

## PATIENT CONTROLLED ANALGESIA (PCA)

Generally recommended for patients 6 yrs & older. However, it is important to assess the individual child's cognitive maturity ~ we have successfully used PCA in a 5 yr old.

### *Prerequisites :*

- Understand the concept of analgesia upon demand (to press for it)
- Able to cope with latency of onset & mandatory lockout for safety.
- Physically able to press the handset button
- No contra-indications ( medical condition /allergies/ cognitive limitations)
- Parents should be instructed **NOT** to press PCA for the child (especially if he/she is sleeping)

### CADD pump set up

- Clear old patient data & select appropriate programme
- Check that appropriate syringe type / size or cartridge is used (this should last at least 24-48h)
- Check that settings are appropriate for the drug used & child's weight
- Y tubings should always have a running drip.
- Straight tubings should be used for Ward 76 and ICU patients.

### *Compulsory Pump Settings:*

#### Please programme

- Bolus
- Lockout
- Max. Dose Limit in 1 hour

### *Optional Pump Settings:* Loading dose

Background Basal Infusion

**Recommended limits are printed on the order form & should not be exceeded**

*Note that the Lockout time range varies with the opiate profile*

with a minimum interval of 5 min for Morphine & 3 min for Fentanyl

*Continuous basal infusions* are NOT recommended as a routine unless the child is adequately monitored /pain is expected to be severe e.g. scoliosis. Start with 0.5-1.0 ml/h; try not to exceed 1.5 ml/h. Wean the background infusion by 25-50% after 24-48h.

Steps to adhere-to at daily morning round:

1. note total opiate use in 24h (in mg or mcg)
2. note successful vs total demands
3. clear old data & adjust bolus or background as needed
4. check that contents should last at least 24-48h

## Dilution:

There are 2 standard ways of diluting the narcotic infusions according to weight: for patients weighing < 50 kg or ≥ 50 kg

(specific dilution order set is available in the CLMM);

All orders must be clearly written, dated & signed

The syringe/cartridges should also be similarly labelled

## PRESCRIPTION: MORPHINE

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| <ul style="list-style-type: none"> <li>• &lt; 50kg<br/>Syringe preparation<br/>Morphine = Body Weight (mg)<br/>in 50ml total volume<br/>1 ml = 20 mcg/kg<br/>1 ml/h = 20 mcg/kg/h</li> </ul>  | <ul style="list-style-type: none"> <li>• 50kg and above (like adults)<br/>Syringe preparation<br/>Morphine = 50mg in<br/>50ml total volume<br/>1 ml = 1 mg<br/>1 ml/h = 1 mg/h</li> </ul>                        |
| <ul style="list-style-type: none"> <li>• Recommended Settings:<br/>Bolus = 1 - 2 ml<br/>Lockout = 5 min<br/>Max. I-h Limit = 200 - 300 mcg/kg/h<br/>Basal Infusion = 0 - 15 mcg/kg/h<br/>Loading Dose = 100 - 200 mcg/kg</li> </ul> | <ul style="list-style-type: none"> <li>• Recommended Settings:<br/>Bolus = 1 - 2 ml<br/>Lockout = 5 min<br/>Max. I-h Limit = 15mg<br/>Basal Infusion = 0 - 1.5ml/h<br/>Loading Dose = 0.1 - 0.2 mg/kg</li> </ul> |

NB: Background Infusion of 2ml /h on top of PCA boluses are associated with increased sedation & episodes of desaturation; as opposed to simple morphine infusions in children (Study by Berde et al) and need to be adequately monitored.

CADD cartridges of various volume capacities (50 ml - 10 ml) require corresponding dilutions to achieve the same final concentration. Please have a 2nd person verify dilution & the math.

## PRESCRIPTION: FENTANYL

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| <ul style="list-style-type: none"><li>• &lt; 50kg</li><li>• Syringe preparation<br/>Wt. x 15 (mcg) Fentanyl<br/>in 50ml total volume<br/>[1 ml = 0.3 mcg/kg]</li><li>• Recommended Settings:<br/>Bolus = 1 - 3 ml<br/>Lockout = 3 - 4 min<br/>Max. 1-h Limit = 4 mcg/kg<br/>Basal Infusion = 0 - 1.5mcg/kg/h<br/>Loading Dose = 0.5 - 2 mcg/kg</li></ul> | <ul style="list-style-type: none"><li>• 50kg and above</li><li>• Syringe preparation<br/>Fentanyl 25 mcg /ml<br/>in 50ml total volume<br/>[1 ml = 25 mcg]</li><li>• Recommended Settings:<br/>Bolus = 1 - 2 ml<br/>Lockout = 3 - 4 min<br/>Max. 1-h Limit = 250 mcg<br/>Basal Infusion = 0.5 - 1.5 ml/h<br/>Loading Dose = 25 - 100 mcg</li></ul> |
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NB: For the opioid tolerant ASA 1-2 patient with severe pain, syringe preparation can increase to 0.5mcg/kg in 1 ml i.e.  
Wt x 25 (mcg) Fentanyl in 50 mls total volume

## Monitoring & trouble-shooting

### 1. Inadequate analgesia

Check patient history from the pump.

If there are multiple unsuccessful attempts, increase the bolus and 1 h max *and* re-educate the child on PCA usage.

If a child has problems pressing the handset, a nurse or parent can help her with this. Perils of over administering should be indoctrinated appropriately.

The lockout interval may vary from 5 – 8 min but to NOT < 4min for morphine.

Dose increments are usually associated with increased side-effects.

NCA (NURSE CONTROLLED ANALGESIA) or  
AACA (Authorised Agent Controlled Analgesia)

The principles & charting are the same as for PCA. Programming is more conservative with strict instructions to press only if pain scores exceed 3-4.

- The lockout period is 10-15 min for morphine & 5-10min for fentanyl
- The maximum 1 h limit is set 20-25% lower
- Typically we limit boluses to no more than 4 per h at the start

## OPIATE INFUSIONS

These follow the dichotomous weight-based PCA prescription; limits should not be exceeded; syringe boluses should not exceed 2 mls & require sufficient interval (15 min) for assessment of response.

## ULTRA LOW-DOSE KETAMINE INFUSIONS

Indicated if :

- The pain is hard to control despite adequate opioids.
- Used to curb opiate tolerance
- Used improve quality of analgesia
- Reduces opiate requirements & thereby ameliorating opioid induced hyperalgesia (OIH) & opiate side- effects

*Dilution:*

*It is recommended to use lockable PCA pump to prevent tampering)*

This is diluted as per morphine to create a **1ml/h = 20 mcg/kg/h**

Generally patients are rational & not over sedated with infusions of 1 ml/h but some will complain of dizziness, excessive salivation, hallucinations & a dis-embodied feeling

### PCA KETAMINE

Indicated if :

frequent intense pain or procedural intervention render PCA opiate or opiate infusion ineffective.

*Dilution:*

*Body Weight (mg) in 50 ml N/S*

Low dose 1 ml /h = 20 mcg/kg/h

Lockout 10-15 min

Background not to exceed 1 ml/h

*Higher concentration or higher dose dilution:*

Body Weight x 5 (mg) in 50 ml ; 1ml/h = 100 mcg/kg/h

if require more intense sedation/ analgesia e.g. for dressing changes provide more drug per bolus; keep infusion to < 1 ml/ h

## PCA KETAMINE-MORPHINE COMBINATION

Indicated if: pain is hard to control despite adequate opioids.

*Dilution:* Both ketamine & morphine combined (1:1) into one PCA

Allow 4-5 presses per hour & increase lockout interval to 10-15 min.

Difficult to adjust dose if patient is intolerant to adverse effects of ketamine so a trial of a separate Low-dose Ketamine infusion allows more flexibility in dose adjustment

Other adjuncts:

- Dexmedetomidine infusion

- Clonidine (1 mcg/kg q6-8h IV / PO)

- Gabapentin, Pregabalin

## Optimising good use of PCA modality

Load opiate or dispense 2 -3 boluses if pain not well controlled

Educate on proper use: encourage pre-emptive 2 boluses before movement & Physiotherapy

Treat side-effects which may deter optimum use

Escalate analgesia by increasing bolus as well as being quick to add an analgesic adjunct

## Weaning & discontinuation

PCAs are usually required for 2 - 3 days, but may be continued for much longer period if indicated e.g. in Oncology, Trauma & Burns, Scoliosis

Once the child is taking orally, start him / her on oral non-opiate analgesics q 6 - 8h (whilst still on the PCA). This will help with weaning the PCA & will provide better analgesia.

Convert the 24h opiate requirement to an oral opiate round the clock with PRN prescription of 10-20% of this amount. Either Mist morphine or Oxycodone (Oxynorm) make good conversions; sustained-release

formulations & trans-dermal applications are neither suited to nor recommended for Acute Pain management.

Discontinue PCA when:

- Minimal use of bolus demands (Eg < 4-8 presses per 24h)
- Minimal 24h opiate requirement (Eg < 0.1-0.3 mg/kg morphine in 24h)
- Patient or surgeon request (providing pain is well controlled)

Drips may need to be re-sited if painful or inflamed.

Additional adjuncts may be required if pain is severe