



**National Institute for  
Health and Clinical Excellence**

## Quick reference guide

Issue date: December 2010

# Sedation in children and young people

Sedation for diagnostic and therapeutic procedures in  
children and young people



### About this booklet

This is a quick reference guide that summarises the recommendations NICE has made to the NHS in 'Sedation for diagnostic and therapeutic procedures in children and young people' (NICE clinical guideline 112).

### Who should read this booklet?

This quick reference guide is for healthcare professionals and other staff who care for children and young people being sedated.

### Who wrote the guideline?

The guideline was developed by the National Clinical Guideline Centre, which is based at the Royal College of Physicians. The Centre worked with a group of healthcare professionals (including consultants, GPs and nurses), patients and carers, and technical staff, who reviewed the evidence and drafted the recommendations. The recommendations were finalised after public consultation.

For more information on how NICE clinical guidelines are developed, go to [www.nice.org.uk](http://www.nice.org.uk)

### Where can I get more information about the guideline?

The NICE website has the recommendations in full, reviews of the evidence they are based on, a summary of the guideline for patients and carers, and tools to support implementation (see inside back cover for more details).

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ISBN 978-1-84936-431-7

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NICE clinical guidelines are recommendations about the treatment and care of people with specific diseases and conditions in the NHS in England and Wales.

This guidance represents the view of NICE, which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer, and informed by the summary of product characteristics of any drugs they are considering.

Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to avoid unlawful discrimination and to have regard to promoting equality of opportunity. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.

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### Patient-centred care

Treatment and care should take into account patients' individual needs and preferences. Good communication is essential, supported by evidence-based information, to allow patients to reach informed decisions about their care. Follow advice on seeking consent from the Department of Health or Welsh Assembly Government if needed. If the patient agrees, families and carers should have the opportunity to be involved in decisions about treatment and care. If caring for young people in transition between paediatric and adult services refer to 'Transition: getting it right for young people' (available from [www.dh.gov.uk](http://www.dh.gov.uk)).

### Introduction

- Sedation may be considered in children and young people if a procedure is too frightening, too painful or needs to be carried out in a child or young person who is ill, in pain or has behavioural problems.
- A change in sedation services to children has become necessary because demand has increased. Sedation may be a better use of NHS resources than anaesthesia. It is important to correctly match the patient and procedure with sedation technique.

## Key to terms

**Age ranges:** Infants: children from birth to 1 year; Neonates: infants aged up to 1 month.

**Levels of sedation:** The definitions of minimal, moderate, conscious and deep sedation used in this guideline are based on those of the American Society of Anesthesiologists (ASA).

- **Minimal sedation:** A drug-induced state during which patients are awake and calm, and respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.
- **Moderate sedation:** Drug-induced depression of consciousness during which patients are sleepy but respond purposefully to verbal commands (known as conscious sedation in dentistry, see below) or light tactile stimulation (reflex withdrawal from a painful stimulus is not a purposeful response). No interventions are required to maintain a patent airway. Spontaneous ventilation is adequate. Cardiovascular function is usually maintained.
- **Conscious sedation:** Drug-induced depression of consciousness, similar to moderate sedation, except that verbal contact is always maintained with the patient. The term is commonly used in dentistry.
- **Deep sedation:** Drug-induced depression of consciousness during which patients are asleep and cannot easily be roused but do respond purposefully to repeated or painful stimulation. The ability to maintain ventilatory function independently may be impaired. Patients may require assistance to maintain a patent airway. Spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained.

**Specialist sedation techniques:** Sedation techniques that have a reduced margin of safety and increased risk of unintended deep sedation or anaesthesia, accompanied by airway obstruction and/or inadequate spontaneous ventilation. Healthcare professionals using specialist sedation techniques need to be trained to administer sedation drugs safely, to monitor the effects of the drugs and to use equipment to maintain a patent airway and adequate respiration.

## Prescribing drugs

The guideline will assume that prescribers will use a drug's summary of product characteristics to inform decisions made with individual patients.

This guideline recommends some drugs for indications, for ages or at doses for which they do not have a UK marketing authorisation at the date of publication ('off-label use'), if there is good evidence to support that use. A brief explanation is given in a footnote in each case, with further details on page 12. Informed consent should be obtained and documented for any use outside the UK marketing authorisation.

**KPI** indicates a key priority for implementation.

## Preparing for sedation

### Is sedation suitable for the child or young person?

- Trained healthcare professionals (see 'Personnel and training', page 11) should carry out pre-sedation assessments and document the results in the healthcare record **KPI**
- Two trained healthcare professionals should be available during sedation **KPI**
- Immediate access to resuscitation and monitoring equipment should be available during sedation **KPI**

Establish suitability for sedation by assessing:

- current medical condition and any surgical problems
- weight (growth assessment)
- past medical problems (including any associated with previous sedation or anaesthesia)
- current and previous medication (including any allergies)
- physical status (including the airway)
- psychological and developmental status **KPI**

Do any of the following apply?

- There is concern about a potential airway or breathing problem
- The child or young person is American Society of Anesthesiologists (ASA) grade 3 or greater<sup>1</sup>
- The patient is a neonate or infant

Yes

Seek specialist advice (before delivering sedation) **KPI**

No

Choose the most suitable sedation technique based on all the following factors:

- what the procedure involves (see 'Choosing sedation technique', page 7)
- target level of sedation (see 'Key to terms', page 4)
- contraindications
- side effects
- patient (or parent or carer) preference
- staff training (see 'Personnel and training', page 11) **KPI**

Offer the child or young person and their parents or carers verbal and written information on all of the following:

- proposed sedation technique
- alternatives to sedation
- associated risks and benefits

Obtain and document informed consent

<sup>1</sup> The ASA physical status classification system (grades 1–6) is a system to classify and grade a patient's physical status before anaesthesia.

## Preparing the child or young person

### Fasting

- Before starting sedation, confirm and record the time of last food and fluid intake in the healthcare record.
- Fasting is not needed for:
  - minimal sedation
  - sedation with nitrous oxide (in oxygen)
  - moderate sedation during which the child or young person will maintain verbal contact with the healthcare professional.
- Apply the 2-4-6 fasting rule for elective procedures using any sedation other than the above (that is, apply the 2-4-6 fasting rule for deep sedation and moderate sedation during which the child or young person might not maintain verbal contact with the healthcare professional):
  - 2 hours for clear fluids
  - 4 hours for breast milk
  - 6 hours for solids.
- For an emergency procedure in a child or young person who has not fasted, base the decision to proceed with sedation on the urgency of the procedure and the target depth of sedation.

### Psychological preparation

- Ensure that the child or young person is prepared psychologically for sedation by offering information about:
  - the procedure itself
  - what the child or young person should do and what the healthcare professional will do
  - the sensations associated with the procedure (for example, a sharp scratch or numbness)
  - how to cope with the procedure.
- Ensure that the information is appropriate for the developmental stage of the child or young person and check they have understood.
- Offer parents and carers the opportunity to be present during sedation if appropriate. If a parent or carer decides to be present, offer them advice about their role during the procedure.
- For an elective procedure, consider referring to a mental health specialist children or young people who are severely anxious or who have a learning disability.

## Choosing sedation technique

### Painless imaging

- Do not routinely use ketamine<sup>2,3</sup> or opioids<sup>3</sup> for painless imaging procedures.
- For children and young people who are unable to tolerate a painless procedure (for example, during diagnostic imaging) consider one of the following drugs, which have a wide margin of safety:
  - chloral hydrate<sup>2</sup> for children under 15 kg
  - midazolam<sup>2</sup>.
- For children and young people who are unable to tolerate painless imaging with the above drugs, consider one of the following, used in specialist techniques, which have a narrow margin of safety (see 'Personnel and training', page 11):
  - propofol<sup>2,3</sup>
  - sevoflurane<sup>2</sup>.

### Painful procedures

- For all children and young people undergoing a painful procedure, consider using a local anaesthetic as well as a sedative.
- For children and young people undergoing a painful procedure (for example, suture laceration or orthopaedic manipulation), when the target level of sedation is minimal or moderate, consider:
  - nitrous oxide (in oxygen) and/or
  - midazolam<sup>2</sup> (oral or intranasal).
- For children and young people undergoing a painful procedure (for example, suture laceration or orthopaedic manipulation) in whom nitrous oxide (in oxygen) and/or midazolam (oral or intranasal) are unsuitable consider:
  - ketamine<sup>2,3</sup>
  - intravenous midazolam<sup>2</sup> with or without fentanyl<sup>3</sup> (to achieve moderate sedation).
- For children and young people undergoing a painful procedure (for example, suture laceration or orthopaedic manipulation) in whom ketamine (intravenous or intramuscular) or intravenous midazolam with or without fentanyl (to achieve moderate sedation) are unsuitable, consider a specialist sedation technique such as propofol<sup>2,3</sup> with or without fentanyl<sup>3</sup>.

<sup>2</sup> See page 12 for details of off-label indications and cautions for recommended drugs.

<sup>3</sup> At the time of publication (December 2010) the British National Formulary for Children (BNFc) stipulated that if deep sedation is needed an anaesthetic agent (propofol or ketamine), or a potent opioid (fentanyl) may be used. However, they should be used only under the supervision of a specialist experienced in the use of these drugs.

### Dental procedures

- For a child or young person who cannot tolerate a dental procedure with local anaesthesia alone, to achieve conscious sedation consider:
  - nitrous oxide (in oxygen) or
  - midazolam<sup>4</sup>.

If these sedation techniques are not suitable or sufficient, refer to a specialist team for an alternative sedation technique.

### Endoscopy

- Consider intravenous midazolam<sup>4</sup> to achieve minimal or moderate sedation for upper gastrointestinal endoscopy.
- Consider fentanyl<sup>5</sup> (or equivalent opioid) in combination with intravenous midazolam<sup>4</sup> to achieve moderate sedation for lower gastrointestinal endoscopy.

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<sup>4</sup> See page 12 for details of off-label indications and cautions for recommended drugs.

<sup>5</sup> At the time of publication (December 2010) the British National Formulary for Children (BNFc) stipulated that if deep sedation is needed an anaesthetic agent (propofol or ketamine), or a potent opioid (fentanyl) may be used. However, they should be used only under the supervision of a specialist experienced in the use of these drugs.



## During sedation

### Clinical environment and monitoring

Continuously monitor, interpret and respond<sup>6</sup> to changes in all of the following

For moderate (excluding for nitrous oxide) and deep sedation	For deep sedation only
● depth of sedation	● three-lead electrocardiogram (ECG)
● respiration	● end tidal CO <sub>2</sub> (capnography) <sup>7</sup>
● oxygen saturation	● blood pressure (monitor every 5 minutes) <sup>7</sup>
● heart rate	
● pain	
● coping	
● distress	

- Ensure data from continuous monitoring during sedation are clearly documented in the healthcare record.
- After the procedure, continue monitoring until the child or young person:
  - has a patent airway
  - shows protective airway and breathing reflexes
  - is haemodynamically stable
  - is easily roused.

<sup>6</sup> For deep sedation, a healthcare professional should be involved only in continuously monitoring, interpreting and responding to these data.

<sup>7</sup> End tidal CO<sub>2</sub> and blood pressure should be monitored, if possible, provided that monitoring does not cause the patient to awaken and so prevent completion of the procedure.

## After sedation

### Discharge criteria

- Ensure that all of the following criteria are met before the child or young person is discharged:
  - vital signs (usually body temperature, heart rate, blood pressure and respiratory rate) have returned to normal levels
  - the child or young person is awake (or returned to baseline level of consciousness) and there is no risk of further reduced level of consciousness
  - nausea, vomiting and pain have been adequately managed.
- Consider referring to an anaesthesia specialist if the child or young person is not able to tolerate the procedure under sedation.

## Personnel and training

### Healthcare professionals delivering sedation should have the following

Knowledge and understanding of and competency in: <b>KPI</b>	Practical experience of: <b>KPI</b>	Documented up-to-date evidence of competency including: <b>KPI</b>
<ul style="list-style-type: none"> <li>• sedation drug pharmacology and applied physiology</li> </ul>	<ul style="list-style-type: none"> <li>• effectively delivering the chosen sedation technique and managing complications</li> </ul>	<ul style="list-style-type: none"> <li>• satisfactory completion of a theoretical training course covering the principles of sedation practice</li> </ul>
<ul style="list-style-type: none"> <li>• assessment of children and young people</li> </ul>	<ul style="list-style-type: none"> <li>• observing clinical signs (for example, airway patency, breathing rate and depth, pulse, pallor and cyanosis, and depth of sedation)</li> </ul>	<ul style="list-style-type: none"> <li>• a comprehensive record of practical experience of sedation techniques, including details of:               <ul style="list-style-type: none"> <li>– sedation in children and young people performed under supervision</li> <li>– successful completion of work-based assessments.</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• using monitoring equipment.</li> </ul>	
<ul style="list-style-type: none"> <li>• recovery care</li> </ul>		
<ul style="list-style-type: none"> <li>• complications and their immediate management, including paediatric life support.</li> </ul>		

### Members of the sedation team should have the following life support skills **KPI**

	<b>Minimal sedation, sedation with nitrous oxide alone (in oxygen), conscious sedation in dentistry</b>	<b>Moderate sedation</b>	<b>Deep sedation</b>
All members	Basic	Basic	Basic
At least one member		Intermediate	Advanced

- Ensure that a healthcare professional trained in delivering anaesthetic agents is available to administer:
  - sevoflurane<sup>8</sup>
  - propofol<sup>8,9</sup>
  - opioids<sup>8</sup> combined with ketamine<sup>8,9</sup>.

Each healthcare professional and their team delivering sedation should update their knowledge and skills through programmes designed for continuing professional development.

<sup>8</sup>See page 12 for details of off-label indications and cautions for recommended drugs.

<sup>9</sup>At the time of publication (December 2010) the British National Formulary for Children (BNFc) stipulated that if deep sedation is needed an anaesthetic agent (propofol or ketamine), or a potent opioid (fentanyl) may be used. However, they should be used only under the supervision of a specialist experienced in the use of these drugs.

## Off-label indications and cautions for recommended drugs

**Chloral hydrate** is used in UK clinical practice for sedating children and young people for painless procedures. At the time of publication (December 2010) chloral hydrate did not have UK marketing authorisation for this indication. See 'Licensing indications', page 13.

**Ketamine** is a dissociative agent: the state of dissociative sedation cannot be readily categorised as either moderate or deep sedation; the drug is considered to have a wide margin of safety. See 'Licensing indications', page 13.

**Midazolam** is used in UK clinical practice for sedating children and young people up to the age of 18. At the time of publication (December 2010) midazolam did not have UK marketing authorisation for oral or buccal administration, or for children younger than 6 months. See 'Licensing indications', page 13.

**Propofol** is used in UK clinical practice for sedating children and young people. At the time of publication (December 2010) propofol did not have UK marketing authorisation for this age group. See 'Licensing indications', page 13.

**Sevoflurane** is used in UK clinical practice for sedating children and young people. At the time of publication (December 2010) sevoflurane did not have UK marketing authorisation for this indication. See 'Licensing indications', page 13.

## Licensing indications

The table that follows provides a summary reference guide to pharmacological treatment. It was prepared from data available in September 2010. Prescribers should refer to the 'British national formulary for children' (BNFc) and summary of product characteristics for each drug for full and up-to-date details of licensing. Informed consent should be obtained and documented for the use of any drug outside the licensed indications.

Drug	Indication	Licensed status and advice for use <sup>a</sup>
<b>Chloral hydrate</b>	Sedation	Not licensed for sedation in painless procedures However, dosing for painless procedures in children from neonates to 18 years is given in the BNFc; by mouth or by rectum
<b>Fentanyl</b>	Analgesia and enhancement of anaesthesia and for deep sedation	Licensed for use in children older than 1 month with spontaneous respiration for analgesia, and during operations for enhancement of anaesthesia by intravenous injection over at least 30 seconds If deep sedation is needed fentanyl may be used. It should be used only under the supervision of a specialist experienced in its use
<b>Ketamine</b>	Anaesthesia (lower doses are used for sedation than for anaesthesia for surgery)	Licensed for use in anaesthesia for all ages; intravenous and intramuscular If deep sedation is needed ketamine may be used. It should be used only under the supervision of a specialist experienced in its use
<b>Midazolam</b>	Sedation	Not licensed for use in children younger than 6 months for premedication and conscious sedation Not licensed for use by mouth or by buccal administration Intravenous midazolam is not licensed for use in children younger than 6 months for conscious sedation No UK marketing authorisation for oral or intranasal midazolam for sedation. However, dosing for children from age 1 month is given in the BNFc
<b>Nitrous oxide</b>	Sedation	50% nitrous oxide licensed for use in sedation for all ages; inhalation Nitrous oxide in concentrations greater than 50% is not licensed for analgesia without loss of consciousness

*Continued*

<sup>a</sup> Taken from the 'British national formulary for children' (BNFc) 2010/11, correct at the time of publication.

Drug	Indication	Licensed status and advice for use <sup>a</sup>
<b>Opioids</b>	Sedation	The BNFC stipulates that if deep sedation is needed a general anaesthetic (for example, propofol or ketamine), or a potent opioid (for example, fentanyl) may be used. However, they should be used only under the supervision of a specialist experienced in the use of these drugs
<b>Propofol</b>	Anaesthesia	Licensed for use in all children older than 1 month in doses of 0.5% or 1%; intravenous
	Sedation	Licensed for use in people older than 17 years. The Guideline Development Group decided to recommend off-label use of propofol for sedation in children of all ages. This was because propofol is widely used in the UK for sedation in children of all ages and the doses used for sedation are much lower than those used for anaesthesia If deep sedation is needed, propofol may be used. It should be used only under the supervision of a specialist experienced in its use
<b>Sevoflurane</b>	Anaesthesia	Licensed for use in anaesthesia for all ages; inhalation
	Sedation	Not licensed for sedation

<sup>a</sup>Taken from the 'British national formulary for children' (BNFC) 2010/11, correct at the time of publication.

## Further information

### Ordering information

You can download the following documents from [www.nice.org.uk/guidance/CG112](http://www.nice.org.uk/guidance/CG112)

- The NICE guideline – all the recommendations.
- A quick reference guide (this document) – a summary of the recommendations for healthcare professionals.
- ‘Understanding NICE guidance’ – a summary for patients and carers.
- The full guideline – all the recommendations, details of how they were developed, and reviews of the evidence they were based on.

For printed copies of the quick reference guide or ‘Understanding NICE guidance’, phone NICE publications on 0845 003 7783 or email [publications@nice.org.uk](mailto:publications@nice.org.uk) and quote:

- N2380 (quick reference guide)
- N2381 (‘Understanding NICE guidance’).

### Implementation tools

NICE has developed tools to help organisations implement this guidance (see [www.nice.org.uk/guidance/CG112](http://www.nice.org.uk/guidance/CG112)).

### Related NICE guidance

NICE has not published any related guidance.

### Updating the guideline

This guideline will be updated as needed, and information about the progress of any update will be available at

[www.nice.org.uk/guidance/CG112](http://www.nice.org.uk/guidance/CG112)

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N2380 1P 33k Dec 10

ISBN 978-1-84936-431-7