# Clinical Radiology

# Sedation, analgesia and anaesthesia in radiology

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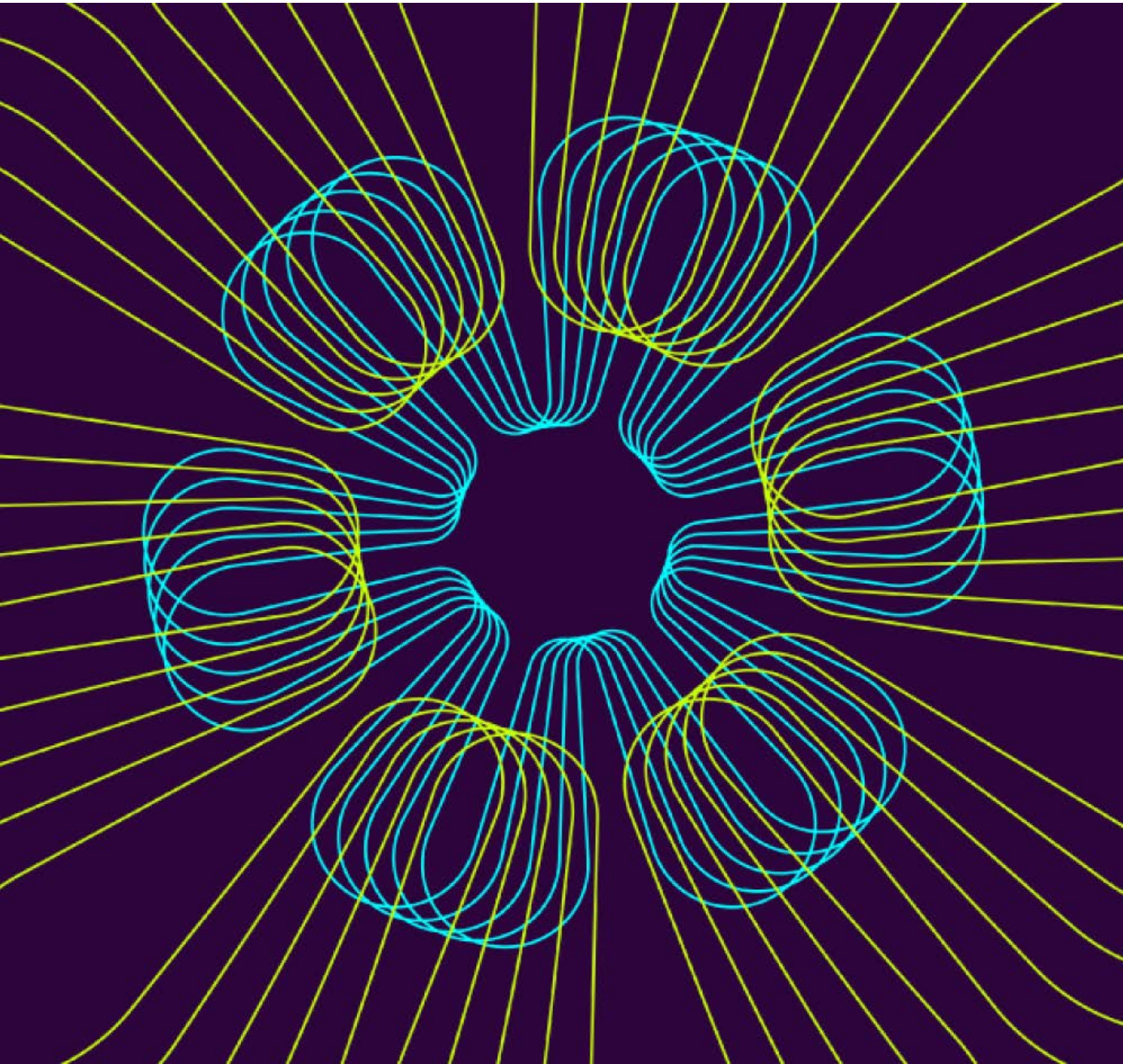

# Contents

# Key points

1. An appropriately trained and credentialed team should administer sedation and analgesia.
2. A multidisciplinary sedation committee should exist in each institution administering sedation and analgesia.
3. Patients requiring sedation should undergo pre-procedure assessment and have a sedation plan.
4. Sedated patients should be appropriately monitored.
5. Resuscitation equipment and reversal agents should be readily available.
6. A properly staffed recovery area and formalised communication are essential for safe aftercare and discharge.
7. Regular audit of practice should be performed.
8. All sedation-related complications should be recorded.
9. Sedation-related adverse outcomes should be discussed with the patient in line with the General Medical Council Duty of Candour recommendation once the effects of the sedation have worn off.

# 01 Introduction

Sedation and analgesia can effectively alleviate the pain, anxiety and psychological and physical distress of radiological procedures and is extensively used in routine clinical practice. Safe use of sedation and analgesia can reduce the burden on healthcare systems by more prudent use of general anaesthesia and inpatient resources. In addition, sedation and anxiolysis may be used to make diagnostic studies more tolerable, and this is specifically covered in Section 14.

This guidance is aimed at those working in radiology teams where sedation is used. The update builds on the foundation established by the prior version in 2018,[1] with a greater focus on defining standards of care for healthcare organisations and departments to ensure sedation and analgesia practice is safe and effective.[2] The recommendations outlined in this document are graded according to the integrated hierarchy of standards of service outlined in the Francis report.[3]

a. **Fundamental standards** of minimum safety and quality. There should be a defined standard operating procedure to ensure compliance.
b. **Enhanced quality standards**, which set requirements higher than fundamental standards, but which are discretionary and subject to availability of resources.
c. **Developmental standards**, which set out longer-term goals for providers. These would aim to improve effectiveness and are more likely to be the focus of commissioners and progressive provider leadership than the regulator.

Organisations providing sedation, analgesia and anaesthesia in the radiology department should adhere to the standards set out in the National Safety Standards for Invasive Procedures (NatSSIPs) from the Centre for Perioperative Care (CPOC). Patients undergoing invasive procedures should also have sequential standards observed and documented as set out by the CPOC.[4]

# 02 Basics of sedation and analgesia

Sedation is a continuum from minimal sedation to general anaesthesia. The definitions used are those recommended by the American Society of Anesthesiologists (ASA) and the National Institute for Health and Care Excellence (NICE) (Table 1).[5]

## Table 1. Definition of level of sedation

| | Minimal sedation (anxiolysis) | Moderate sedation ('conscious sedation') | Deep sedation | General anaesthesia |
|---|---|---|---|---|
| Responsiveness | Normal response to verbal stimuli | Purposeful response to verbal or tactile stimuli | Purposeful response to repeated or painful stimuli | Unrousable, even to painful stimuli |
| Airway | Unaffected | No intervention required | Intervention may be required | Intervention usually required |
| Spontaneous ventilation | Unaffected | Adequate | May be impaired; assistance may be required | Frequently impaired; assistance may be required |
| Cardiovascular function | Unaffected | Usually maintained | Usually maintained | May be impaired |

Appropriately trained sedation teams should be able to safely induce a state of minimal or moderate sedation. Deep sedation and general anaesthesia remain the remit of an anaesthetist. As the level of sedation increases, physiological responses become depressed and the likelihood of adverse events increases.

A target level of sedation should be defined prior to the procedure. However, a deeper level of sedation may be inadvertently produced, and the sedation team should be able to rescue the patient by correcting the physiological consequences and returning the patient to the intended level of sedation.

Analgesia and sedation are closely related. Anxiety potentiates pain and vice versa. Analgesia is therefore crucial and can be multimodal including local and regional anaesthesia and opioid and non-opioid drugs.

# 03 Pre-procedural assessment

All patients undergoing sedation for procedures should be pre-assessed to ensure their fitness and suitability. Patients scheduled for elective procedures should undergo an assessment within 30 days of the procedure.

Assessments may occur in nurse-led clinics or interventional radiology (IR) clinics or use pre-existing preoperative assessment services. The assessment and resultant pre-procedure plan should be documented and available at the time of procedure. *Fundamental standard*.

A medical history and a systems survey should be obtained to identify co-morbidities and disease control issues. Factors that may indicate sensitivity to sedation should be identified, for example obstructive sleep apnoea, moderate-severe chronic obstructive pulmonary disease (COPD), obesity, morbid obesity (BMI >40 kg/m$^2$), older patients (>70 years), chronic renal or hepatic impairment and neuromuscular or neurological disease. ASA grade (Table 2) should be assessed.[5] *Fundamental standard*.

## Table 2. ASA physical status classification[5]

| | Patient characteristic | Example |
|---|---|---|
| Class I | A normal healthy patient | Non-smoker, minimal drinker, healthy |
| Class II | A patient with a mild systemic disease | Smoker, well-controlled hypertensive or diabetes, mild lung disease, moderate drinking |
| Class III | A patient with a severe systemic disease | Distant history of myocardial infarction (MI), cerebrovascular accident (CVA), cardiac stent, end-stage renal failure (ESRF), pacemaker, ejection fraction <40% |
| Class IV | A patient with severe systemic disease that is a constant threat to life | Recent MI, CVA, transient ischaemic attack (TIA), ongoing cardiac ischaemia, ejection fraction <28% |
| Class V | A moribund patient who is not expected to survive without the procedure | Acute aortic syndrome, bowel ischaemia |

Anaesthetic consultation for Classes III–V should be considered.

Opiate usage and chronic pain predict higher sedation requirements and anaesthetic input should be considered. Patients already taking narcotic analgesia, including patches and patient-controlled analgesia (PCA) pumps, are often habituated to opiates and should be identified. Regular analgesics should be taken on the procedural day to ensure comfortable positioning.

# 03

## Pre-procedural assessment

A range of factors may increase the risk of sedation including potential airway or respiratory problems. These include an ASA grade of 3 or greater, neurological impairment, behavioural disturbance, raised intracranial pressure, epilepsy, risk of pulmonary aspiration of gastric contents and severe renal or hepatic failure. The anaesthetic history may highlight these or other issues such as previous difficult intubations or an event, which may indicate the need for experienced anaesthetic input.

The airway should be assessed by a member of staff adequately trained to do so as per institutional guidelines. This may include the Mallampati airway score, jaw protrusion, neck flexion and neck extension issues.[6] If potential airway problems that may compromise airway management and the ability to ventilate are identified, anaesthetic input should be sought.

Fasting advice should be given[7] (see Section 4 Immediate pre-procedure care). Patients should receive written (available in a variety of languages) or visual information detailing what to expect from the sedation and the procedure. Adequate aftercare (accompanying adult, transport) must be ensured and written post-procedure instructions (for example, no driving for 24 hours) given at the pre-assessment visit. *Fundamental standard*.

# 04 Immediate pre-procedure preparation

Although the need for fasting with moderate sedation is debated, as there is the possibility of inadvertent over-sedation, fasting instructions should be in line with institutional guidance for general anaesthesia. Most often for adult patients this is food until six hours before the procedure and clear fluid (including black tea and coffee) until two hours before. There are specific recommendations for paediatric patients (see Section 13 Paediatric sedation). For emergent, non-fasted cases that cannot be delayed, intravenous therapy (such as metoclopramide and H2 blocker) to promote gastric emptying, neutralise gastric acid and reduce chance of aspiration or even general anaesthesia and intubation for airway protection can be considered.[7] Fasting is unnecessary for inhaled nitrous oxide and oxygen (Entonox) alone.

Reliable intravenous access, preferably 20 gauge (G) pink cannula or above (except for inhaled or minimal oral sedation) should be established prior to sedation administration. *Fundamental standard*.

# 05 Intraprocedure monitoring and management[8]

## Table 3. Monitoring equipment used for sedation (mandatory and optional)

| Mandatory monitoring | Optional monitoring |
|---|---|
| Continuous monitoring of pulse oximetry, respiratory rate and electrocardiogram. | Temperature, especially with prolonged procedures. |
| Automated non-invasive blood pressure measured at least every five minutes. | Capnography is advocated for early detection of apnoea prior to desaturation but not considered essential.[9] Capnography should be used whenever there is loss or likelihood of loss of normal response to verbal contact. |
| Sedation and pain level monitored at least every ten minutes. | The use of bispectral index monitoring (BIS) to measure and quantify sedation level is controversial.[10] |
| Blood glucose measured before, during and after procedure in patients with diabetes. | |
| Record of all drugs administered. | |
| Pressure and position monitoring. | |

# 06 Recovery and discharge post procedure

Patients transferred from the procedural room to a recovery area should be handed over to a named member of staff where vital monitoring can continue until baseline status is established and patients can be discharged. Scoring systems such as the Aldrete or modified Aldrete scores[11] may be used to aid post-procedure discharge. The patient should be provided with post-procedure instructions, including contact details, and have a responsible adult at home. *Fundamental standard*.

# 07 Equipment

A checklist of essential equipment for provision of safe sedation is provided in Table 4. *Fundamental standard*.

## Table 4. Essential equipment required for provision of safe sedation

| Equipment details |
|---|
| Resuscitation or emergency cart with back-up power, defibrillator, equipment for intubation and ventilation immediately available with regular documented checks. |
| Oxygen supply – portable or fixed source with back-up supply. |
| Airway maintenance and oxygen delivery equipment including nasal cannulae, face masks (including one capable of delivering 100% oxygen), oral airways and Ambubag. |
| Suction equipment, capable of producing continuous suction at 150 millimetres of mercury (mmHg), and suction catheters, regularly checked and immediately available. |
| Monitoring equipment as described in Section 5. |
| Pressure or position-related injury prevention equipment (such as straps and gel pads). |
| Anaphylaxis pack containing adrenaline 1 in 1,000 for intramuscular (IM) injection and blood tubes for tryptase. |
| Readily available, clearly displayed emergency response plans (possibly wall charts) for cardiovascular collapse, over-sedation or reversal and anaphylaxis. |
| Homeothermia preserving equipment (forced air warming system). |
| Magnetic resonance imaging (MRI) appropriate equipment for sedation in MRI scanner (see Section 14 Cross-sectional imaging). |

# 08 Personnel

Sedation and analgesia should be administered by a competent and well-trained sedation team and oversight provided by a sedation committee within the institution.

## Sedation team members

### Performing clinician (the person performing the procedure or diagnostic investigation)

Should be at least immediate life support (ILS) trained, understand the indications and objective of sedation and analgesia, obtain consent for sedation and analgesia and prescribe medications as required. They should be aware of and recognise potential synergism with other medications administered intraprocedurally. They should also be able to identify the adverse effects of sedation and analgesia and be able to administer reversal agents.

### Primary sedation practitioner

Should be at least ILS trained and may be a doctor, nurse or appropriately trained healthcare professional. *Fundamental standard*. They will administer sedation and analgesia, monitor the patient and record the results. They should be able to identify adverse effects of sedation and analgesia and be able to administer reversal agents. The primary sedation practitioner should continue to monitor the patient and stay with them until full recovery or formalised handover. They should have no responsibility during the procedure other than to administer sedation and monitor the patient response.

## Sedation team composition

The minimal sedation team for IR should be the performing clinician and a primary sedation practitioner. *Fundamental standard*. Ideally the original sedation team should remain in place throughout the procedure, but this is not always possible. Any change to the team requires approval of the performing clinician and appropriate handover.

The minimum sedation team composition should be the same in hours and out of hours. Patients treated out of hours are usually clinically unwell and hence pose a risk to safe sedation.

# 09 Therapeutic agents

Drugs should be targeted at the anticipated problem, usually pain or anxiety, although these are interrelated. The intravenous route is preferred to oral or intramuscular as the unpredictable bioavailability with the latter makes titration of dose difficult. However, oral medication is used in cross-sectional imaging such as prior to MRI in claustrophobic patients. The dose of medication used is titrated to effect and the predetermined target sedation level. Older people are much more sensitive to sedative effects of and paradoxical reactions to drugs (especially benzodiazepines) than younger patients and doses should be adjusted accordingly.

Combination therapy (sedation and analgesia) is often used in IR. The sedative effects of opiates and benzodiazepines are synergistic rather than additive. A benzodiazepine and opiate with equal sedative effect given together have an eightfold increase in sedative effect rather than twofold.

## Sedatives

Benzodiazepines are the most used sedative agents possessing both anxiolytic and amnesic properties. Midazolam is the benzodiazepine of choice because of its rapid onset of action and short elimination half-life (one to four hours). The typical initial dose of midazolam is 1–2 milligrams (mg) with subsequent doses titrated to response and clinical need. Propofol and ketamine have significant side-effects to consider and are generally considered within the remit of ‘anaesthetics only’ drugs.

## Analgesics

### Opioids

Opioids are the most used intraprocedural systemic analgesic, and fentanyl is the opioid of choice due to its rapid onset of action, short half-life and fewer side-effects compared with other opioids such as morphine, diamorphine or pethidine. Typical initial dose is 25–100 micrograms (µg) with subsequent doses titrated to response and clinical need. Rarely, fentanyl can cause skeletal muscle rigidity resulting in ‘stiff chest syndrome’, which may require urgent escalation to undergo paralysis and intubation. Patient controlled analgesia (PCA) with opioids can be used successfully for many IR procedures, particularly solid organ embolisation.

### Non-opioids

These include paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs) and Entonox. Entonox (50% nitrous oxide and 50% oxygen) can be used as a patient-activated inhaled form of analgesia. Rapid onset of action with minimal side-effects means it is suited to use in many clinical settings. A local policy for the use of Entonox should be in place. An Entonox champion who oversees training and availability is advised.

09
Therapeutic agents

## Local anaesthesia

Topical local anaesthetics such as creams, sprays and jellies can be useful for needle-phobic patients prior to intravenous access or prior to infiltration of local anaesthetic. The most widely used is Emla cream (2.5% lidocaine and 2.5% prilocaine) applied to the desired location under an occlusive dressing one hour prior to procedure.

Subcutaneous lidocaine is the most widely used infiltrative local anaesthetic with a maximum dose of 3 mg/kilogram (kg) (typically 30 ml of 1% and 15 ml of 2%). Bupivacaine, levobupivacaine, mepivacaine and ropivacaine are longer acting and have slightly different side-effects. Local anaesthetic systemic toxicity (LAST) can occur when an excessive dose of local anaesthetic is infiltrated or injected in the wrong location (such as intravascular). This results in a wide range of symptoms from metallic taste, mouth numbness and light headedness through to seizures and cardiac arrest. Urgent anaesthetic assistance should be sought for airway management and cardiovascular support in the rare instances this occurs. Intravenous lipid can be used for LAST, especially in unresponsive cardiac arrest. Every department giving infiltrative local anaesthetic should have a local policy for management of LAST.[12] *Fundamental standard*.

## Regional anaesthesia

Local anaesthetic can be infiltrated around nerves to produce larger areas of anaesthesia. Regional anaesthesia can be very effective and reduce the need for sedatives and opioid analgesia. Examples of these include infraclavicular block for haemodialysis fistula intervention and superior hypogastric nerve block for uterine artery embolisation.

## Reversal agents

The sedation team should be familiar with recognising the clinical sequelae of sedation overdose and be familiar with the reversal agents required. Flumazenil blocks the sedative and amnesic effects of benzodiazepines and reverses benzodiazepine-induced respiratory depression within two minutes of administration. Reversal dose is 0.01 mg/kg. It is typically given in 0.1–0.2 mg increments for partial reversal and 0.4–1 mg for complete reversal. Flumazenil may cause agitation, anxiety and tremors. Naloxone blocks and reverses the effect of opioids. It reverses the respiratory depression but also the analgesic effects. Thus, its administration can cause pain, anxiety and agitation. Therefore, it should be administered in incremental doses with full-dose reversal reserved for life-threatening respiratory depression, and reversal of benzodiazepine sedation should be considered first in the event of excessive sedation to maintain analgesia. 0.1–0.2 mg should be given at two-to-three-minute intervals until respiratory depression is reversed. Its short half-life may necessitate repeated administration.

# 10 Complications

There should be a low threshold for summoning assistance if complications of sedation are identified. Complications of sedation should be recorded as part of departmental morbidity and mortality (M&M) data. *Fundamental standard*.

Paradoxical agitation can occur, especially with children, adolescents and older people. Giving more sedation may exacerbate the situation and rescheduling the procedure with anaesthetic assistance should be strongly considered. Hypotension can be due to sedation or analgesia but other causes such as sepsis and blood loss need to be considered. Nausea and vomiting are recognised side-effects of sedation. Suction must be available in case vomitus compromises the airway. *Fundamental standard*. Anti-emetics (for example, ondansetron typically 4 mg IV over two minutes) should be given to relieve nausea. Respiratory depression should be managed in line with Immediate Life Support (ILS) principles.

# 11 Training and audit

Practitioners should undergo structured, documented training in the knowledge, skills and competencies necessary for safe sedation practice.[13] Essential topics covered should include an understanding of co-morbidities, monitoring during sedation, recognition of the complications of sedation and competencies necessary to rescue patients from these complications. When appropriate, this training should be regularly updated. All practitioners should have up-to-date ILS training.

Regular audit of practice and review of adverse events are essential for quality assurance. *Fundamental standard*. A proposed template for audit is provided in Appendix 1. The learning and recommendations derived from such reviews should be shared with the entire team through departmental clinical governance meetings. *Fundamental standard*.

# 12 Organisation

## Table 5. Organisational requirements for departments and trust executives where sedation is used

| Departmental requirements | Trust executive requirements |
|---|---|
| Clearly defined pathway for elective patients including pre-assessment, periprocedural and intraprocedural monitoring and postoperative care. | A sedation committee should be formed within every institution using sedation to ensure appropriate governance. |
| Written advice for patients who will receive sedation for a procedure, given in advance of admission. | The sedation committee with a nominated clinical lead should have representatives of key clinical teams using sedation, anaesthetist, specialist in pain control, pharmacy and lay members. |
| Mechanisms for ensuring that all staff involved in administering or monitoring sedation are appropriately trained (eg ILS trained). | The sedation committee should hold regular, documented meetings to ensure high standards of care that include:<br>• Development and review of local standard operating procedures (SOPs)<br>• Review of adverse clinical incidents<br>• Overview of staff training and continuing professional development in sedation practice. |
| Local links between radiology recovery area and theatre recovery to enable education and training. | |
| Defined pathways for managing and recording events of inadvertent deep sedation. | |

# 13 Paediatric sedation

Sedation is used for anxiety relief, pain control and to control behaviour in paediatric clinical practice.[14] It is possible to achieve a high success rate for sedation in children undergoing radiological studies. Levels of sedation in paediatrics are the same as those in adults (Table 1).

A local multidisciplinary sedation committee should be formed to define local sedation practices, set age limits, review practice, learn from audit cycles and report critical incidents to the appropriate national body. *Fundamental standard*.

It should be possible to achieve a high success rate for sedation in children undergoing radiological imaging. Low success rates should prompt a review of the sedation service and changes must be implemented before the service is resumed.

The paediatric sedation team should work in close collaboration with the paediatric anaesthetic department.

Techniques that can minimise or avoid the need for sedation should be thoroughly evaluated. For older children, the administration of pre-procedural and periprocedural analgesia may be adequate to avoid sedation or general anaesthesia. Modalities including distraction, guided imagery, parental presence and the use of topical local anaesthesia may also reduce the need for and depth of sedation. The imaging investigation or treatment should be tailored to allow safe completion in the shortest possible time.

## a. Pre-procedure workup

Pre-assessment prior to sedation is mandatory. *Fundamental standard*. Pre-assessment should include evaluation of current medical condition, growth assessment, past medical problems (particularly related to sedation or anaesthesia), medication history and physical status including airway problems and psychological and developmental status. The preferences of the child and parents should be considered.

If any of the following apply, an anaesthetic review is needed, as it may be safer for the procedure to be performed under general anaesthesia:[15]

- Potential airway or respiratory problem
- ASA grade 3 or greater
- Neonate or infant
- Neurological impairment
- Global developmental delay
- Behavioural disturbance
- Raised intracranial pressure
- Uncontrolled grand mal epilepsy
- Risk of pulmonary aspiration of gastric contents
- Severe renal or hepatic failure.

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Paediatric sedation

When assessing a child, it should be decided how much patient motion can be tolerated. Although many radiology procedures require the patient to be motionless, this is not always necessary. In these cases, a lighter level of sedation may be sufficient.

Consent for sedation should form part of the consent process, where the proposed sedation technique and alternatives to sedation should be discussed with the child (particularly if Gillick and Fraser competent) and the parents or carers.[16,17] *Fundamental standard*.

Clear fasting instructions should be agreed locally and communicated with the patient and family. NICE guidance advises that fasting is not required for minimal sedation, Entonox and moderate sedation during which the child will maintain verbal contact. However, caution is advised with moderate sedation as there is the risk of inadvertent over-sedation. Recommended fasting times are usually one to two hours for clear fluids (includes dilute iodinated contrast for bowel opacification in computed tomography [CT]), four hours for breast milk and six hours for solids. It is important that children do not undergo unnecessary prolonged fasting as this can cause significant distress and affect the efficacy of sedation.

## b. Environment

The type of hospital where the sedation is undertaken is an important safety consideration. It is of key importance that the entire team involved is familiar with caring for sedated children undergoing imaging studies. This is not something that can be undertaken as occasional practice. When an established and experienced team is not available, early consideration should be given to transferring the child to a specialist paediatric hospital.

The facilities should be safe, secure, child-friendly and separate from adult services. Transportation of sedated children over long distances is undesirable.

Gaining access to the child if they deteriorate can be difficult (especially during MRI). The rescue and resuscitation procedures for a child in this setting should be documented in local sedation guidelines.

## c. Equipment

The availability of appropriate equipment for age and size is mandatory. *Fundamental standard*. The equipment required for monitoring is described in Section 7.

## d. Staff

The staff undertaking sedation should be competent in airway management and basic paediatric life support. *Fundamental standard*.

Staff must be trained to recognise and manage changes in the child's condition throughout the investigation or procedure and recovery until the child is easily rousable with a stable airway and protective airway or respiratory reflexes.

Sedation should be administered by a healthcare professional who is not directly involved in the procedure – a primary sedation practitioner (see Section 8). *Fundamental standard*.

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Paediatric sedation

## e. Therapeutic agents

There is no perfect sedative agent in children and all drug regimens have a failure rate.

Those younger than four months can successfully complete diagnostic imaging procedures with a feed and wrap technique.

Entonox is a potent analgesic, anxiolytic and sedative. It causes depressed consciousness and therefore is self-administered under the supervision of an appropriately trained healthcare professional (familiar with its administration, side-effects and contraindications, and who is trained in paediatric basic life support). Entonox is contraindicated in conditions where air may be trapped in body cavities (for example intestinal obstruction), head injury with depressed consciousness and poor nutritional status.[18]

Midazolam can be administered by a variety of routes; orally, intranasally or intravenously. It has a rapid onset and produces anxiolysis and amnesia, which may be useful. Paradoxical agitation occurs in up to 15% of patients. Children must be closely observed for signs of respiratory depression, especially if it is used in conjunction with an opioid.

Dexmedetomidine has been introduced into British paediatric clinical practice relatively recently. It is a highly selective Alpha 2 agonist that has sedative and analgesic effects. It has been safely used as an intravenous infusion for paediatric MRI. A notable side-effect is bradycardia.

Chloral hydrate is given in a single dose orally. Dose ranges are 30–100 mg/kg up to 1 g. It is used in infants and children >45 weeks post-menstrual age (PMA) and <15 kg. The main disadvantage is gastric irritation, which can lead to vomiting. At higher doses respiratory depression has been reported.

Simple analgesics including paracetamol and Non-steroidal anti-inflammatory drugs (NSAIDs) may be effective for children having diagnostic studies. Occasionally local anaesthetic to a puncture site will be enough, but often an opiate such as fentanyl is required.

## f. Recovery and discharge

Vital signs must return to pre-sedation values before discharge. *Fundamental standard*. The child must be awake (or have returned to their baseline level of consciousness) with no risk of further reduced level of consciousness. *Fundamental standard*. Symptoms resulting from sedation, analgesia or anaesthesia (nausea or vomiting) or from the procedure (pain) must be adequately managed. *Fundamental standard*.

The parent or carer must receive clear and relevant instructions on aftercare prior to discharge from hospital. *Fundamental standard*.

# 14 Cross-sectional imaging

Patients undergoing outpatient investigations such as CT and MRI may require premedication with standard oral anxiolytics prior to attendance for the examination. These may be prescribed by the referring clinical team or general practitioner and these patients do not require any specific recovery or assessment before discharge.

Confusion, dementia and involuntary movement can compromise the ability to image patients. Varying levels of sedation or general anaesthesia are required according to the severity of an underlying problem. Appropriate consent should be sought and in many cases anaesthetic input will be needed. For patients who are unable to lie still due to pain, sedation and analgesia can be helpful.

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# A1 Audit of sedation, analgesia and anaesthesia in radiology

## Background

Tool for assessing the safety and efficacy of sedation and analgesia in the setting of radiological procedures and designed to be used in conjunction with *Sedation, analgesia and anaesthesia in the radiology department*, third edition.

## Standards

1. Appropriately trained and credentialed team should administer sedation and analgesia.
2. Patients requiring sedation should undergo pre-procedure assessment and have a sedation plan.
3. World Health Organization (WHO) checklist should be used for every sedated case.
4. Sedated patients must be appropriately monitored.
5. Resuscitation equipment and reversal agents must be readily available.
6. A properly staffed recovery area and formalised communication are essential for safe aftercare and discharge.
7. Capture any adverse events related to sedation.

### Target

100% of these criteria should be met.

A1

Audit

# Indicators

1. All personnel administering sedation should have appropriate and current training in line with local and national guidance.
2. Documented pre-procedure assessment and sedation plan should be available.
3. Completed WHO checklist including sign-in and sign-out should be available for every case.
4. Appropriate monitoring should be used for all cases. The observations should be recorded in a legible way, with an appropriate frequency of measurement.
5. Resuscitation trolley and drug inventory should be checked daily and signed.
6. Documented handover after the procedure and written discharge information should be available for every patient.
7. Regular audit should assess number of procedures performed, sedation techniques and drugs used.
8. Occurrence of the following events should be regularly analysed:
   - Cases of sustained oxygen saturation <90%
   - Hypotension (systolic blood pressure <90 mmHg in adults) related to sedation
   - The need for use of reversal agents such as naloxone and flumazenil
   - Unplanned admissions following sedation
   - Cardiac or respiratory arrest.

Where the target is not met, action should be taken promptly to ensure the target is achieved and a repeat audit undertaken. If the targets are achieved, then a routine audit should be undertaken annually to ensure safe standards of practice are maintained.

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