescribed by the Department of Paediatric Anaesthesia and requests should be directed to the Acute Pain Management Service or the Duty Paediatric Anaesthetist (See protocol section 4.3).

3.9 Local Anaesthetic Procedures

Many children undergoing surgical procedures are able to wake up pain free by the simple use of local anaesthesia. This can be either as wound infiltration (**Max dose of bupivacaine 0.25% or ropivacaine 0.2% is 1.2ml/kg**) or local anaesthetic blocks (eg caudals, femoral nerve blocks) done at the time of surgery. The duration of these blocks is several hours and attention to ongoing analgesia after the local anaesthetic has worn off is important. Continuous epidural techniques are available for selected cases (*See protocol section 4.4*).

3.10 Entonox

Entonox is a mixture of 50% Nitrous Oxide in Oxygen. It is used in school-aged children to provide potent analgesia for painful minor procedures. The major benefits of using entonox are its speed of onset, quick recovery and its ease of administration. Entonox apparatus is readily available in Newland ward, Paediatric Accident and Emergency and Ronald McDonald House (*See protocol section 4.5*).

3.11 EMLA Cream/Angel Gel

The insertion of intravenous cannulae is potentially very distressing for children. Some of the pain and distress is reduced by using the topical local anaesthetic designed for this purpose, either EMLA (mixture of 5% Lignocaine and 5% Prilocaine) cream or Angel (amethocaine 4%) gel. EMLA needs to be applied **at least one hour beforehand**. It can be left on. We recommend caution in children aged less than 3 months because of the possibility of methaemoglobinemia from the prilocaine component. Angel gel needs to be applied 30 minutes beforehand and **removed after 1 hour maximum**.

3.12 Midazolam

Midazolam is a short-acting benzodiazepine which is used intravenously to provide rapid onset of sedation, anxiolysis and amnesia. It is administered orally or intranasally as premedication before procedures. **It does not provide analgesia**. Intravenous administration is usually by Anaesthetists or medical staff in the PICU or Emergency Department. Oral administration may be used in the wards. The intranasal route has a faster onset (10 minutes) but can cause stinging.

Dose: Oral: 0.5mg/kg/dose (**maximum of 15mg**)

Intranasal: 0.2-0.4mg/kg/dose

4.1 PROTOCOL: INTERMITTENT I.V. OPIOIDS:

This technique of analgesia is suitable for **minor** surgery where there is a need for short term intravenous analgesic therapy. If more than 3 boluses are required, an intravenous infusion or PCA should be considered.

Advantages:

1. Needs no equipment
2. Prevents painful I.M. Injections

Disadvantages:

1. Labour Intensive
2. Short duration of effect
3. Variable analgesia
4. Drawing up errors easy

PRESCRIPTION:

This is prescribed on the Inpatient Prescription Sheet.

SUGGESTED REGIME:

Morphine 0.05mg/kg/dose I.V. 2-hourly prn

Pethidine 0.5mg/kg/dose I.V. 2-hourly prn

If the patient is in moderate or severe pain, this dose can be given over 5 minutes directly into the I.V. port of a running drip and the patient observed closely for the next 15 minutes.

Alternatively, if the need is less urgent, then the dose should be given in the burette to be infused.

Morphine is the drug of first choice. Repeated or prolonged dosing with pethidine can result in disorientation, hallucinations or seizures due to norpethidine toxicity. Consequently, pethidine is used only when side effects or allergic reactions prohibit the use of morphine.

4.2 PROTOCOL: INTRAVENOUS OPIOID OR TRAMADOL INFUSIONS:

A. INTRODUCTION:

Infusions of morphine, fentanyl, pethidine or tramadol can provide continuous analgesia without the "ups and downs" of intermittent bolus administration. They are suitable for children of any age particularly those who are unsuitable for patient-controlled analgesia. Additional prescribed **bolus doses** may be required to cover breakthrough or additional "incident" pain which occurs during movement or when painful things are done to the patient. Intravenous infusions **need close observation** as the patient is always receiving the drug and accumulation may occur.

B. HOW TO PRESCRIBE AN IV OPIOID OR TRAMADOL INFUSION:

N.B. Tramadol is not licenced for use in children under 12 years. It should not be used in infants less than 1 year of age. Prescription **must** be in consultation with the Acute Pain Management Service.

PRESCRIPTION: This is written in **Two** places:

1. Inpatient Prescription Sheet (plus an orange "Opioid administration in progress" sticker)
2. Intravenous Opioid Infusion Order Sheet

Syringe Order:

Add opioid or tramadol as indicated below and dilute to a total volume of **50mls** with normal saline.

Morphine	0.5mg/kg	Pethidine	5mg/kg
Fentanyl	5mcg/kg	Tramadol	5mg/kg

Settings:

Infusion: Run up to a **max. rate** of 4.0mls/hr (equals 40ug/kg/hr Morphine).

Boluses: 3.0mls 30 minutely prn.

This is the recommended infusion regime only and may be varied at the discretion of the attending Medical Officer according to the individual patient's needs.

C. CHILDREN YOUNGER THAN 3 MONTHS:

The method of analgesia should be discussed with senior medical staff. If an opioid infusion is chosen, then the dilution of morphine, fentanyl or pethidine remains the same. However, infusion rates and bolus doses should be **HALVED**: i.e. rates of up to **2mls/hr** and boluses of **1.5ml**.

4.3 INTRAVENOUS PATIENT-CONTROLLED ANALGESIA:

A. INTRODUCTION:

PCA is a technique of managing acute pain which utilises a programmable syringe pump to allow patients to **self-administer** their own intravenous opioid analgesics. It can be used by any child who is able to understand the concept of pressing a button when it hurts.

Advantages:

1. Gives patient "control"
2. High patient satisfaction
3. Safe
4. Reduces staff workload

Disadvantages:

1. Requires equipment
2. Needs proper supervision

B. INDICATIONS: Treatment of the following types of acute pain:

1. Postoperative pain
2. Oncology
3. Burns
4. Other painful conditions.

C. CONTRAINDICATIONS:

1. Inability to understand PCA eg. preschool children, intellectually impaired
2. Head Injury
3. Severe intercurrent illness eg asthma, heart disease
4. Inability to activate PCA machine (e.g. can't press button)

N.B. These contraindications are relative, and should be discussed with the Acute Pain Management Service or Duty Paediatric Anaesthetist.

D. HOW TO ARRANGE PCA:

Requests for postoperative PCA should be made in advance to allow for preoperative education.

Requests for PCA should be directed to the Anaesthetist allocated for the child's anaesthesia or the Duty Anaesthetist (Page 3643). After hours requests should be directed to the duty Anaesthetic Paediatric Registrar.

Patients starting on PCA need to be titrated to comfort with intravenous boluses before starting the PCA.

E. FOLLOW-UP

PCA is a specialised technique and must be commenced and supervised by the Acute Pain Management Service or Paediatric Anaesthesia staff. We do, however, welcome participation by parent clinics in subsequent decision-making regarding PCA therapy.

F. PRESCRIPTION OF PCA

The prescription of the PCA is by Paediatric Anaesthesia staff and machine programming is only performed by Anaesthetists and/or accredited nursing staff. PCA orders are written in two places:

1. PCA Order Sheet
2. Inpatient Prescription Sheet (plus an orange "Opioid administration in progress" sticker)

G. PROTOCOL

An appropriate intravenous giving-set with **in-built anti-reflux** valve is necessary with all intravenous PCA.

To **60ml** B-D syringe add 1.0 mg/kg of Morphine and dilute to a total volume of 60mls with normal saline. The amount of morphine added is rounded off to increments of 6 mg to facilitate easier programming of the PCA machine.

The following variables are programmed:

Bolus Dose: 16.6ug/kg Morphine (equals 1 ml)

Lockout Interval: 5 minutes

Background Infusion: 16.6ug/kg/hr (equals 1 ml/hr).

If a background is added, the patient must be nursed in close proximity to the nurses station.

Any requests for change of settings are referred to the Acute Pain Management Service or the Duty Paediatric Anaesthetist.

Syringes should be changed every 24 hours. Syringe changes are performed by ward nursing staff and are managed by repeating the prescription on the **PCA order sheet**. Each syringe change is signed for on the Inpatient Prescription Sheet and the time recorded.

Observations of pulse rate and respiratory rate are recorded hourly and recorded on the nursing record chart. The volume delivered, pain score, sedation score and vomiting scores are recorded on the PCA observation sheets. The 24 hour total of the volume delivered is included on the fluid intake section of the nursing record chart. Refer to Clinical Standards Manual.

The need for less frequent observations on longer-term PCA patients should be discussed with Acute Pain Management Service or Paediatric Anaesthetic Staff.

H. PROBLEMS:

Refer to Common Problems, Section 5 first. Any other problems/ enquiries should be directed to the Acute Pain Management Service or the Duty Anaesthetist. After hours problems should be directed to the Paediatric Anaesthetic Registrar.

Urgent problems:

1. If oversedation occurs, stop PCA and call the above person to assess.
2. If patient unrousable or apnoeic,
 - (a) Resuscitate
 - (b) call Emergency, and
 - (c) administer Naloxone (NARCAN) 0.01mg/kg IV stat.

EPIDURAL INFUSION PROTOCOL:

A. INTRODUCTION:

Mixtures of dilute local anaesthetic and opioids infused into the epidural space can provide virtually complete analgesia for selected urological, thoracic, abdominal and lower limb procedures especially in patients with compromised or potentially compromised respiratory function. Epidural catheters can be placed either in the caudal, lumbar or thoracic areas.

Although epidurals have a number of advantages, potentially serious complications, including death, can occur.

Advantages:

- (1) Provides very effective analgesia in region of block
- (2) Low doses of more than one drug allow synergistic effect with few side effects
- (3) Reduced analgesic requirement and, as a result,
- (4) Considerably less sedation, post-op confusion and nausea and vomiting
- (5) Allows early mobilization if applicable
- (6) Can be considered for all age groups.

Disadvantages:

- (1) Requires an epidural catheter which may fall out, be dislodged or block off
- (2) Some degree of motor block and/or sensory loss besides pain relief may occur
- (3) Urinary retention and pruritis may be increased.

B. CONTRAINDICATIONS:

Absolute:

- (1) Head Injury / Raised ICP
- (2) Bleeding and clotting disorders, low platelet count
- (3) Local or Systemic Infection
- (4) Patient/parent refusal
- (5) Inadequate staffing
- (6) Suitable equipment not available

Relative:

- (1) Hypovolaemia
- (2) Pre-existing or progressive neurological deficit
- (3) Vertebral column disorders (e.g. scoliosis, spina bifida) for technical reasons
- (4) Back pain
- (5) Compartment syndrome

C. CATHETER PLACEMENT:

This is performed by the anaesthetist at the time of surgery or, rarely, by the surgeon during procedures such as Spinal Fusion. Redressing of catheters, if required, should be performed by an anaesthetist.

D. PRESCRIPTION ORDERS:

Prescription is only by Anaesthesia staff.

These are recorded as

- (1) Epidural infusion order on "Epidural Infusion Order Sheet"
- (2) An orange "Opioid Administration in progress" sticker on Medication Sheet.
- (3) Either ondansetron 0.1mg/kg or naloxone 4mcg/kg i.v. stat dose (for itch)
- (4) Antiemetic
- (5) Intravenous access must be maintained for the duration of the epidural infusion

ADDITIONAL ANALGESIA AND/OR SEDATION: No other opioid analgesia or sedative drug including anti-histamines are to be administered unless prescribed by an Anaesthetist

E. SUGGESTED PRESCRIPTION:

A combination of one local anaesthetic and one opioid are commonly used. Premixed ropivacaine 2mg/ml with fentanyl 2 mcg/ml in 100 ml bags is recommended. Other prescriptions will have to be prepared at the time.

Epidural Mixture: Add 50ml of prescribed solution to a 50ml syringe for use in a designated epidural infusion pump.

Run at rate from 0.1 to 0.3ml/kg/hr, starting at 0.2ml/kg/hr.

System set-up:

- (1) The tubing from the syringe to the epidural must incorporate an antibacterial filter.
- (2) The normal sequence should be epidural catheter - filter – REM-EPISSET Epidural administration set.
There are to be no 3-way taps or injection ports in this line.
- (3) Antiseptic agents such as alcohol or betadine are not to come in contact with the epidural catheter or tubing as they are neurolytic.
- (4) Green labels inscribed with "Epidural" in white should be attached to the epidural catheter and the giving set.
- (5) The Anaesthetist prescribing the epidural infusion should attach the giving set to the epidural catheter personally.
- (6) The epidural system should not be disconnected except for syringe changes.

F. SUBSEQUENT MANAGEMENT

Infusions can be managed within the prescribed rates by the ward nursing staff according to patient comfort. Bolus doses, if required, should be administered by an Anaesthetist.

NURSING CARE: Only nurses accredited in paediatric epidural infusion management may look after these patients.

SUPPORT FACILITIES:

- (1) Oxygen must be available at the bedside
- (2) Resuscitation equipment must be available on the ward
- (3) Naloxone must be available in the ward Emergency Box
- (4) Pulse oximetry must be available
- (5) Suction must be available
- (6) Ward with accredited nursing staff allocated to patient with epidural

Observations:

- (1) Measure pulse, respiratory rates and motor function hourly and blood pressure at least 4 hourly and record on the nursing record chart.
- (2) Sensory level should be checked, using response to ice, on return to the ward from the operating theatre, at each nursing shift change, 30 minutes after any intervention and if the patient complains of pain.
- (3) Volume delivered, pain, sedation and vomiting scores are recorded on the Epidural Infusion Order chart. The total volume delivered for each 24 hour period is added to the fluid balance sheet.

Syringe changes:

- (1) Performed by ward nursing staff by repeating the prescription on the epidural infusion order sheet.
- (2) Syringe changes are recorded on the medication order sheet by the administering nurses along with the time of the syringe change.
- (3) Syringes should be changed at least every 24 hours.

DISCONTINUING AN EPIDURAL:

- (1) When advised by an Anaesthetist.
- (2) Ensure suitable step-down analgesia has been ordered.
- (3) Removal of the catheter is simply performed by an Anaesthetist or accredited nursing staff by removing the adhesive tapes and withdrawing the catheter and dressing.

- (4) The catheter should be checked visually for completeness.
- (5) Maintain intravenous access for 12 hours after catheter removal.
- (6) Bandaid is optional.

Follow-up will be performed daily by the prescribing Anaesthetist, the Children's Acute Pain Service or, if unavailable, the Duty Anaesthetist.

G. PROBLEMS:

Enquiries should be directed to the Anaesthetist who inserted the epidural or the Acute Pain Service Clinical Nurse Coordinator (Page 4302). If unavailable or after hours, call the Duty Anaesthetist (Page 3643).

H. COMPLICATIONS:

1. Nausea and vomiting: Can be related to opioid but usually less troublesome than with intravenous opioids.

Management:

- (1) Tropisetron 0.1mg/kg i.v. or metoclopramide 0.2mg/kg i.v.
- (2) Review by Anaesthetist if not settling.
- (3) May need to change to another opioid in the epidural or omit altogether.

2. Itch: Usually related to opioid

Management:

- (1) Trim nails and cover hands if appropriate.
- (2) Ondansetron 0.1mg/kg.dose i.v. 6 hourly prn or naloxone 0.4mcg/kg/dose i.v. every 15 minutes up to 3 doses.
- (3) If itch persists, review by Anaesthetist and consider naloxone infusion 1mcg/kg/hr i.v., changing or ceasing opioid in infusion.

3. Uncontrolled pain: multiple causes

Management:

- (1) Check epidural catheter for leakage under dressing or catheter dislodgement
- (2) Check for leakage at all epidural connection sites
- (3) Urgent review by Anaesthetist

4. Pump malfunction: Call Anaesthetist

5. Catheter problems:

Blockage: manifest by syringe pump alarming

Causes:

- (1) catheter itself blocked
- (2) components screwed too tightly together
- (3) Catheter kinked at or near skin

Management:

- (1) Examine for obvious causes without taking down dressing
- (2) Attempt to flush system with 0.2ml/kg normal saline in 5ml syringe at bacterial filter (side away from the patient)
- (3) If this fails, review by Anaesthetist

Breakage: usually caused by vigorous pulling on catheter during catheter removal. May require surgical removal of retained catheter.

Management: If catheter not easily removed, call Anaesthetist

6. Urinary retention: caused by dense local anaesthetic block

Management:

- (1) Try simple measures first: anticipate voiding difficulties
- (2) Assess level of block and quality of analgesia.
- (3) Review by medical staff
- (4) May respond to reducing the dose of the epidural block if block is more extensive than required.
- (5) If block is ideal, the patient may require urinary catheter.

7. Constipation: multiple causes

Management: best prevented.

Prophylaxis– PO lactulose 0.5ml/kg/dose b.d.

8. Respiratory depression: Caused by excessive opioid in infusion or administered by another route.

Sedation score is best indicator of impending respiratory depression.

Management:

- (1) Stop epidural infusion and administer oxygen via face mask if sedation score is 3
- (2) Call Anaesthetist
- (3) Administer naloxone 4 mcg/kg i.v.
- (4) If respiratory arrest, call Code Blue and commence resuscitation.

9. Spinal headache: may occur in older children and adolescents. Characteristically a postural headache coming on 2 to 3 days after epidural procedure (even if epidural catheter no longer in place).

Management: Review by Anaesthetist.

10. High block: very uncommon, caused by relative or absolute over dose of local anaesthetic. Comes on slowly, usually over hours.

Symptoms include:

- (1) tingling fingertips
- (2) difficulty talking, swallowing and yawning
- (3) difficulty breathing, possible respiratory arrest
- (4) bradycardia and fall in blood pressure

Management:

- (1) Stop infusion and administer oxygen via face mask
- (2) Urgent anaesthetic review

Neurological complications: several possible causes

Management: Any unexpected sensory or motor deficit warrants Anaesthetic review.

4.5 PROTOCOL: ENTONOX:

A. INTRODUCTION

Entonox is a 50% mixture of Nitrous Oxide in Oxygen. It is a odourless, colourless gas which can provide potent short-term analgesia for painful procedures. It has a quick onset of action (several minutes) and wears off almost as quickly.

It is unsuitable for chronic, long-term administration because of the risk of bone-marrow toxicity.

B. APPARATUS

Entonox is self-administered via a demand apparatus.

The apparatus consists of:

1. A 4,000 litre (Size E) or a 1,600 litre (Size D) cylinder.
2. A small pressure (contents) gauge.
3. A reducing valve which reduces the pressure from the cylinder pressure to one suitable for inhalation.
4. A demand valve which allows gas to flow only when the patient inhales from the face mask or mouth-piece. For this to occur, the face mask or mouth-piece must be well sealed and a characteristic sound is heard when entonox is being inhaled.
5. Black tubing leading to the face mask.
6. An expiratory valve near the face mask vents expired gas to the atmosphere.

C. CONTRAINDICATIONS

1. Closed head injury or unconsciousness,
2. Airway obstruction or airway burns,
3. Pneumothorax (Nitrous Oxide diffuses into air-filled cavities and expands them),
4. Children unable or unwilling to use entonox (eg < 4 yrs),
5. Intoxication with alcohol or other drugs.

These contraindications may be relative, in which case, the Duty Paediatric Anaesthetist (Page 3643) should be consulted prior to the use of Entonox.

D. SIDE EFFECTS

1. **Sedation.** If the child becomes sedated, the seal around the mask or mouthpiece will be lost and flow of Entonox will stop. This mechanism is responsible for the inherent safety of Entonox.
2. **Nausea** will occasionally occur
3. **Bone marrow depression** with prolonged use. Ward patients should be limited to no more than **1.5 hours** administration per day. Children requiring Entonox for longer than 2 weeks should be prescribed Folic Acid 15mg orally daily until Entonox is ceased.

E. ADMINISTRATION OF ENTONOX

Entonox is prescribed on the Inpatient Prescription Sheet for ward patients. The duration of administration is recorded and signed for with each use.

For outpatients, entonox is administered at the discretion of the attending nursing or medical staff but its use is recorded in the outpatient notes.

Where practical, the child should be fasted (food and fluids) for 2 hours prior to administration.

Entonox may be administered by any RN or medical staff who have been trained in the safe administration of Entonox.

F. METHOD OF ADMINISTRATION

1. Turn the key to open the cylinder and check the contents of the cylinder.
2. Explain how to use the Entonox and allow the child time to become familiar with the equipment and the noise it makes.
3. Instruct the child how to hold the face mask or mouth-piece to ensure a good fit. The child should self-administer Entonox wherever possible. If the child is unable to do so (eg burnt or fractured arms) then the nurse should provide assistance by holding the mask and creating a seal. Verbal contact should be maintained with the patient and the mask should be removed temporarily should oversedation occur.

4. Administration should commence several minutes prior to the painful procedure.
5. The child continues to breathe normally from the apparatus. The noise indicates satisfactory delivery of entonox. The expiratory valve should be observed for movement.

Enquiries should be directed to Acute Pain Management Service or the Duty Paediatric Anaesthetist (Page 3643)

5. MANAGEMENT OF COMMON PROBLEMS:

Routine problems can be referred to the parent clinic. Problems with specialized techniques such as epidural infusions should be referred to the Acute Pain Management Service or the Duty Paediatric Anaesthetist (Page 3643).

5.1 INADEQUATE ANALGESIA:

A careful history is the most important step in assessing inadequate analgesia. A number of questions must be answered.

- What is the cause of the pain?
Consider nature, site and associated features.
Consider pain from other sources or complications of surgery.
e.g. tight plaster requiring elevation of limb or splitting of plaster
urinary retention may require insertion of urethral catheter
intermittent pain due to muscle spasm requiring antispasmodics
- Is there distress from other sources?
e.g. hunger, exhaustion, anger, disruption of routine, or parental separation.
- What analgesia has been given?
- Why is the analgesia inadequate?
Common reasons are
 - a) an inadequate regimen was chosen
 - b) the regimen chosen has not been applied properly
 - c) a new pain stimulus requiring a different treatment

COMMON EXAMPLES AND THEIR MANAGEMENT:

Problem	Management
Inadequate oral/rectal analgesia with paracetamol	Check dose/dosing interval and adjust or try Painstop Day or codeine (see pages 5 & 6)
Local anaesthetic block regressed	Institute alternative treatment
Inadequate analgesia with opioid infusion	Give bolus dose then increase infusion rate by 1 ml/hr (see page 9)
Inadequate analgesia with PCA	Check patient understands the system and is confident to use it. If not, use alternative regimen e.g. i.v. infusion Check actual amount of drug delivered, size of bolus and lockout time. If adequate, titrate to comfort with i.v. boluses (given by medical officer) then Consider addition or increase of background infusion Consider increase bolus dose

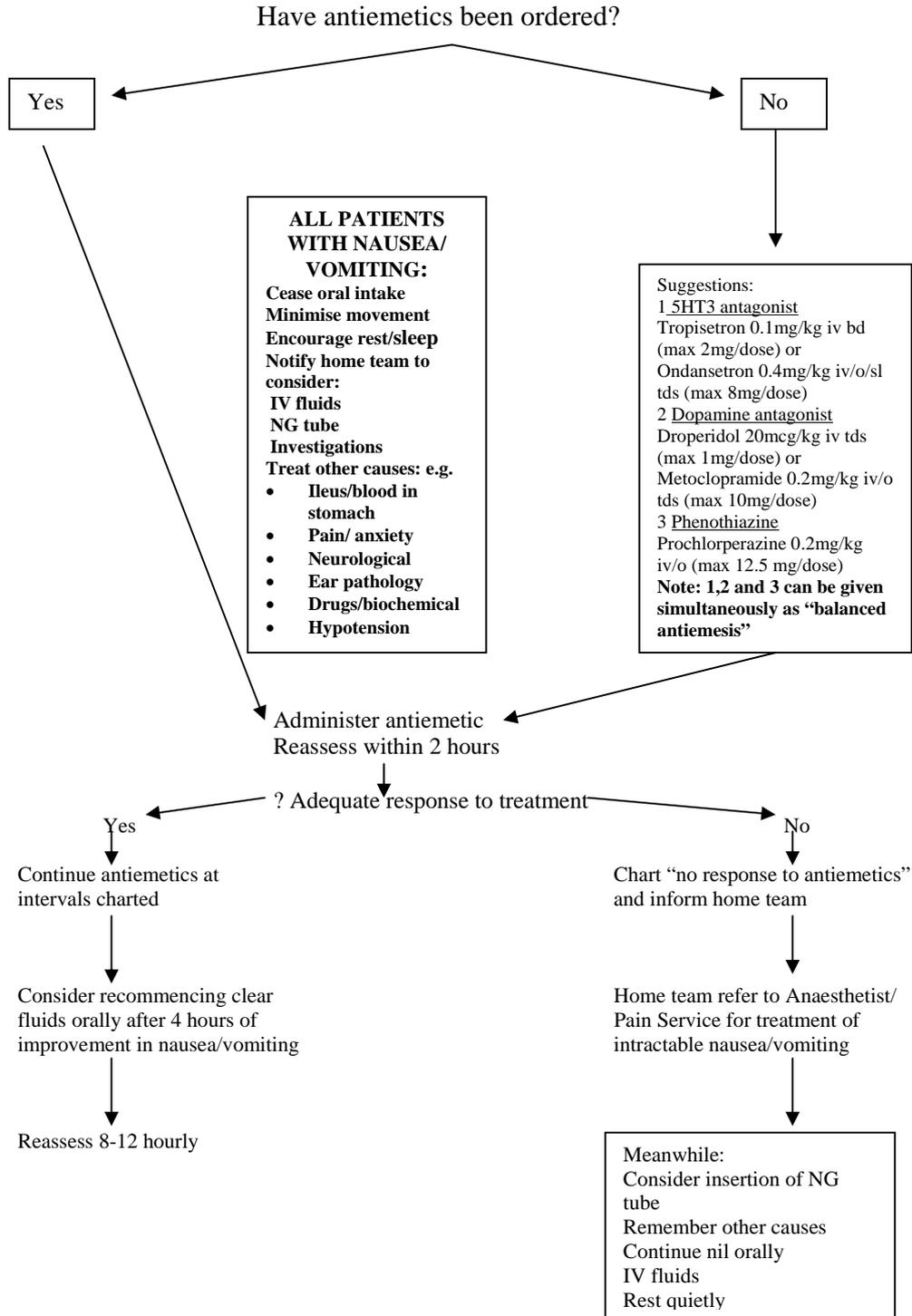
5.2

RESPIRATORY DEPRESSION

- a) Mild (moderate decrease in respiratory rate, $\text{SaO}_2 > 90\%$)
- Decrease or cease opioid if marked sedation
 - Administer oxygen
 - Stimulate patient
 - Continuously monitor HR, RR and SaO_2
- b) Severe (apnoea, $\text{SaO}_2 < 90\%$ or significant decrease in RR or HR)
- Administer oxygen, support airway, breathing and circulation
 - Cease opioid
 - Naloxone 2mcg/kg increasing to 100mcg/kg by doubling the dosage as required
 - Summon resuscitation team (call Code Blue)
 - Continuously monitor HR, RR, BP and SaO_2

Consider diagnosis of cause of respiratory depression and review the pain management of this patient.

5.3 Guidelines for the Management of ESTABLISHED NAUSEA AND VOMITING



This is a **guideline** only for ward nursing staff/medical staff as there is relatively little data on the treatment of established nausea and vomiting in children.

5.4 **PRURITUS:**

Common causes include:

- Opioids (esp. morphine and epidural opioids)
- Other drugs (esp. those releasing histamine)
- Heat or warm ambient temperature
- Topical creams or lotions
- Physiological causes (rash, fever, viraemia, sweating)
- Dermatological diseases or associations (uraemia, diabetes)
- Insect bites
- Allergy, anaphylaxis

Management:

- Distraction or reassurance
- Cool sponges or topical relief (calamine or local anaesthetic solutions)
- Change opioid (NB pruritus is less common with fentanyl)
- If opioid induced - treat with ondansetron 0.1mg/kg/dose 6 hrly prn or naloxone up to 0.4mcg/kg i.v.
- Promethazine 200mcg/kg i.v. for non-opioid-related pruritus (monitor sedation score and respiratory rate regularly due to additive sedation with opioids and sedating antihistamines)

5.5 **CONSTIPATION:**

Common causes:

- Opioid side-effect
- Post-operative ileus
- Other drugs
- Endocrine/metabolic causes (hypokalaemia, hypercalcaemia)
- Neurological causes (primary or secondary to epidural analgesia)
- Long-term problem/past history

Management:

- Increase fluids and fibre if appropriate
- Withdraw opioid if appropriate
- Pharmacological treatment:
 - * Osmotic laxatives (lactulose)
 - * Faecal softeners (paraffin oil, coloxyl +/- senna)
 - * Suppositories or enemas
- Surgical consultation may be necessary

6. FURTHER READING:

- Schechter, N, Berde, CB and Yaster M. (Eds) "Pain Management in Children and Adolescents". Williams & Wilkins (2002)
- Finley, GA and McGrath, PJ (Eds) "Acute and Procedure Pain in Infants and Children" Progress in Pain Research and Management Vol 20 IASP Press, Seattle (2001)
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- Brown, TCK, Eyres, RL and McDougall RJ (1999) "Local and Regional Anaesthesia in Children". Br J Anaesth 83:65-77
- Rowney, DA and Doyle, E (1998). "Epidural and Subarachnoid Blockade in Children". Review Article. Anaesthesia 53:980-1001
- Gaukroger, PB, Tomkins DP and van der Walt, JH (1989) "Patient-controlled Analgesia in Children" Anaesth Intens Care 17:264-8
- Kanagasundaram, SA, Lane LI et al (2001) Efficacy and safety of nitrous oxide in alleviating pain and anxiety during painful procedures. Arch Dis Child 84:492-5
- Gall, O, Annequin, D et al (2001) Adverse events of premixed nitrous oxide and oxygen for procedural sedation in children. Lancet 358:1514-15