University Hospitals of Leicester NHS Trust

Paediatric Intensive Care Unit

Analgesia and Sedation Guideline for Paediatric Intensive Care Unit

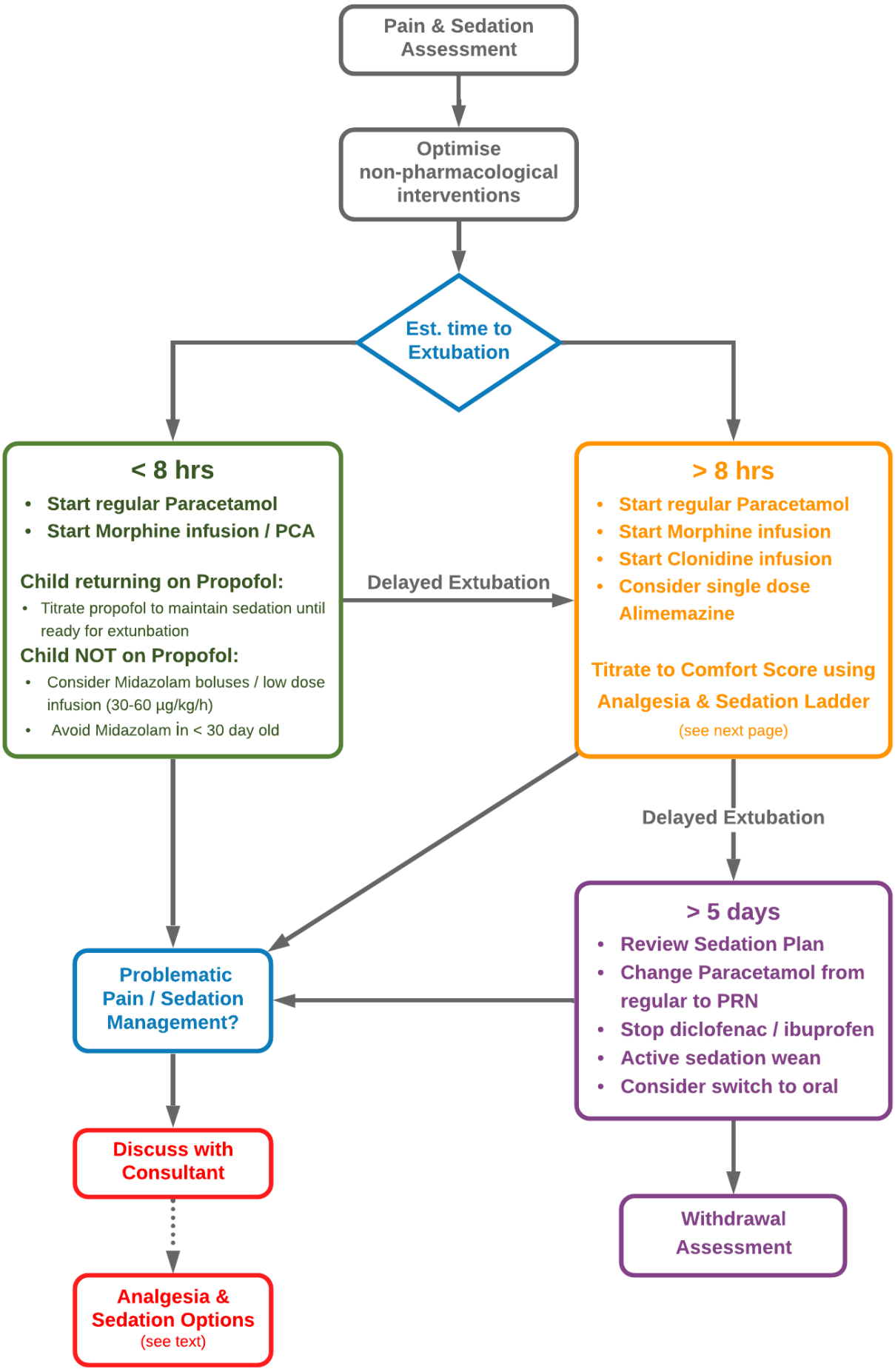
Staff relevant to:	Medical and Nursing staff caring for children in the PICU
Approval date:	Jun 2019
Version:	2.0
Revision due:	Jun 2022
Written by:	J Tong, S Wheeler
Trust Ref:	C10/2009

Related Guidelines and Policies:	
C39/2017	Application of Arm Splints
C116/2016	PICU Management of the Endotracheal Tube (ETT)
C150/2016	Clinical management on PICU following cardiac surgery
TBC	Post-operative pain guideline following cardiothoracic surgery
TBC	Sedation and Analgesia Weaning and Withdrawal – Scoring Chart
TBC	Quiet time on PICU
C22/2010	Oral Morphine and Clonidine weaning guideline
C246/2016	Guideline for the care of children and young people (under 18 yrs) requiring morphine Patient Controlled Analgesia (PCA), Nurse Controlled Analgesia (NCA) & continuous morphine infusion
C7/2015	Guideline for the care of neonates, children and young people requiring epidural analgesia
B17/2003	IV PCA Policy

Keywords:	Sedation, Analgesia, Pain, Agitation, Distress, Withdrawal, Morphine, Fentanyl, Midazolam, Alimemazine, Clonidine, Paracetamol, Ibuprofen, Ventilated, PICU

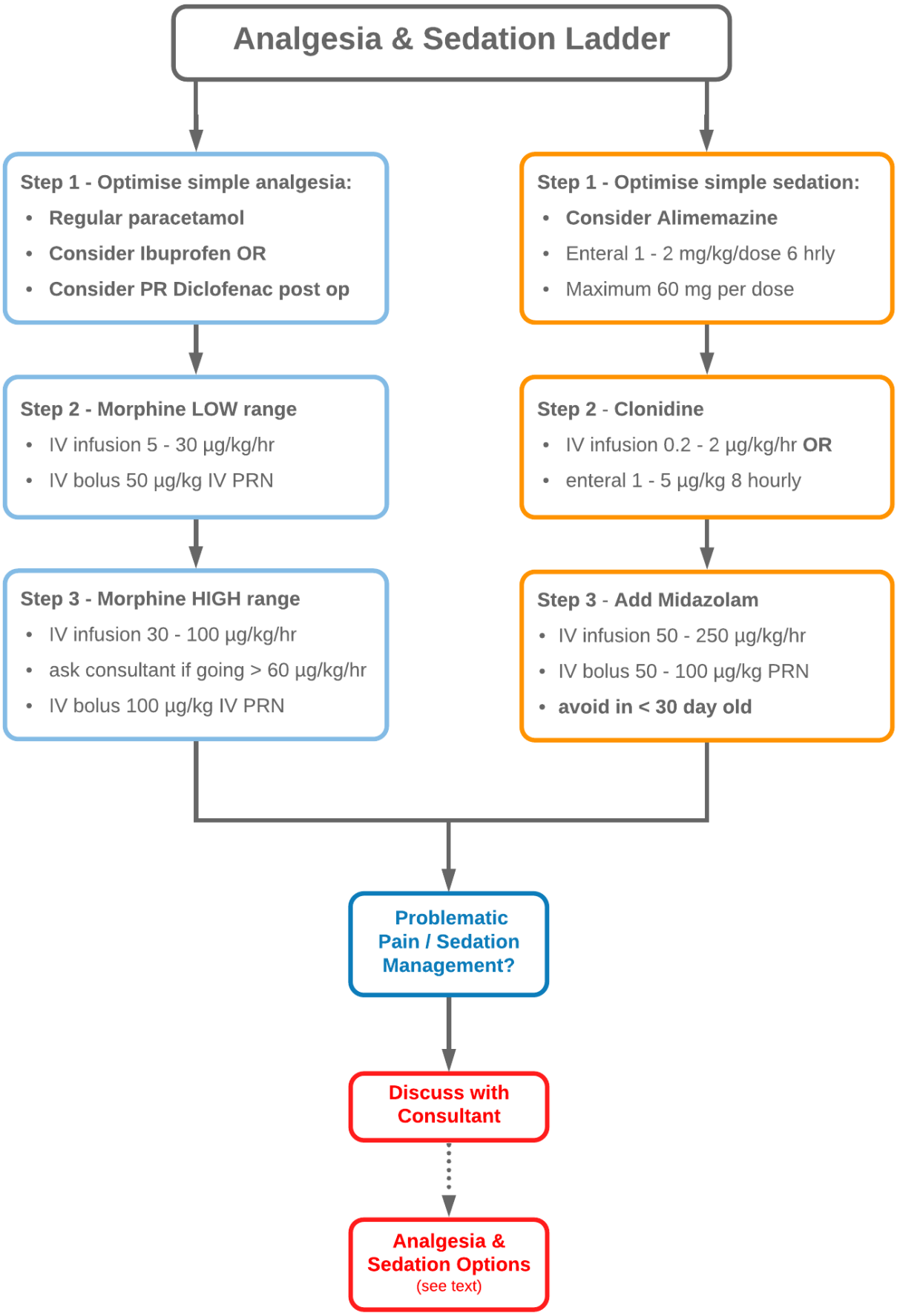
UHL PICU Analgesia & Sedation Guideline

This guideline should be considered for ALL children in PICU



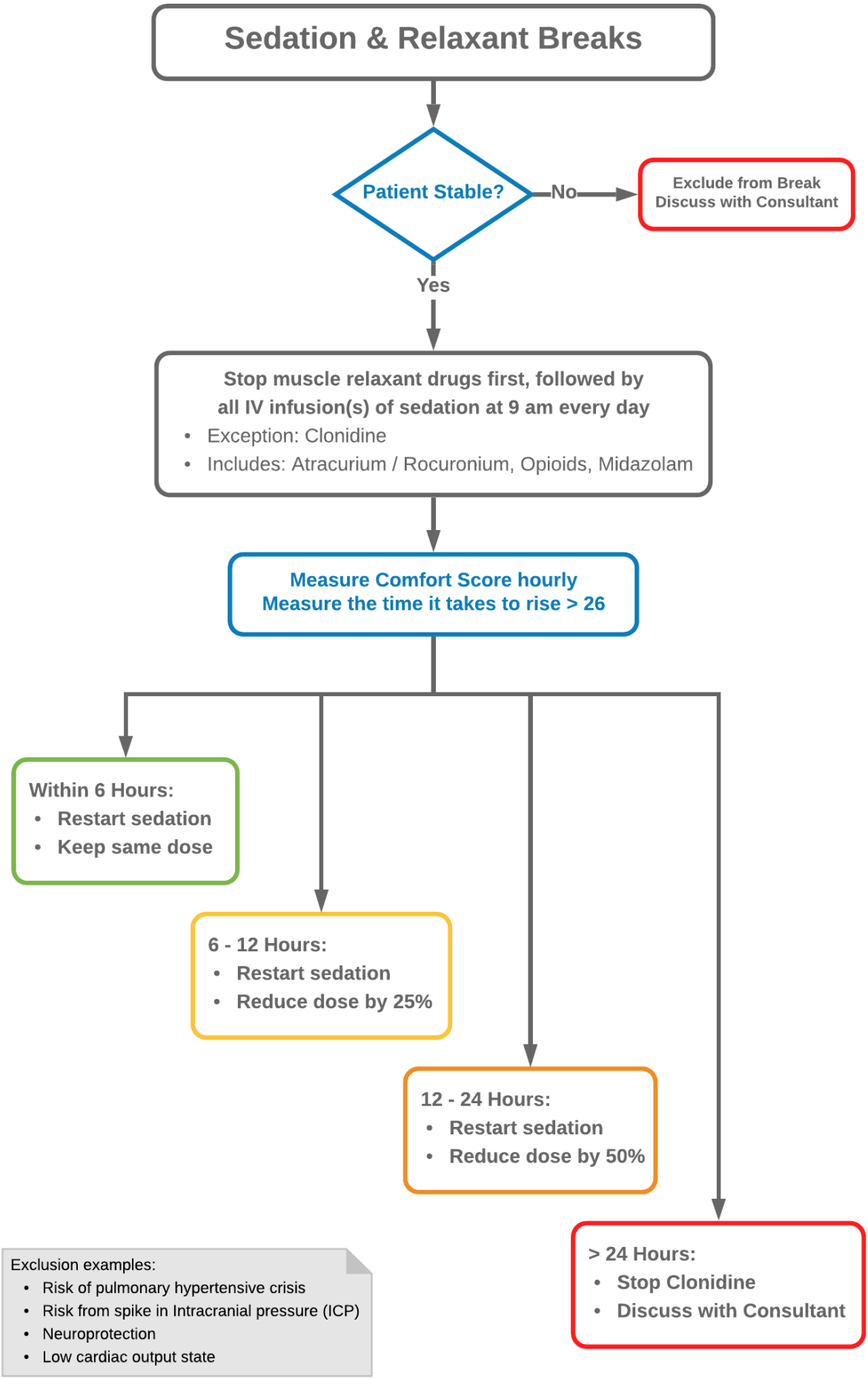
UHL PICU Analgesia & Sedation Guideline

This guideline should be considered for ALL children in PICU



UHL PICU Analgesia & Sedation Guideline

This guideline should be considered for ALL children in PICU



1 Introduction

1.1 Infants, children and young people admitted to the paediatric intensive care unit (PICU) experience pain, anxiety, agitation and fear as a consequence of the care they are receiving.

1.2 Factors such as: The PICU environment, unfamiliar staff and routines, high intensity light and noise, fever/environmental temperature, surgical procedures, PICU procedures and monitoring, positioning and physical movement, and other factors all contribute to discomfort, pain, anxiety, agitation and fear in our patients.

1.3 Looking after critically ill children in the PICU involves caring for both the physical and psychological comfort.

1.4 Pain and agitation stimulate stress responses and increases metabolic and oxygen demand. Pain has also been shown to lead to permanent structural and functional changes in the developing brain.

1.5 Irrespective of the need for sedation, all infants, children and young people have the right to adequate pain relief.

1.6 Agitated and scared children on PICU are at significant risk of harm due to unplanned removal of vital monitoring and therapeutic devices.

1.7 Sedation can be helpful in facilitating nursing care and reducing recall of unpleasant situations. Both under and over sedation present safety risks to the patient and adversely impacts on PICU length of stay.

1.8 This guideline offers a structured approach to managing analgesia and sedation for infants, children and young people admitted to the PICU.

2 Scope

2.1 This guideline is intended to help guide doctors, nurses, play specialists, physiotherapists and other staff in caring for infants, children and young people in the paediatric intensive care unit (PICU).

2.2 This guideline applies infants and children being cared for in the PICU. Most of these patients will be ventilated for critical illness or for recovery following surgery.

2.3 This guideline does not cover new born and infants being cared for in the special care baby unit (SCBU) or neonatal intensive care unit (NICU).

3 Key Points

3.1 **Adequate analgesia should be provided to all infants, children and young people in PICU regardless of the need for sedation.**

3.2 Optimise non-pharmacological interventions to maximise comfort.

3.3 Optimise simple analgesics early e.g. paracetamol / ibuprofen

3.4 For patients requiring > 8 hours intubation and ventilation, use the sedation and analgesia ladder. Discuss with PICU consultant where pain/agitation management is problematic.

3.5 Titrate analgesia and sedation to the desired levels of effect for safety and comfort.

3.6 Pain assessment (FLACC scale / Verbal / Grimace score) should be done 1 – 4 hourly.

3.7 Sedation assessment (COMFORT score) should be done 1 – 4 hourly.

3.8 Patient-controlled analgesia device should be considered for older children.

3.9 Early use of enteral sedative and analgesia agents is recommended.

3.10 Monitor for withdrawal syndrome following prolonged use of opioids and or sedatives (typically > 5 days).

4 Non-pharmacological interventions

4.1 Address any correctable environmental and or physical factor causing stress, pain or discomfort alongside pharmacological management. This can be achieved by:

- Sympathetic care from staff and family
- Reducing environmental noise and light
- Promotion of sleep and day–night orientation
- Relaxation / Distraction therapy
- Play and Music therapy (inc. bubble tubes and fibre-optic lights)
- Parental involvement in care
- Comforting touch/ massage or rocking
- Consider swaddling and non-nutritive sucking in infants
- Addressing feeding and hydration needs wherever possible
- Address essential cares e.g. mouth & eye care, body wash

4.2 Encourage a normal sleep pattern using good sleep hygiene. Reduce environmental noise and light (see also Quiet time on PICU Guideline). Minimise unnecessary procedures during sleep time.

4.3 Note that sleep quality is often worsened due to increased doses of sedative and hypnotic medications paradoxically with the (well-meaning) intention of improving the subjective assessment of sedation and sleep.

5 Pain Assessment

5.1 Patients who cannot communicate should be assessed for the presence of pain-related behaviours and physiological indicators of pain

5.2 Pain assessment (FLACC scale / Verbal / Grimace score) should be done 1 – 4 hourly.

5.3 Titrate analgesia to the desired levels of effect for safety and comfort.

5.4 If a patient required more than 3 bolus doses of morphine within 1 hour, consider increasing the infusion dose by 20%.

5.5 Monitor for withdrawal symptoms following prolonged use of opioids - typically > 5 days.

6 Sedation Assessment

6.1 Sedation assessment (COMFORT score) should be done 1 – 4 hourly. (Appendix)

6.2 Sedation therapy should be discussed on all patients on the morning ward round.

6.3 The total amount of sedative drugs given in the previous 24 hours should be clearly stated (infusion and boluses).

6.4 **Under Sedation: Comfort score > 26 or greater than target comfort score**

- Give a morphine bolus 50 – 100 micrograms/kg IV (max 5 mg) and review comfort score in 15 minutes.
- Repeat morphine bolus if Comfort score still not in range twice more, reviewing Comfort score every 15 min.
- Increase morphine infusion rate by 20% if Comfort score still not in target range after 3 morphine boluses.
- Move to next step on the sedation ladder (see Flow Chart) +/- give a midazolam bolus 50 – 100 microgram/kg if Comfort score is still not in target range and if the child is cardiovascularly stable.
- Discuss with PICU consultant if Comfort score still not in target range.

6.5 **Patient about to have an accidental / unintended extubation:**

- Call for help and bolus 100 micrograms/kg of morphine +/- midazolam if child is cardiovascularly stable and increase the back ground rate by 20%.

6.6 **Over sedation: Comfort score < 17 or less than target range**

- Review in an hour.
- Decrease sedation by 20% if the Comfort score is still < 17.

6.7 Patients in PICU > 48hrs should have a daily sedation breaks (see Flow Chart).

6.8 If a patient is thought to be in distress during a sedation break drugs should be recommenced immediately, and a bolus dose considered. This information must be relayed to the medical staff and discussed on the daily sedation review the following morning.

7 Sedation Care Plan

7.1 Infants, children and young people who has been in PICU for > 5 days should be managed with a Sedation Care Plan (Appendix).

7.2 The Sedation Care Plan should be completed by the bedside nurse or key nurse following discussion with the duty PICU consultant, and with input from parents, the PICU play specialist, PICU physiotherapist and PICU pharmacist as required.

7.3 Patients who have been on IV sedation + / - muscle relaxants for 48 hours should have daily sedation breaks (see Sedation & Relaxant Breaks Flow Chart).

7.4 Sedation break is where IV sedation (including morphine if it is used for its sedative effects) and muscle relaxants if applicable are paused from 9 am until the patient shows signs of movement or awareness, when IV sedation infusions may be re-started. If it takes > 6 hours to achieve movement or awareness, restart sedation infusion at a 20% reduced dose.

7.5 The Sedation Care Plan should be reviewed by the bedside nurse / named nurse and duty PICU consultant on a weekly basis until all sedation has been discontinued and the patient has no further signs of withdrawal syndrome.

8 Drugs used for analgesia and sedation in the PICU

8.1 See flow charts for an overview of analgesia and sedation in PICU.

8.2 Table 1 summarises the drugs commonly used for analgesia and sedation in PICU and provides additional information.

8.3 Early use of enteral sedative agents is recommended.

Table 1: Commonly used drugs for analgesia and sedation in the PICU

Drug	Dosing info	Notes
Morphine	See flow chart	Potential histamine release (avoid in asthma); consider reduced dose in renal and hepatic impairment.
Fentanyl	See options	Rapid onset; relatively long elimination half-time, especially after prolonged use due to redistribution in fat. Infusion > 9 days is 100% predictive of withdrawal syndrome
Paracetamol	Consult BNFC	If enteral route is not possible, IV paracetamol is a preferred alternative. Rectal administration associated with variable uptake.
Ibuprofen	Consult BNFC	Use with caution in renal disease; water retention; potential for gastrointestinal bleeding.
Diclofenac	Consult BNFC	Use with caution in renal disease and coagulation defects; may exacerbate inflammatory bowel diseases; potential for uncontrolled hypertension.
Midazolam	See flow chart	Problems with tolerance and withdrawal syndrome: Incidence ~ 17 - 30% with total dose of > 60 mg/kg (200 micrograms/kg/hr Infusion for 12.5 days) Possible prolonged sedation on discontinuation; reduced efficacy in infants.
Clonidine	See flow chart	May be associated with withdrawal syndrome; avoid sudden discontinuation. Caution with low blood pressure as clonidine is antihypertensive.
Alimemazine	See flow chart	Avoid in renal and hepatic failure. High dose is associated with acute dystonia, dyskinesis and seizures.
Chloral Hydrate	See options	Can cause hypotension. Avoid in severe renal and hepatic failure. Paradoxical excitement may occur. Use with caution in neonates.

9 Analgesia & Sedation Options

The following options should be considered and discussed with the PICU consultant when pain and or sedation management for a patient is problematic:

9.1 Local / Regional anaesthesia

Local and regional anaesthetic techniques should be considered where appropriate, e.g. epidural anaesthesia for abdominal surgery, regional nerve blocks for limb pain.

Discuss with an anaesthetic colleague or a member of the pain service.

A patient-controlled analgesia device may be useful in older children.

9.2 Morphine

Higher doses of morphine up to 100 micrograms/kg/hr or higher may be used for analgesia in exceptional circumstances. Discuss with the duty PICU consultant as per flow chart if higher doses (> 60 micrograms/kg/hr) of morphine is felt to be required.

Morphine commonly causes nausea and vomiting, constipation and drowsiness. Large doses cause respiratory depression and hypotension.

Caution: Avoid in acute asthma/bronchospasm due to histamine release associated with morphine. Effect prolonged in severe renal failure or hepatic failure.

9.3 Fentanyl

Fentanyl is an opioid analgesic 100 times more potent than morphine. It is associated with less histamine release compared to morphine and provides analgesia while being relatively stable from a cardiovascular point of view.

Fentanyl has a rapid onset of action (1 – 2 minutes) and brief duration of action (approx. 30 minutes) and is therefore useful for short term analgesia during surgical procedures on PICU e.g. dressing changes, bone marrow aspiration and chest closure.

Fentanyl is also useful for reducing the risk of acute pulmonary hypertension caused by stimuli such as chest physiotherapy.

Rapid injection of fentanyl can be associated with chest wall rigidity which can make ventilation difficult. Muscle relaxants will improve this.

Fentanyl should be avoided in children on extracorporeal membrane oxygenation (ECMO) due to high drug loss within the ECMO circuit.

Prolonged infusion (> 48 hours) of Fentanyl should be avoided due to dramatic increase in half life and reduction in clearance. This causes significant withdrawal problems if used long term.

Neonate and Child (ventilated)

1 – 5 micrograms/kg IV bolus to be administered over at least 30 seconds

1 – 6 micrograms/kg/hr IV infusion

Caution: Chest wall rigidity with rapid injection. Effect prolonged in severe renal failure or hepatic failure.

9.4 Remifentanil

Remifentanil is a very short acting and potent opioid and is ideal for use during short stimulating procedures such as physiotherapy or chest drain removal.

Due to its very short half-life, it may be useful in situations where frequent neurological assessment is needed as it can be paused/stopped, allowing the child to quickly gain a window of awareness/consciousness for assessment.

Remifentanil is metabolised by non-specific blood and tissue esterases (and unlike other opioids is not metabolised in the liver) and therefore may be useful in situations where hepatic impairment is a concern.

Due to its very short half-life, a child returning from theatre on a remifentanil infusion will rapidly experience severe pain if an alternative analgesia is not adequately established before weaning remifentanil. Discuss transition with a consultant.

Neonate

0.4 – 1 microgram/kg/min IV infusion

Child 1 month – 12 years

0.05 – 1.3 microgram/kg/min IV infusion

Child 12 - 18 years

0.05 – 2 microgram/kg/min IV infusion

Caution: Avoid IV bolus remifentanil in PICU due to risk of severe hypotension.

9.5 Diclofenac

IV or rectal (PR) diclofenac is an option if enteral ibuprofen cannot be given.

Note enteral drugs can often be given even if a child is not fed – check with a doctor. PR diclofenac is no more effective than ibuprofen but avoids the oral route.

PR Diclofenac dosing bases on BNFC doses and available suppositories:

Child 6 months – 17 years

Weight	Dose (max 4 days)
8 - 12 kg	12.5 mg BD
12 - 17 kg	12.5 mg TDS
17 - 24 kg	25 mg BD
25 - 32 kg	25 mg TDS
33 - 49 kg	50 mg BD
> 50kg	50 mg TDS

Caution: With renal disease; with coagulation defects; may exacerbate inflammatory bowel diseases; potential for uncontrolled hypertension.

Warning: Do not give diclofenac (or ibuprofen) to infants on prostin infusion or with duct dependent circulation as it will cause the ductus arteriosus to close.

9.6 Ketamine infusion

Ketamine produces dissociate anaesthesia. It has profound analgesic, amnesic and sedative properties. Ketamine acts at the N-methyl-D-aspartate (NMDA) receptor.

At Low doses (0.5 – 1 mg/kg) it provides sedation and analgesia of the skin, muscle and bone, while preserving airway reflexes, whereas higher doses (1 – 2 mg/kg) produce general anaesthesia.

Ketamine is a bronchodilator and may be helpful in managing patients with acute asthma/bronchospasm.

Neonate

0.5 – 2 mg/kg IV bolus

8 micrograms/kg/min IV infusion (max. 30 micrograms/kg/min)

Child

0.5 – 2 mg/kg IV bolus

600 – 2700 micrograms/kg/hr IV infusion

Side effects: confusion; abnormal behaviour; hallucination; diplopia/nystagmus; increased muscle tone; nausea; sleep disorders.

Do not use in tricyclic antidepressant overdose.

9.7 Diazepam

Diazepam is a benzodiazepine with active metabolites and exhibits entero-hepatic recirculation, leading to a long half-life of 20 – 90 hours (midazolam has a half-life of 2 – 4 hours with no active metabolites when used short term, longer term use leads to significant increase in the half-life of midazolam).

The long half-life of Diazepam makes it useful for children in weaning or tapering phases of their sedation management. It may be given once or twice daily.

As Diazepam is used mainly for medium to long term sedation management, the dose should be weaned or tapered before discontinuing.

Child 1 month – 11 years

0.2 mg/kg/dose 8 - 12 hourly

Caution: Not suitable for neonates

Side Effects: Paradoxical aggression/anxiety, confusion, respiratory depression, seizures, gastritis, paradoxical agitation, withdrawal syndrome.

9.8 Chloral Hydrate

Chloral Hydrate (Chloral) has many undesirable side effects and its use should be discussed with a consultant first. It mainly used for short term or procedural sedation.

Chloral has a variable, age-dependent half-life and accumulates with repeated dosing. Premature babies and neonates metabolise and excrete the drug much more slowly than larger children.

Chloral is very irritant to Airway Mucosa If aspirated. It should also be avoided in children following upper GI surgery as it aggravates peptic ulceration and can cause haemorrhagic gastritis.

Chloral should also be avoided in hepatic or renal impairment and in cardiac arrhythmias as it can precipitate SVT, VT and torsades de pointes.

Chloral interacts with Frusemide resulting in agitation, flushing, sweating and tachycardia. It also displaces albumin bound bilirubin, aggravating jaundice.

Finally, Chloral can cause acute dystonia on sudden withdrawal and should be weaned gradually following prolonged use.

Neonate

10 – 50 mg/kg oral (or PR only if oral route not available)

Give 45 – 60 min before procedure, max. 8 hourly

Child 1 month – 11 years

10 – 50 mg/kg oral (or PR only if oral route not available) (max. per dose 1g).

Give 45 – 60 min before procedure, max. 8 hourly

Child 12 – 17 years

1 – 2 g oral (or PR only if oral route not available) (max. per dose 2g).

Higher doses should be avoided in neonates, infants and prolonged use.

Side Effects: Respiratory depression, hypotension, nausea/vomiting, arrhythmia, seizures, gastritis, paradoxical agitation, withdrawal syndrome.

9.9 Propofol

Propofol should not be used to provide continuous sedation in critically ill children.

Prolonged infusion of Propofol may result in potentially fatal effects, including metabolic acidosis, arrhythmias, cardiac failure, rhabdomyolysis, hyperlipidaemia, hyperkalaemia, hepatomegaly, and renal failure.

Risk factors for Propofol infusion syndrome include:

- > 4mg/kg/hr for 48 hours, but can occur at lower doses
- younger age
- acute neurological injury
- low carbohydrate intake
- catecholamine infusion
- corticosteroids infusion

The UK Committee on Safety of Medicines has published a categorical statement that Propofol was contraindicated for the sedation of children aged 16 years and below. Long-term sedation of children with Propofol cannot be supported.

Propofol is used for induction and maintenance of anaesthesia in children (see BNFc), but should only be administered by, or under the direct supervision of, personnel

experienced in its use, with adequate training in anaesthesia and airway management, and when resuscitation equipment is available.

In PICU, some children may return from theatre on a short term Propofol infusion with the intention of weaning and extubating on PICU within a short (< 4 hours) period of time. In these instances, continue using Propofol for the respiratory wean or extended theatre recovery; discuss management with a PICU consultant.

If the child requires Propofol for > 4 hours, convert sedation to morphine and midazolam IV infusions as per flow chart.

Due to its short half-life and rapid offset, Propofol may be useful in select patients for the purpose of facilitating a controlled extubation. Under PICU consultant guidance, IV sedation infusions may be converted to Propofol infusion for up to 8 hours to allow the effects of opioids and benzodiazepines to wear off. Propofol can then be weaned/stopped, allowing wakefulness and extubation. Note blood pH must be normal with serum lactate < 4 mmol/l.

Child 1 month – 17 years (within PICU with consultant supervision as above)

1 – 4 mg/kg slow IV bolus, dose adjusted according to response

2 – 4 mg/kg/hr IV infusion, adjusted according to desired level of sedation and response

Side effects: Respiratory Depression, Hypotension, Metabolic Acidosis, Bradycardia, Convulsions.

9.10 Dexmedetomidine

Currently awaiting TAS application and pending approval, may become available on a named patient basis.

Dexmedetomidine is a selective alpha-2 adrenergic agonist. It is structurally related to clonidine but is 8 times more selective for alpha-2 receptors.

It reduces sympathetic activity and agitation and induces sedation via activation of alpha-2 receptors at the locus coeruleus of the brainstem.

A patient sedated with Dexmedetomidine can be easily roused with minimal stimulation and experiences minimal respiratory depression

Dexmedetomidine also has analgesic effects through modulation of pain impulses mediated by noradrenergic bulbar/spinal pathways. It can therefore reduce the need for opioid analgesics.

Do not use dexmedetomidine if clonidine was stopped because of side effects – the side effects of both drugs are very similar.

Dosing information for children is limited and prolonged infusion has not been described. Half-life is approximately 6 minutes.

Dose:

0.7 – 1.4 micrograms/kg/hr IV infusion (for 48 – 72 hrs only)

Side effects: bradycardia and hypotension; nausea; dry mouth; initial transient hypertension with reflex bradycardia; discontinuation syndrome

10 Withdrawal Assessment

10.1 See Sedation and Analgesia Weaning and Withdrawal – Scoring Chart guideline due to be published.

10.2 See also Oral Morphine and Clonidine Weaning Guideline C22/2010 for information on transition to oral analgesia and sedation weaning when a child is stepping down from intensive care.

10.3 The potential for opioid and benzodiazepine withdrawal syndrome increases with higher doses and longer duration of use. The probability of withdrawal approaches 100% after infusions lasting > 9 days.

10.4 Routine tapering or weaning of opioids should be considered after 4 – 5 days of continuous therapy or if higher doses have been administered.

10.5 Clonidine can be useful as an opioid sparing drug during weaning.

10.6 Features of withdrawal syndrome usually occur within a few hours of stopping the drug responsible. These may include:

Central nervous system manifestations

e.g. agitation, seizures, hallucinations, and psychosis

Autonomic features

e.g. vomiting, tachycardia, hypertension, and fever

Cardiovascular effects

e.g. arterial desaturation

10.7 Assessment for withdrawal symptoms can be difficult. Use the Weaning Assessment Tool to aid in assessment of withdrawal symptoms. (See Sedation and Analgesia Weaning and Withdrawal – Scoring Chart guideline due to be published.)

10.8 Risk of withdrawal syndrome from weaning can be minimised by:

- Reducing doses by 5 – 10% every 24 – 48 hours.
- Planned substitution for enteral preparations

  e.g. IV morphine -> oral morphine solution.
- Planned substitution for different class drugs

  e.g. IV midazolam -> oral clonidine.
- Considering use of long acting agents, e.g. lorazepam, clonidine.

10.9 Use the sedation care planning at 5 days as an opportunity to identify and anticipate any potential issues with sedation, analgesia, and withdrawal syndrome.

11 Bibliography

11.1 Gupta, K., Gupta, V. K., Jayashree, M., Muralindharan, J. and Singhi, S. (2012) 'Randomized controlled trial of interrupted versus continuous sedative infusions in ventilated children.', Pediatric critical care medicine, vol. 13, no. 2, pp. 131–135 [Online]. DOI: 10.1097/PCC.0b013e31820aba48.

11.2 Kamat, P. P., McCracken, C. E., Gillespie, S. E., Fortenberry, J. D., Stockwell, J. A., Cravero, J. P. and Hebbar, K. B. (2015) 'Pediatric critical care physician-administered procedural sedation using propofol: a report from the Pediatric Sedation Research Consortium Database.', Pediatric critical care medicine, vol. 16, no. 1, pp. 11–20 [Online]. DOI: 10.1097/PCC.0000000000000273.

11.3 Keogh, S. J., Long, D. A. and Horn, D. V. (2015) 'Practice guidelines for sedation and analgesia management of critically ill children: a pilot study evaluating guideline impact and feasibility in the PICU.', BMJ open, vol. 5, no. 3, pp. e006428–e006428 [Online]. DOI: 10.1136/bmjopen-2014-006428.

11.4 Kudchadkar, S. R., Aljohani, O. A. and Punjabi, N. M. (2014) 'Sleep of critically ill children in the pediatric intensive care unit: a systematic review.', Sleep Medicine Reviews, vol. 18, no. 2, pp. 103–110 [Online]. DOI: 10.1016/j.smrv.2013.02.002.

11.5 Lucas, S. S., Nasr, V. G., Ng, A. J., Joe, C., Bond, M. and Dinardo, J. A. (2016) 'Pediatric Cardiac Intensive Care Society 2014 Consensus Statement: Pharmacotherapies in Cardiac Critical Care: Sedation, Analgesia and Muscle Relaxant.', vol. 17, no. 3, pp. S3–S15 [Online]. DOI: 10.1097/PCC.0000000000000619.

11.6 Pan, W., Wang, Y., Lin, L., Zhou, G., Hua, X. and Mo, L. (2016) 'Outcomes of dexmedetomidine treatment in pediatric patients undergoing congenital heart disease surgery: a meta-analysis.', Paediatric anaesthesia, vol. 26, no. 3, pp. 239–248 [Online]. DOI: 10.1111/pan.12820.

11.7 Playfor, S. (2008) 'Analgesia and sedation in critically ill children.', Archives of disease in childhood Education and practice edition, vol. 93, no. 3, pp. 87–92 [Online]. DOI: 10.1136/adc.2007.119628.

11.8 Playfor, S., Jenkins, I., Boyles, C., Choonara, I., Davies, G., Haywood, T., Hinson, G., Mayer, A., Morton, N., Ralph, T., Wolf, A., United Kingdom Paediatric Intensive Care Society SedationAnalgesia and Neuromuscular Blockade Working Group (2006) 'Consensus guidelines on sedation and analgesia in critically ill children.', vol. 32, no. 8, pp. 1125–1136 [Online]. DOI: 10.1007/s00134-006-0190-x.

11.9 Raffaeli, G., Allegaert, K., Koch, B., Cavallaro, G., Mosca, F., Tibboel, D. and Wildschut, E. D. (2018) 'In Vitro Adsorption of Analgosedative Drugs in New Extracorporeal Membrane Oxygenation Circuits.', Pediatric critical care medicine, vol. 19, no. 5, pp. e251–e258 [Online]. DOI: 10.1097/PCC.0000000000001484.

11.10 Wolf, A., McKay, A., Spowart, C., Granville, H., Boland, A., Petrou, S., Sutherland, A. and Gamble, C. (2014) 'Prospective multicentre randomised, double-blind, equivalence study comparing clonidine and midazolam as intravenous sedative agents in critically ill children: the SLEEPS (Safety profiLe, Efficacy and Equivalence in Paediatric intensive care Sedation) study', *Health Technology Assessment*, vol. 18, no. 71, pp. 1–212 [Online]. DOI: 10.3310/hta18710 .

12 Education and Training

12.1 This guideline will be circulated to all staff on the PICU clinical practice group mailing list to raise awareness. It will be available to download from PAGL on Insite.

12.2 This guideline will be presented in QUICK meetings and via Focus on Guideline (FoG) spots regularly as required, with support and guidance provided by senior clinical staff and PICU pharmacists.

12.3 Education and training for nursing staff will be carried out by the nursing education team. Junior doctors will be made aware of this guideline at induction, with support and guidance provided by senior clinical staff and PICU pharmacists.

13 Monitoring Compliance

What will be measured to monitor compliance	Method of Assessment	Frequency	Monitoring Lead	Reporting
Guideline Algorithm followed	Audit	As necessary	PICU CPM	PICU CPM
Unplanned extubation rate	Datix Audit	As necessary	PICU CPM	PICU CPM
Unplanned line removal rate	Datix Audit	As necessary	PICU CPM	PICU CPM

14 Equality Statement

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.

As part of its development, this policy/guideline and its impact on equality have been reviewed and no detriment was identified.

Development and Approval Record for this Document			
Executive Lead:		A Duke	W&C Chief Nurse
Guideline Lead:		J Tong	PICU Consultant
		S Wheeler	PICU Pharmacist
Reviewed by:		J Vujcikova	PICU Consultant
		C Westreope	PICU Consultant
		J Whitelaw	PICU Consultant
		R Smith	PICU Staff Nurse
		R Joyce	PICU Clinical Skills Facilitator
		C Bostock	PICU ACP
		L Ballard	Play Specialist
Approved by:		PICU Clinical Practice Group	
Approval date:		Jun 2019	
Antimicrobial Working Party (AWP) Approval Required?			
AWP Approval date:		N/A	
AWP Reference:		N/A	
Review Record			
Date	**version**	**Reviewed by**	**Description of change (if any)**
Jun 2019	2.0	J Tong	New guideline