



UHL EMCHC & Children's Hospital

Sedation during Painless Imaging for Children and Young People (not for ED, pre-operative sedation or painful procedures).

Staff relevant to:	Clinical staff working within the UHL Children's Hospital and East Midlands Congenital Heart Centre.
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1. Introduction and Scope

Sedation is often required for imaging, to prevent image degradation from motion. Different levels of drug therapy are required to minimize anxiety immediately before and during the procedure.

It is important to note that when deeply sedated, children may lose their protective reflexes and ability to maintain their airway. For this reason, we have created a sedation record for patient monitoring before, during and after the procedure, with set standards to be met prior to discharge.

The aim of this guideline is to provide a framework for Medical and Nursing staff caring for patients within UHL EMCHC and the Children's Hospital who require mild (anxiolysis) or moderate (conscious) sedation (where the patient will only respond to repeated stimulation and therefore hopefully comply fully with scanning) whilst maintaining patient safety and comfort.

This guideline covers sedation for painless imaging: CT, MRI, Skeletal survey and sedated ECHOs.

Related Documents:

[Basic Life Support or Choking UHL Childrens Hospital Guideline C2/2016](#)

2. Guideline Standards and Procedures

2.1 Risks of sedation

The greatest risk is of the patient entering an excessively deep level of sedation and losing the ability to maintain a patent airway. Without appropriate measures this can lead to hypoxia and cardiac arrest. As long as appropriate steps are taken to re-establish the airway and assist breathing if needed, there will be no harm to the patient.

The use of deep sedation may put the patient at risk for aspiration of gastric contents, particularly if there is a loss of protective reflexes or they are not adequately fasted.

2.2 Drugs:

Chloral hydrate

Chloral hydrate is a sedative-hypnotic drug, which is hydrolysed on ingestion to trichloroethanol, which is responsible for its psychological and physiological side effects. It is available as oral syrup within our hospital trust. It is well tolerated by most patients. The most common adverse side effects reported include mild respiratory depression, nausea and vomiting, disorientation, confusion, headache and lethargy. More uncommonly, there may be prolonged drowsiness or paradoxical agitation. There is no reversal agent.

Alimemazine

Alimemazine has sedative, antihistamine, hypnotic and anti-emetic properties. It is not recommended for children less than 2 years of age due to the risk of marked sedation and prolonged respiratory depression. The most common adverse side effects reported are nasal stuffiness, dry mouth and agitation. There is no reversal agent.

Midazolam

Midazolam has sedative, hypnotic and amnesic properties. It is available as an oral solution and well tolerated. It is not licensed for conscious sedation in patients under 6 months old. It has a faster onset of action than diazepam, but may be longer in those with insufficient cardiac output or after repeated dose. The reversal agent is flumazenil, but this has a shorter length of action than midazolam so repeated doses may be necessary.

Other

Anaesthetic agents including ketamine, morphine and propofol, may only be used by staff in anaesthesia and PICU, who are appropriately trained, have advanced airway skills (i.e. can intubate children) and are working under the supervision of a consultant in anaesthesia or intensive care.

2.3 Cautions/Contraindications

Contraindications:

Sedation may be contraindicated due to pre-existing medical conditions (please see Table 1), drug interactions with the patients' regular medications (please see Table 2) or known allergy to sedative drugs / previous adverse reaction.

Specific notes:

Cyanotic heart disease* may not be a contraindication to sedation, provided the child is stable and has a known cyanotic cardiac lesion and is not requiring supplemental oxygen, with saturations of 75% or greater in air. The request for sedation must be discussed with the child's cardiologist, and documented in the child's notes.

Mild URTI are common in children. The symptoms of a significant active infection include cough, fever, lack of appetite and purulent nasal discharge. In these circumstances, the procedure/sedation should be postponed until the child is well.

Table 1 – Contraindications to sedation

System	Underlying condition
Respiratory	Abnormal airway History of sleep apnoea Respiratory failure Active respiratory tract infection
Cardiovascular	Cardiac failure Cardiovascular instability Cardiac arrhythmia Hypotension / hypovolaemia Pulmonary hypertension Cyanotic heart disease*(see above)
Gastrointestinal	Bowel obstruction Severe gastro-oesophageal reflux disease, such as frequent vomits and recurrent apnoeas
Neurological	Head Injury Raised intracranial pressure Neuromuscular disease Depressed conscious level
Other	Known allergy or adverse reaction to sedative Child too distressed despite adequate preparation Older child with severe behavioural problems Consent refusal by parent or patient

Table 2 – Drug interactions with sedative agents

Drug group	Notes
Drugs with sedative side effects	For example anti-depressants, anti-convulsants, anti-psychotics and opioids. May lead to unpredictable and uncontrollable level of sedation. Sedation is contraindicated with concurrent IV anticonvulsants and with regular or recent (within the last 24hrs) diazepam / lorazepam.
Hepatic enzyme inducers	For example phenobarbitone and phenytoin. Leads to increased sedation failure rate.
Warfarin	Chloral hydrate may displace warfarin from plasma protein binding sites, increasing the risk of haemorrhage in anti-coagulated patients, INR should be monitored following oral sedation with chloral hydrate.

Equipment required

The following equipment must be immediately available and taken with the patient if they are leaving the ward:

- Oxygen supply and appropriately sized masks
- Suction
- Self-inflating bag valve mask of appropriate size
- Appropriate size oropharyngeal airway
- Equipment to establish IV access
- The patient must be continuously monitored with a pulse oximeter that has an audible tone and alarms. It is useful to take a spare saturation probe
- Other: Child's notes and drugs chart. Please remember if the child is having an MRI scan, the parents need to sign the forms in the department
- For Skeletal Survey – Signed consent form or clearly documented in notes

Monitoring

Baseline and suitable continuous monitoring of

- Heart rate
- Oxygen saturation
- Respiratory rate (visually)

Patient monitoring

Vital signs recorded every 15 minutes during sedation for the first hour, observations should then be recorded every thirty minutes throughout the recovery period. These should be recorded in line with local policy. It is vital that an oxygen saturation monitor is connected to the patient at all times with audible tone and alarms. If the Heart Rate, Respiratory Rate or Oxygen Saturations become abnormal for that patient, the scan should be paused and a clinical assessment of the patient carried out.

Personnel

The patient must at all times be observed by a member of staff trained in bag-mask ventilation. A direct line of sight must be maintained between the observer and the patient/monitors from the onset of sedation until they have fulfilled the criteria for recovery (see below). This also applies during any transfer of the patient, for example from a ward to the radiology department and during the imaging. Two appropriately trained staff members must accompany each child to the imaging department. This would usually be 1 doctor and 1 nurse/HCA; a minimum of one BLS trained person and a HCA. This is to ensure there is a mechanism for calling for help.

Consent for sedation

For any procedure involving sedation, the parents, and if appropriate, the patient should be given information about the rationale for sedation, the technique to be used and the risks and side effects. Their consent (ideally a written consent) should be obtained and recorded. Relevant Patient Information Leaflets should be supplied outlining details of the planned procedure(s).

Preparation for Sedation and Scan

Follow UHL Childrens pre-operative general anaesthetic guidance

Principles:

- Appropriate preparation by the play team may reduce the sedation requirements.
- Ensure consent for scan and starvation prior to patient arrival in X-Ray.
- Starvation 2 hours for water, 4 hours breast milk, 6 hours for food. Essential medication may be given with a sip of water.
- Apply Ametop[®] Keep the child awake for as long as possible in the time leading up to the sedation. The child will sedate better if he/she is already tired.
- If contrast is required, a cannula must be inserted – (a larger bore cannula in the antecubital fossa is preferable.). To aim for cannulation before sedation if possible.
- Liaise with CT/MRI/ECHO department agreeing the scan and ward medication administration time - **These are given orally 30-45 minutes before the procedure.**
- Transfer the patient to the scan department as soon after administration as possible to reduce the disturbance caused by transfer. Transfer patient with nurse/ HCA, doctor, oxygen, CH transfer bag (kept on PICU, cPICU, Ward 1, LRI) and a Saturation monitor. Wait for the sedation to take effect.
- If for oral contrast study, then arrange for contrast medium to be sent to the ward to be administered with the sedation.
- Ideally child should be completely undressed into the hospital gowns or in such clothes that minimum disturbance done whilst they are sedated for the procedure.
- For CT/MRI all possible materials that can produce artefacts (eg metal clothing with metal studs) should be removed from clothing and body including ECG leads which are not MRI/CT compatible
- For Echocardiography: Chest should be exposed before patient goes into sleep, and ECG leads to be placed by the Imaging team.
- For Skeletal Survey, liaise with radiology department to take the child directly to x-ray prior to weaning of the sedation.

Sedation Medication

Assess the level of sedation required based on the length and disturbance of the scan, for example, sedation required for CT head should be significantly less than for MRI. Juniors to discuss with the imaging consultant or on-call consultant if any concerns.

Table 3 Drugs and Dosages For Non-Cardiac Imaging

Age/Weight	Oral Sedation
Premature infant under 38 weeks gestation	Assess on an individual basis following discussion with patient's consultant
Over 38 week gestation and under 1 month old	Feed only or Chloral hydrate 30mg/kg for longer procedures (i.e. MRI)
Over 1 month old but less than 5kg	Feed only or Chloral hydrate 50mg/kg, Higher doses up to 70mg/kg may be used
Equal to or greater than 5kg but less than 10kg	Chloral hydrate 50-100mg/kg (Please see examples below to inform dosing)
10-15kg, <4 years old	Chloral hydrate 50-100mg/kg * (Please see examples below to inform dosing) Maximum dose 2 gm as per BNFC
> 15kg, < 4years old	Midazolam oral (Use oral solution) 0.5mg/kg max 20mg
Over 4 years old Oral sedation likely to fail Consider general anaesthesia, especially for longer scans.	Midazolam oral (Use oral solution) 0.5mg/kg max 20mg

*In this age group consideration can be given to adding Alimemazine 1mg/kg (maximum 30 mg)

However, combined sedation regimens result in increased risks to children, and Alimemazine is not licenced for children under 2 years.

If a child fails to sedate with lower dose sedation, the dose can be topped up to the maximum dose.

Table 4 Drugs and Dosages For Cardiac Imaging

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Over 1 month old but less than 5kg	Feed only or Chloral hydrate 50mg/kg, Higher doses up to 100 mg/kg may be used
Equal to or greater than 5kg but less than 10kg	Chloral hydrate 100mg/kg (Please see examples below to inform dosing)
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Over 4 years old Oral sedation likely to fail Consider general anaesthesia, especially for longer scans.	Midazolam oral (Use oral solution) 0.5mg/kg max 20mg

If you suspect that single agent oral sedation will be inadequate for your patient, discuss with the consultant whether dual agent sedation or general anaesthesia is the preferred option.

Oral sedation is more likely to fail over the age of 18 months and consideration of General anaesthesia should be made, depending on the type of imaging required

If the child spits out or vomits the dose

Within 10 minutes - Repeat the full dose
 After 10 minutes but before 20 minutes - Repeat a reduced dose of 50% of the Chloral hydrate (and 50% of the Alimemazine dose if previously administered)
 After 20 minutes - Do not repeat the dose as significant absorption may have already occurred

A child who receives higher levels of sedation may remain asleep for some time and consideration should be given to siting an IV cannula for fluids

Please see appendix 1 for procedure booking GA scans at LRI.

Criteria for discharge home

Alert, orientated and can talk (if age appropriate)

Has returned to pre-sedation level of consciousness

Can sit unaided (if age appropriate)

Takes oral fluids without vomiting

Is in the care of a responsible adult who has been given discharge advice

3. Education and Training

Staff trained in paediatric resuscitation mandatory annual training.

4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
100% of children are sedated with medication in line with this guideline.	Audit of patient notes	Dr Shebani Dr Radcliffe	3 yearly	At departmental audit meeting
100% of children meet safe discharge criteria at discharge	Audit of patient notes	Dr Shebani Dr Radcliffe	3 yearly	At departmental audit meeting

5. Supporting References

NICE Clinical guideline [CG112] Published: 15 December 2010 Sedation in under 19s: using sedation for diagnostic and therapeutic procedures
<https://www.nice.org.uk/guidance/cg112> (accessed April 2024)

SIGN 58 Safe Sedation of Children Undergoing Diagnostic and Therapeutic Procedures. Scottish Intercollegiate Guidelines Network 2004

American Academy of Pediatrics. Guidelines for Monitoring and Management of Pediatric Patients During and After Sedation for Diagnostic and Therapeutic Procedures: An Update. *Pediatrics* Volume 118, Number 6, December 2006

6. Key Words

Sedation, Painless Imaging, Procedures, Imaging

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 and its impact on equality have been reviewed and no detriment was identified.

Contact & review details	
Guideline Lead (Name and Title) Vinayak Rai – Consultant Paediatrician Suhair Shebani – Consultant Cardiologist	Executive Lead Chief Medical Officer
Details of Changes made during review: Updated title to include ‘not for ED, pre-operative sedation or painful procedures’ October 2024 : Minor amendment: <ul style="list-style-type: none"> - Table 3 clarified as Drugs and Dosages for Non-Cardiac Imaging - Addition of Table 4 Drugs and Dosages For Cardiac Imaging 	

Appendix 1 **UNIVERSITY HOSPITALS OF LEICESTER NHS TRUST**

Theatre Utilisation Meeting Adhoc Patient Activity

Completed Form to be email to 642@uhl-tr.nhs.uk

Date of Request	
Name of Requester	Name & Position
Patient S Number	
Patient Location	
If not an in-patient when / where will they be admitted	Details
Procedure Required	
Lead Speciality	
Other Specialities Required	
Site	LRI / LGH / GGH
Location	COD / Angio / MRI / etc
Time Slot	<1.5hrs, >1.5hrs, >3hrs
Anaesthetist Required	Yes / No
ODP Required	Yes / No
Scrub Required	Yes / No
Recovery Required	Yes / No
Preferred Day of Week	
Preferred Time	AM / PM
Contact Clinician	
Contact Matron	
Contact Manager	
Reason for Adhoc Listing	
Rate of Pay	RTT / WLI / Other
Cost Code for Charging	
Discussed at Scheduling	Date
Deadline for Completion	Date
1st Date Offered	Date
2nd Date Offered	Date

CHILD NEEDS A CT/MRI UNDER GA

EMERGENCY
(Done within 24 hours,
NCEPOD 1-5)

URGENT
(1-7 days, usually an
InPatient)

ELECTIVE / PLANNED
(> 7 days, usually an
OutPatient)

Paediatric Team to book child onto Emergency List (with NCEPOD rating)
The Emergency Bleep Holder / Consultant Paediatric Anaesthetist will be able to give an indication of time
*Note this is the emergency list and subject to frequent last minute changes

Please do **NOT** contact Anaesthetics or Theatre Floor Control direct, they will redirect you to 642 / Theatres Service Manager
Please do not book a radiology slot until the availability of an Anaesthetic team has been confirmed

Contact 642 Mailbox, attach a **completed** Adhoc Proforma

Contact Radiology Bookings Regular Lists
Tues AM CT or MRI
Tue PM MRI
Thurs PM MRI

ITAPS will look for a staffing and advise Paediatrics of the identified slot

Radiology Bookings: 18765

Paediatric Team to liaise with MRI / CT staff regards timings

Paediatrics to liaise with Radiology to book a slot

Theatres Bleep Holder: 4120
Emergency Paed Anaes: via Switch
CT: 16947 MRI: 17747

Theatres Service Manager: via 642@uhl-tr.nhs.uk

ITAPS/Paed CT or MRI Process - Updated May 2017