Paediatric Acute Postoperative Pain and PCA Guidelines

Paediatric PCA: Patient Controlled Analgesia

These guidelines have been designed to provide evidence-based information on analgesia however, they are guidelines only and these recommendations may not be appropriate for use in all circumstances. If in doubt discuss with the acute pain service, anaesthetist or the responsible clinician.

Aim

To enable the child to safely operate and administer analgesia, e.g. morphine, via a Patient Controlled Analgesia Device **(Fresenius Kabi Agilia syringe pump)** under the supervision of trained staff.

Patient criteria for using PCA: all 3 must be met

1. Age 5 years and over.
2. The child can physically operate the PCA device.
3. The child has a basic understanding of what happens when the PCA button is pressed.

Minimum Requirements for care of child on PCA

1. Staff appropriately trained in use of Fresenius Kabi Agilia PCA device.
2. Hourly recordings carried out as per PCA prescription and observation chart.
3. Continuous pulse oximetry.
4. Daily visit by member of pain control team *(Pain Nurse or Anaesthetist)*.
5. Use dedicated cannula or anti-reflux valve if on IV fluids.
6. Resuscitation equipment available.
7. Naloxone available on ward (*dose: see below and/or BNFc dosing for reversal of post operative respiratory depression)*.

Target Group: Medical & Nursing Staff in Paediatric Wards, Theatre & ACCU
Keywords: Paediatrics, Post-op Pain,PCA,Paediatric PCA Guidelines, Paediatric Morphine, Acute Pain,Morphine Pump

Prescription and preparation

IV Patient Controlled Analgesia with morphine (IVPCAM)

Use dedicated anti-syphon and anti-reflux extension set (*for example Alaris Extension Set [Ref 30852]*) Maintenance fluids can be run using the y connector on the PCA extension set via an infusion pump and with anti reflux valve on the line this will avoid reflux and unintended morphine bolus with intravenous fluids.

Only medical or nursing staff who have completed Fresenius Kabi Agilia SP PCA competency based training can programme the pump and/or change syringes in the PCA device. This requires 2 trained nurses who must both check prescription and preparation of drug syringe and device settings.

Only the acute pain nurse or an anaesthetist can program (*or reprogram*) and initiate a PCA on the paediatric ward, and they are required to check the prescription, syringe preparation and pump settings with a staff member who has received PCA training and is competent to facilitate this arrangement. In the setting of uncontrolled severe acute pain when neither of these individuals is available then it will be necessary, if simple analgesia is ineffective, to titrate a loading dose of intravenous morphine in 50microgram per Kg increments, 5 to 10 minutely to max 200micrograms/Kg with continuous monitoring.

Syringe Preparation

When commencing a Paediatric PCA - Theatre recovery staff may use 50mg in 50ml vials for preparation if child of weight above 50kgs. For changing syringe within Paediatric Ward the monograph (Appendix 1) will be used.

See Appendix 1: Morphine for Patient Controlled Analgesia in Paediatrics syringe preparation monograph. Our current stock leur lock syringe is BD Plastipak.

Fresenius Kabi Agilia PCA syringe pump

Bolus dose:	1ml bolus, with above dilution, 20microgram/Kg bolus
Lockout interval:	5 minutes
Morphine Solution Concentration:	20microgram/Kg/ml
Loading dose:	Zero usually (*as should be loaded with intravenous titrated morphine already in theatre or if required for ward patient as PCA inevitably takes time to set up on ward suggest load separately with iv morphine prior to PCA as above*)
Background infusion:	Zero usually (*only consider a background of 4 micrograms/Kg/hr = 0.2ml per hour which can be useful in the first 24hours post op to improve sleep pattern*)

Always ensure use of BD Plastipak 50ml luer syringe.

Patient Controlled Analgesia Observations

From Theatre

When collecting a child from theatre, the ward nurse is responsible for checking the following details are complete:

Checklist

1. **CHART:** PCA prescription and observation chart:
   a. Patient details correct. Name, Chi Number, date of birth.
   b. Doctors prescription legible: Drug name, concentration, bolus dose, lockout and doctors signature.
   c. Form dated & timed.
   d. Drug Batch number and PCA device Serial Number recorded
   e. 2 loaders signatures
   f. First set of observations completed

2. **DEVICE:** PCA device.

   Syringe clearly labelled with
   a. Patient name.
   b. CHI Number.
   c. Drug Name, Dose & Batch number.
   d. Date & Time prepared.
   e. Date & Time of expiry (*24 hours*).
   f. 2 loaders signatures.

Program, check device program matches PCA prescription and observation chart.

3. **HEPMA:** check prescription on Hepma

4. Once above details are correct, both ward and theatre nurse to sign anaesthetic form.

On return to Ward the following observations must be carried out hourly:

a. Respiratory rate.
b. Saturation rate (*continuous*).
c. Temperature - can decrease to 4hrly prn.
d. Pulse.
e. Blood pressure can decrease to 4hrly prn.
f. Pain score (*see pain assessment chart*).
g. Sedation score.
h. Nausea and vomiting score.
i. Total dose infused and check intravenous cannulation site.
j. Volume remaining in syringe.
k. Signature.

Only the child can activate the PCA Device

1. Respiratory Depression: Observe for signs of respiratory depression.

If the rate falls below: Age 5 - 8yrs: 15/min

Age 9 and over: 12/min

1. Stop PCA.
2. Seek medical help - inform paediatric doctor & anaesthetist on call.
3. Consider intravenous titrated naloxone bolus (dose as per BNFc for reversal of post operative respiratory depression. Age 1 month to 11 years. 1 microgram per Kg. Child 12 to 17 years initially 1.5-3 micrograms/Kg. If inadequate response repeat every 2 to 3 minutes) Naloxone can be diluted to 10ml with sodium chloride 0.9% and titrated to obtain sufficient respiratory response. Caution as naloxone antagonises analgesic effect.
4. Consider naloxone infusion. As naloxone has a shorter duration of action than morphine repeated boluses or infusion may be necessary. Monitor patient. See Medusa naloxone monograph available via Firstport.

Always have naloxone available on the ward

2. Saturation Rate: Continuous monitoring.

- Record hourly on PCA form.
- Minimum saturation level 95% - give O2 if not already being administered 1 - 2 litres via nasal cannula. Refer to previous readings to establish if any deterioration, if consistently recorded at minimum level or below. Seek medical advice.

3. Pain Score: Record hourly on PCA form using 0 - 4 verbal/visual assessment scale.

- Record pain scores on movement.
- If the child is consistently scoring high (*above 2*) check usage via chart and pump history this may indicate that they are perhaps not understanding PCA or are reluctant to use it for some reason which should be sought (*fear, dysphoria, nausea, itch*) and reassurance given or much less likely that the analgesia may need increased.
- Check PCA device is working properly and cannula site satisfactory.
- If the child can tolerate oral/PR give co-analgesia if appropriate, though do not give any other opioids.
- If pain scores continue to be high - contact pain team. Consider also review by surgeon in case of surgical complication.

4. Sedation Score:

- Record hourly on PCA form using 0 - 3 assessment scale - always compare previous readings. If sedation score consistently high (*2 or above*) seek medical advice.
- If the child is asleep record an (*A*) on PCA form.

5. Nausea & Vomiting:

- Record hourly on PCA form using scale.
- If child is nauseated or vomiting give anti-emetics as prescribed.
- Seek medical advice if nausea & vomiting persists.

6. Total dose Infused:

- Record hourly the total dose infused and volume remaining in the device.
- If a new syringe is required this may be prepared by the ward nurses and changed if they have completed Fresenius Kabi Agilia PCA competency training otherwise contact acute pain team or if unavailable on call anaesthetist.
- PCA syringes should be changed every 24 hours if prescription to continue.
- PCA giving sets can be in situ for up to 72 hours and then require renewal if prescription to continue.

7. IV Site: Check site hourly for any problems.

On discontinuation of PCA

Two nurses verify and destroy as per medicine code of practice. Complete details on PCA form. File in patients casenotes.

Co-Analgesia for severe postoperative pain

Consider using Ideal Body Weight for Paracetamol and Ibuprofen dosing in Obese children

Paracetamol

AGE	ORAL		RECTAL		MAXIMUM DAILY DOSE ORAL OR RECTAL
	Loading Dose	Maintenance Dose	Loading Dose	Maintenance Dose	
>3 months to 18years	20 to 30mg/kg (max 1g)	15 - 20mg/kg up to 4-6hrly (to max 1g)	40mg/kg (max 1g)	20mg/kg up to 4-6hrly (max 1g)	75mg/kg/day (up to max 4g/day)

Table adapted from BNFc app 2021 doses for post operative pain.

Licensed use: not licensed for use in children under 2 months by mouth; doses for severe symptoms not licensed.

Cautions: Hepatic impairment, Renal impairment, Preterm & neonates less than 1 month - see BNFc for iv dosing see BNFc (*extract below*)

Paracetamol: by intravenous infusion over 15 minutes - only if oral route unavailable

Child body weight 10 - 50kg: 15mg/kg every 4-6 hours; max. 60mg/kg daily

Child body weight over 50kg: 1g every 4-6 hours; max. 4g daily

Consider using Ideal Body Weight for Paracetamol and Ibuprofen dosing in Obese children

Ibuprofen: age over 1. Oral 7.5mg/kg per dose up to 6 hourly with a max daily dose of 30mg/kg/day

Syrup 100mgs/5mls or Tablet 200mg or 400mg

Caution: if bleeding risk, asthma, renal dysfunction, GI ulceration/bleeding, on anticoagulants, age <1 year.

Diclofenac

Oral/Rectal 1mg/Kg 8 hourly. Maximum single oral dose 50mg. Maximum 50mg PR

If oral route unavailable (e.g. NBM, Ileus or Nausea/Vomiting) consider intravenous dosing. 0.3 to 1mg/Kg once or twice daily for maximum 48hours. For intravenous infusion see BNFc or Medusa via Firstport. Maximum daily dose by any route 150mg.

Tablet (*Enteric coated*) 25mg or 50mg, Tablet (*Soluble*) 50mg or Suppository 12.5mg, 25mg or 50mg

Caution: if bleeding risk, asthma, renal dysfunction, GI ulceration/bleeding, on anticoagulants, age <1 year.

Anti-Emetics

Ondansetron: 0.1mg/kg (*100micrograms/kg to maximum single dose 4mg*) up to 8hourly.
4mg in 2ml vial, Tablet 4mg

Dexamethasone: 0.1 to 0.15mg/Kg up to max. 8mg given intravenously slowly - a one off rescue dose, only if not already received in theatre. Beware insomnia if given in evening. Not for use in those at risk of tumour lysis syndrome.

Cyclizine: 1mg/kg 8-12hourly oral/iv, to maximum single dose 25mg under 12 years, over 12 years 50mg per dose.
50mg in 1ml vial, Tablet 50mg

Please note if one anti-emetic is ineffective consider using another anti-emetic.

References

1. The Association of Paediatric Anaesthetists of Great Britain & (and) Ireland (2009). Guidelines on the Prevention of Post-operative Vomiting in Children.
2. Royal College of Paediatrics and Child Health (2010) The use of unlicensed medicines or licensed medicines for unlicensed applications in Paediatric Practice. Policy Statement produced by the joint RCPCH/NPPG Standing Committee on Medicines.

Appendix

1. Morphine for PCA in Paediatrics Syringe Preparation Monograph

Acute Pain Service

Nurse Specialist S Anderson/L Steele hours of work 08:30-16:30, Dr C. Slorach (Page 133) : Monday - Friday 9am - 5pm
After hours or if unavailable, contact Duty Anaesthetist (Page 003)

Appendix 1

Morphine for Patient Controlled Analgesia in Paediatrics

Syringe Preparation Monograph

Presentation[1,2]: 10mg in 1ml Morphine sulphate ampoules

Dosage[3]: As per Acute Pain Service: Paediatric PCA guideline for Fresenius Kabi Agilia PCA syringe pump *(available via Firstport)*

Method of Administration[3]

Only the acute pain nurse or an anaesthetist can program and initiate a PCA on the Paediatric Wards.

1. Preparation

The final concentration of morphine in the 50ml syringe for a paediatric PCA delivered via the Fresenius Kabi Agilia PCA pump is determined by the child's weight such that the final concentration is always 20micrograms/kg/ml, **except when weight over 50Kg**.

Dose (mg) morphine = patients weight (kg), if weight over 50Kg take maximum dose of 50mg

Volume (ml) of morphine 10mg/ml = ...mg divided by 10

Dilute calculated volume (ml) of morphine up to 50ml with sodium chloride 0.9% using a 50ml BD luer lock syringe.

Example:

A child weighing 23kg

Dose (mg) morphine = patients weight (kg) = 23mg

Volume (ml) of morphine 10mg/ml = 23mg divided by 10 = 2.3ml

Dilute calculated volume = 2.3ml of morphine up to 50ml with sodium chloride 0.9% using a 50ml BD Plastipak luer lock syringe.

2. Administration

To be administered via Fresenius Kabi Agilia PCA SP. Only medical or nursing staff that have completed Fresenius Kabi Agilia pump training competency based training can change syringes in the Fresenius Kabi Agilia device.

The PCA device will be programmed to deliver a bolus dose when required by the patient. A further dose can only be delivered after a 5 minute lockout delay.

A 1ml bolus dose delivers 20micrograms/kg/ml morphine, except when the child's weight is more than or equal to 50kg when the final concentration will be 50mg in 50ml, equalling 1mg/ml and a 1ml bolus dose will deliver 1mg.

Example:

A child weighing 23kg

1ml bolus dose delivers 20micrograms/kg morphine

1ml bolus dose delivers 20micrograms x 23 morphine

1ml bolus dose delivers 460micrograms morphine

Storage/Stability[1]

Morphine sulphate is a controlled drug and must be stored in the controlled drug cupboard and registered in a controlled drug register.

Licensed Status[1]

Morphine 10mg/ml solution for injection is a licensed product not licensed for use in children under 12 years.

Compatibility[2]

Solution compatibility	Glucose 5%, Glucose 10%, Sodium chloride 0.9%
Solution incompatibility	Contact pharmacy for further information
Additive compatibility	Contact pharmacy for further information
Additive incompatibility	Contact pharmacy for further information.

References

1. Summary Product Characteristics, Morphine 10mg/ml injection. Accessed 26/6/2019. Wockhardt. https://www.medicines.org.uk/emc/product/2244
2. BNF for Children 2020

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