

Procedural sedation

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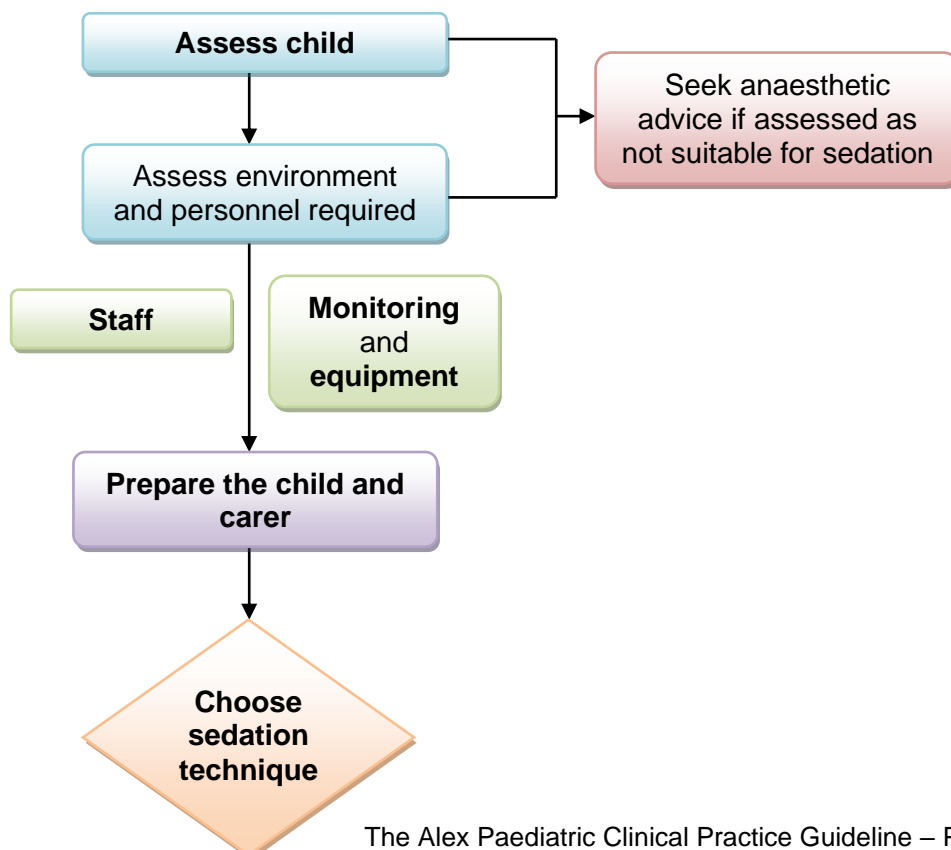
See also: **Procedural sedation in CED** guidelines. To skip straight to MRI sedation doses click [here](#)

Background

Procedural sedation aims to **reduce fear and anxiety, augment pain control, and minimise movement** during medical procedures – the relative importance of each depends on the nature of the procedure and the characteristics of the patient.

Sedation depth	Sedation score	Conscious state
	0	Awake, normal conscious level
Minimal sedation	1	Patient awake and calm, responds normally to verbal commands. Cognitive function and coordination impaired, ventilation and cardiovascular functions unaffected.
Moderate sedation	2	Patient sleepy but responds purposefully to verbal commands or light tactile stimulation. Airway patent and spontaneous ventilation. Cardiovascular function maintained.
Deep sedation	3	Patient asleep and cannot be easily roused. Responds purposefully to repeated or painful stimulation. May require assistance to maintain a patent airway. Spontaneous ventilation may be inadequate. Cardiovascular function maintained.
	4	Unroutable

Procedural sedation flowchart (click [here](#) to skip to drug details):



Assessment

Patients

Establish suitability for the sedation by assessing:

- Fasting status for food and drink
- Current medical condition and any surgical problems
- Weight
- PMH including any history of problems with sedation or anaesthesia
- Current and recent medication and allergies
- Physical status including an assessment of the airway
- Psychological and developmental status.

Relative contra-indications:

If any of the following are present, discuss with Consultant:

- Concern about a potential airway or breathing problem
- Child has ASA grade ≥ 3 airway
- Infants < 1 year

Provide verbal and written information on:

- Procedure – what the patient should do, and what the clinician will do; what will happen, and how to cope with the procedure.
- Proposed sedation technique
- Alternatives to sedation
- Risks and benefits

Gain **written consent** prior to procedure. Parents / carers should always be given the opportunity to be present during the procedure – if they are going to be present, inform them of their role prior to procedure starting.

Fasting

Not required for minimal sedation, sedation with nitrous oxide (in oxygen), or moderate sedation where verbal contact is maintained.

For moderate and deep sedation where verbal contact is not maintained use the “2-4-6 rule” (2 hours clear fluids, 4 hours breast milk, 6 hours solids).

In the absence of adequate fasting, discuss with the Consultant on duty whether to proceed based on the urgency of the procedure and target depth of sedation.

Management

Staff

Clinician and assistant must be trained in delivering, monitoring and dealing with complications of sedation. **If you are not trained, you cannot give the sedation.**

Members of the team must have the following **life support skills**:

	Minimal sedation	Moderate sedation	Deep sedation
All members	Basic	Basic	Basic
At least one member		Intermediate	Advanced

For deep sedation, one clinician should only be responsible for delivering, continuously monitoring, interpreting and responding to:

- Depth of sedation
- Observations
- Pain, coping and distress

Equipment and environment

Sedation should be administered in an appropriate environment where constant monitoring can be provided. Ensure this is available in your area.

Resuscitation equipment (must be to hand) – oxygen with mask and reservoir, self-inflating bag and mask, oropharyngeal airway, suction, resuscitation drugs and specific reversal drug (if applicable).

Monitoring equipment – ECG, BP and end-tidal capnography if planning moderate – deep sedation (if available).

Use the [sedation checklist](#) (print out and leave in patient notes).

Monitoring

During procedure and until patient has a patent airway, normal respirations, is haemodynamically stable and easily rousable, monitor:

- Depth of sedation
- Respiration
- Oxygen saturations
- Heart rate
- **ECG***
- **End-tidal CO₂ (if available)***
- **5-minutely blood pressure***
- Pain
- Coping
- Distress

*Required for deep or moderate sedation

Sedation agent

Choose based on:

- What the procedure involves
- Target level of sedation
- Contraindications
- Side effects
- Patient or carer preference

Non-pharmacological methods

For children <6 months: feeding and wrapping can often be adequate

For older children: distraction and relaxation techniques (involve Play Team) – see below for more details.

Drugs (see next page for more details)

Painless procedures such as imaging (CT / MRI):

- Chloral hydrate for children < 15 kg
- Midazolam

For children unable to tolerate painless imaging with the above drugs, consider need for anaesthetic input for use of Propofol / Sevoflurane. Contact the duty or on-call Paediatric Anaesthetist to discuss.

Painful procedures such as I.V access / blood tests in a needle-phobic child, LP, suturing or orthopaedic manipulation:

- nitrous oxide and / or
- midazolam (oral or intranasal)

If the above is unsuitable, consider (**only to be given under consultant supervision**):

- Ketamine (IV or IM)
- Intravenous midazolam (with or without Fentanyl) to achieve moderate sedation.

If this is unsuitable, then consider a specialist sedation technique such as Propofol with or without Fentanyl – Contact duty or on-call Paediatric Anaesthetist to discuss.

Combine sedation with a local anaesthetic or appropriate analgesia such as intranasal fentanyl

The addition of opioid analgesics will **increase the level of sedation** – ensure an appropriately trained clinician is available to administer and monitor sedation.

Discharge criteria

- Vital signs have returned to normal levels.
- The patient is awake with no risk of further reduced level of consciousness.
- Nausea, vomiting and pain adequately managed.
- Procedure complete and appropriate follow up arranged.

Non-pharmacological methods:

- Give children a sense of control by letting them make choices e.g. where to sit for the procedure, which hand to use for the IV insertion.
- Do not give the child a choice about when to start the procedure as it increases anticipatory anxiety.
- Use age-appropriate distraction such as bubbles, windmills, stories, music, toys, electronic games, non-procedural talk or imagery (see table below).
- To promote relaxation encourage breathing exercises, muscle relaxation and imagining a favourite place, sport or activity.
- Continue the verbal distraction / imagery until after the end of the procedure. Prompt the child to use coping behaviours and praise all attempts.

INFANTS	TODDLERS	PRE-SCHOOLERS	SCHOOL-AGE	ADOLESCENTS
Dummy	Bubbles	Bubbles	Deep breathing	Deep breathing
Rattle/Shaker	Sound books	I Spy	TV/tablet/smartphone	TV/tablet/smartphone
Bubbles	Singing	Counting	I Spy	Music
Interactive Toys		Singing	Non-Procedural talk	I Spy
		Big belly breaths		Non-Procedural Talk
		TV/tablet/smartphone		

Table: Age-appropriate distraction techniques

Drugs

Chloral Hydrate

- Hypnotic drug with **no** analgesic properties
- Useful for painless procedures such as imaging
- Contraindicated in severe cardiac disease, gastritis, acute porphyria
- No specific antidote. Dose usually lasts up to 4 hours.

Dose:

Sedation for MRI only (see next page for non-MRI sedation):

By mouth (or PR if oral route not available):

< 1 month old: Feed and wrap and / or 30 mg/kg chloral hydrate

> 1 month old, body weight under 5 kg: 70 mg/kg

Body weight 5 – 15 kg: 100 mg/kg (Max 2 g)

Body weight > 10 kg can add alimemazine 1 mg/kg if adequate sedation not achieved.

Body weight > 15 kg: use alternative agent or consider general anaesthesia

NB. Alimemazine is unlicensed for use under 2 years and should be used with caution under 6 months.

Bottle available from HDU supply only.

Any other sedation:

By mouth (or PR if oral route not available):

- 1 month to 12 years: 30 – 50 mg/kg (max 1 g) 45 – 60 minutes before procedure.
- 12 – 18 years: 1 – 2 g 45 – 60 minutes before procedure.

Midazolam

- Benzodiazepine. Relief of anxiety, sedative and amnesic properties.
- May occasionally cause marked respiratory depression. Can cause severe disinhibition and restlessness.
- Fast onset of action.
- Contraindicated in children with marked neuromuscular respiratory weakness, severe respiratory depression, acute pulmonary insufficiency, sleep apnoea syndrome.
- Can potentiate effects of analgesics like opioids – **use with caution if giving together.**

Dose

By mouth:

1 month – 18 years: 500 micrograms / kg (max 20 mg) 30 – 60 minutes before procedure.

Buccal:

6 months – 10 years: 200 – 300 micrograms / kg (max 5 mg)

10 – 18 years: 6 – 7 mg (max 8 mg if 70 kg or over).

IV injection over 2 – 3 minutes 5 – 10 minutes before procedure:

Start at 25 – 50 micrograms / kg increased if necessary in small steps to a maximum total dose of:

1 month – 6 years: 6 mg

6 – 12 years: 10 mg

12 – 18 years: 7.5 mg

Antidote:

Flumazenil will rapidly reverse midazolam effects but repeated doses may be required. Give **10 micrograms / kg** (max 200 micrograms), repeated at 1 minute intervals if required to total dose 50 micrograms / kg (max 1 mg).

Can be given as an intravenous infusion if drowsiness recurs: 2 – 10 micrograms / kg / hour (maximum 400 micrograms / hour).

Flumazenil should not be given to an epileptic child who had been on long term benzodiazepine treatment, as it may precipitate a withdrawal convulsion.

Nitrous oxide

- Anaesthetic gas delivered in variable concentrations with oxygen.
- Modest analgesic and sedative properties.
- Given as Entonox (50% nitrous oxide / 50% oxygen) or in the Children's Emergency Department up to 70% can be delivered.
- Can be combined with intranasal fentanyl for enhanced analgesia / deeper sedation
- Very quick onset of action and clearance from body.
- Contraindicated in children with head injury, asthma exacerbation, bowel obstruction, pneumothorax.
- Requires co-operation so Entonox use limited to > 4 years old.

Using Entonox:

1. If using fentanyl, give dose prior to starting Entonox
2. Check cylinder has a tight seal to the regulator pipe.
3. Appropriate size face mask or mouth piece.
4. Connect the mask / mouth piece to a bacterial filter and then attach the filter to the demand valve.
5. Turn the cylinder to the open position and the regulator will record the amount of Nitrous Oxide left in the tank (if <500KPa then cylinder needs changing).

Procedure:

6. The child should self-administer Nitrous Oxide for at least two minutes before the painful procedure. A harsh sound is heard on inspiration if the gas is flowing properly.
7. The child should continue to breathe Nitrous Oxide throughout the procedure and one minute after the procedure is finished.
8. If the child feels nauseated withhold inhalation for few seconds (but effects will wear off quickly).

Post procedure:

9. Turn the cylinder valve to closed position, the regulator valve will go back to zero until the line from the regulator to the face mask is emptied.

Notes

For further information see

- <http://www.nice.org.uk/guidance/cg112>

Date / time:

Prepare Team and Patient

- Weight _____ kg
- Allergies – recorded on medication chart
- Airway assessment
- Risk assessment checked
- Exclusion criteria checked
- Fasting time

Any positive findings, contraindications or not fasted to be discussed with Consultant on duty

- Risks discussed, consent signed and sedation handout to parents

- Allocate sedation team roles

Sedation clinician

Sedation assistant

Procedure clinician

Prepare Equipment

Check equipment ready and working:

- O₂ mask with reservoir, oxygen on 15 L/min
- Self-inflating bag and mask and oropharyngeal airway to hand
- Working suction
- Resuscitation trolley with emergency drugs available

Monitoring:

- Pulse oximetry
- ECG monitoring, BP cycling 5 minutely and end-tidal CO₂ for moderate – deep sedation
- Baseline vital signs recorded on observation chart PRIOR to commencing sedation

Drugs:

- Sedation drug – prescribed and prepared
- Reversal drugs available
- IV access for deep sedation

Prepare for difficulty

Plan for vomiting?

Plan for over-sedation?

Access to relevant equipment including alternative airway?

Contact for any complications:

Name: _____ Bleep: _____

Do you need more help now?

During and after procedure:

- Continuous oximetry plus ECG monitoring, BP every 5 minutes and end-tidal CO₂ for moderate – deep sedation
- Vital signs documented every 5 minutes
- Depth of sedation documented
- Nil orally until fully alert
- Fulfils discharge criteria
- Side effect or adverse event of sedation documented

Establish suitability for the sedation by assessing:

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Informed consent

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