# CHAPTER 23
# SEDATION

## 23.1 SEDATION

### DESCRIPTION
Sedation aims to reduce some combination of anxiety, agitation and pain while the patient retains control of airway, breathing and blood pressure.

## 23.1.1 PROCEDURAL SEDATION AND ANALGESIA

Procedural sedation and analgesia is a technique that uses medications to allow patients to tolerate unpleasant medical, interventional or diagnostic procedures.
It is a brief intervention, unlike sedation in intensive or palliative care. It is commonly used in emergency units, dentistry and for certain endoscopic and gynaecological procedures.
The information described does not apply to:
» Patients receiving inhaled anaesthetics.
» Patients receiving analgesia for pain without sedation.
» Patients receiving sedation to manage behavioural emergencies.
» Patients who are intubated.

### GENERAL MEASURES
Procedural sedation is a continuum: ranging from minimal sedation (anxiolysis), moderate sedation/analgesia, deep sedation/analgesia, to general anaesthesia.

Deep sedation/analgesia includes the dissociative state caused by medicines like ketamine. It is often difficult to predict levels of sedation and therefore clinicians undertaking procedural sedation should be adequately trained in this technique. The clinician should have a detailed understanding of the risks and benefits of all the medicines used. Further the clinician should be competent in resuscitation, airway management and assisted ventilation.

Procedural sedation should only be performed in an area with adequate light, space and fully functional and adequate observation, monitoring and resuscitation equipment.

Besides the clinician performing the procedure, there must be one other trained health care provider present responsible for observing the patient, assisting with resuscitation if necessary and monitoring the patient. The trained health care provider should observe the patient until the patient is ready for discharge.

Patient monitoring and details of the types and amounts of all medicines used must be recorded for each procedure. After the procedure the patient's fitness to leave the observation area should be formally assessed and recorded.
**Sedation level:**

| Sedation | | | | General anaesthesia |
|---|---|---|---|---|
| **Depth** | **Minimal** | **Moderate** | **Deep** | |
| **Other aims** | **Anxiolysis** | **Analgesia** | | |
| Examples | Nitrous oxide **OR** benzodiazepine | Opioid **AND** benzodiazepine | Opioid **AND** benzodiazepine **OR** propofol **OR** etomidate | |
| Response to stimuli | Verbal | Purposefully to verbal or tactile | Purposefully only after repeated/painful | Unrousable |
| Airway intervention | Not required | Not usually needed | May be needed | Requires assistance |
| Breathing | Normal | Usually normal (spontaneous ventilation adequate) | May need assistance | Requires assistance /positive pressure ventilation |
| BP/Pulse | Normal | Usually normal/ maintained | | May need support |
| Monitoring | Intermittent review of vital signs | Continuous pulse oximetry and heart rate, intermittent BP and respiratory rate. Continuous ECG if CVS disease or sedation with more than one agent | | As for any general anaesthetic |
| Cognitive Function or level of conscious | Impaired | depressed | | Loss of consciousness |

*LoE:III*[i]

### Ketamine

Ketamine administration leads to a dissociative state (patients may not be able to speak coherently or respond purposefully to verbal commands) and provides both sedation and analgesia. Used on its own, it rarely requires airway intervention or affects breathing, but may cause hypertension and tachycardia because of sympathetic stimulation.

*LoE:III*[ii]

## MEDICINE TREATMENT

Patient characteristics and required depth and/or duration of sedation lead to differences in dosing requirements; the doses listed serve only as a guide, and incremental further dosing may be required depending on clinical response.

### Minimal sedation and anxiolysis (no analgesic effect required)

Oral sedation may be appropriate for certain procedures.

Initial dose (further dose increments may be necessary – consult full prescribing information for each agent to determine maximum safe dosages, and reduce doses in the frail and elderly):

- Diazepam, IV, 0.1 mg/kg. (In a 60 kg patient, give boluses of 2 mg every minute; may require up to 10 mg).

**OR** *LoE:II*[iii]

Midazolam, IV, 0.05 mg/kg. (In a 60 kg patient, give boluses of 1 mg every minute; may require up to 3 mg).

**OR**

Nitrous oxide, inhaled 20 to 50%, in oxygen (will also provide some analgesia).

Benzodiazepines may cause respiratory depression; monitor accordingly.

**Moderate sedation and analgesia**

If analgesia is required, one of the above is usually combined with an opioid. However, ketamine has analgesic activity and can be used on its own, or combined with a benzodiazepine. The opioids may cause respiratory depression; monitor accordingly.

Initial doses:

- Fentanyl, IV, 0.25 mcg/kg.
  - Titrate to effect and repeat dose every five minutes until desired level of analgesia has been achieved.

**OR** *LoE:III*[iv]

Morphine, IV, 0.1 mg/kg, in increments of 2 mg every 5 minutes.

**OR**

Ketamine, IV, 0.5 mg/kg (the addition of a benzodiazepine is often recommended to reduce the incidence/severity of phenomena such as hallucinations and dreaming, but the benefit of this is unclear).

- Repeat doses of 0.5 mg/kg as required, every 5 to 10 minutes. *LoE:III*[v]

**OR**

Nitrous oxide, 20–50% inhaled, in oxygen.

*LoE:III*[vi]

**Other agents for moderate sedation**

Propofol on its own provides moderate sedation for short procedures (e.g. endoscopy), but without analgesia:

- Propofol, IV, 0.5 mg/kg, repeated as 0.25 mg/kg boluses every 5 minutes as required. Specialist consultation. *LoE:III*[vii]

Etomidate is a short-acting agent like propofol, but is more likely to cause myoclonus. It has minimal haemodynamic effects and a reliable onset of action, but no analgesic effect and is more commonly used for emergency unit procedures, rather than endoscopies.

- Etomidate, IV, 0.1 mg/kg. *LoE:III*[viii]
  - Repeat doses of 0.05 mg/kg every 5 minutes, as required.

**Deep sedation and analgesia**
This is usually achieved with either higher doses of medications used for moderate sedation, or by combining an opioid, a benzodiazepine, and either propofol or etomidate.

When agents are combined, lower doses may be adequate. Always have another health care provider monitoring the patient and resuscitation equipment present.

**Supplemental analgesia**
Simple analgesics can be given before or after the procedure as appropriate:

- Paracetamol, oral, 1 g 4–6 hourly when required.
  - Maximum dose: 15 mg/kg/dose.
  - Maximum daily dose: 4 g in 24 hours.

**AND/OR**

- NSAID, e.g.:
- Ibuprofen, oral, 400 mg 8 hourly with meals after the procedure.

Other routes (e.g. rectal or intramuscular) may be appropriate for certain indications and medications.

**Reversal Agents** must be available as medicine doses for sedation/analgesia are highly variable as are patient's age, concurrent medication and medical conditions. Supportive management is aimed at maintaining cardiorespiratory function.

For opioid toxicity:

- Naloxone, IV, 0.08 mg immediately. *LoE:III*[ix]
  - Repeat doses as required at 2 minute intervals.
  - Maximum total dose is 10 mg.

## 23.1.2 SEDATION IN INTENSIVE CARE

Indications for sedation in intensive care need to be defined for each patient, and may include one or more of: anxiolysis, analgesia, agitation control, or to help patients tolerate uncomfortable situations or procedures (e.g. intubation and ventilation). Sedation requirements fluctuate rapidly and warrant regular review. Individualised sedation objectives should be clearly defined, and level of sedation regularly recorded. Sedation protocols that recognise the need for dose minimisation, weaning and sedation interruptions probably improve outcomes.

*LoE:II*[x]

Adequate pain control is often more efficacious than sedatives for reducing agitation. Delirium should be considered, and managed appropriately. The doses listed apply to ventilated patients in whom short term respiratory depression is not a concern.

**Short term sedation (less than 24 hours)**

- Midazolam, IV infusion, 0.05–0.2 mg/kg/hour.

**OR**

Propofol, IV infusion, 0.5 mg/kg/hour.

**Note:** Propofol does have cardiovascular effects; benzodiazepines are preferred.

*LoE:III*[xi]

**Longer term sedation (expected 72 hours or more)**

- Lorazepam, IV, 0.1 mg/kg/hour.

**OR**

Midazolam, IV, 0.2 mg/kg/hour.

**Note**: Lorazepam (0.1 mg/kg/hour) is as effective (and as easy to wean) as midazolam 0.2 mg/kg/hour) but is more difficult to titrate. Due to high fat solubility, midazolam also becomes 'long acting' after infusions of more than 24 hours.

**Supplemental analgesia:**

Analgesia can be added to any of the above regimens:

- Morphine, IV infusion, 0.1–0.2 mg/kg/hour.

**OR**

- Fentanyl, IV infusion, 1 mcg/kg/hour (also becomes long acting after prolonged infusion due to fat solubility.)

*LoE:III*[xii]

## 23.1.3 SEDATION IN PALLIATIVE CARE

See section 24.5: Sedation in palliative care.

**References:**

[i] Medication used for sedation: American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. Anesthesiology. 2002 Apr;96(4):1004-17. http://www.ncbi.nlm.nih.gov/pubmed/11964611

Medication used for sedation: The South African Society of Anaesthesiologists. South African Society of Anaesthesiologists Sedation Guidelines, 2015. South Afr J AnaesthAnalg 2015;21(2)S1-S36.http://www.sasaweb.com/content/images/SAJAA_V21N2_1665_Sedation_Guideline.pdf

[ii] Ketamine: American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. Anesthesiology. 2002 Apr;96(4):1004-17. http://www.ncbi.nlm.nih.gov/pubmed/11964611

[iii] Diazepam: Mitchell AR, Chalil S, Boodhoo L, Bordoli G, Patel N, Sulke N. Diazepam or midazolam for external DC cardioversion (the DORM Study). Europace. 2003 Oct;5(4):391-5. http://www.ncbi.nlm.nih.gov/pubmed/14753637

Midazolam: Mitchell AR, Chalil S, Boodhoo L, Bordoli G, Patel N, Sulke N. Diazepam or midazolam for external DC cardioversion (the DORM Study). Europace. 2003 Oct;5(4):391-5.http://www.ncbi.nlm.nih.gov/pubmed/14753637

[iv] Fentanyl IV: The South African Society of Anaesthesiologists. South African Society of Anaesthesiologists Sedation Guidelines, 2015. South Afr J AnaesthAnalg 2015;21(2)S1-S36.http://www.sasaweb.com/content/images/SAJAA_V21N2_1665_Sedation_Guideline.pdf

Fentanyl IV: Poulos JE, Kalogerinis PT, Caudle JN. Propofol compared with combination propofol or midazolam/fentanyl for endoscopy in a community setting. AANA J. 2013 Feb;81(1):31-6. http://www.ncbi.nlm.nih.gov/pubmed/23513321

[v] Benzodiazepines (ketamine-induced agitation): Strayer RJ, Nelson LS. Adverse events associated with ketamine for procedural sedation in adults. Am J Emerg Med. 2008 Nov;26(9):985-1028. https://www.ncbi.nlm.nih.gov/pubmed/19091264

Benzodiazepines (ketamine-induced agitation): Akhlaghi N, Payandemehr P, Yaseri M, Akhlaghi AA, Abdolrazaghnejad A. Premedication With Midazolam or Haloperidol to Prevent Recovery Agitation in Adults Undergoing Procedural Sedation With Ketamine: A Randomized Double-Blind Clinical Trial. Ann Emerg Med. 2019 May;73(5):462-469. https://www.ncbi.nlm.nih.gov/pubmed/30611640

[vi] Morphine, IV: American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. Anesthesiology. 2002 Apr;96(4):1004-17. http://www.ncbi.nlm.nih.gov/pubmed/11964611

Morphine, IV: The South African Society of Anaesthesiologists. South African Society of Anaesthesiologists Sedation Guidelines, 2015. South Afr J AnaesthAnalg 2015;21(2)S1-S36.http://www.sasaweb.com/content/images/SAJAA_V21N2_1665_Sedation_Guideline.pdf

Ketamine, IV: American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. Anesthesiology. 2002 Apr;96(4):1004-17. http://www.ncbi.nlm.nih.gov/pubmed/11964611

Ketamine, IV: The South African Society of Anaesthesiologists. South African Society of Anaesthesiologists Sedation Guidelines, 2015. South Afr J AnaesthAnalg 2015;21(2)S1-S36.http://www.sasaweb.com/content/images/SAJAA_V21N2_1665_Sedation_Guideline.pdf

Nitrous oxide, inhaled, in 20-30% oxygen: American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. Anesthesiology. 2002 Apr;96(4):1004-17. http://www.ncbi.nlm.nih.gov/pubmed/11964611

[vii] Propofol, IV: Poulos JE, Kalogerinis PT, Caudle JN. Propofol compared with combination propofol or midazolam/fentanyl for endoscopy in a community setting. AANA J. 2013 Feb;81(1):31-6. http://www.ncbi.nlm.nih.gov/pubmed/23513321

[viii] Etomidate, IV: American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. Anesthesiology. 2002 Apr;96(4):1004-17. http://www.ncbi.nlm.nih.gov/pubmed/11964611

[ix] Naloxone, IV (reversal agent for opioid toxicity): The South African Society of Anaesthesiologists. South African Society of Anaesthesiologists Sedation Guidelines, 2015. South Afr J AnaesthAnalg 2015;21(2)S1-S36.http://www.sasaweb.com/content/images/SAJAA_V21N2_1665_Sedation_Guideline.pdf

[x] Sedation protocols in intensive care: Jackson DL, Proudfoot CW, Cann KF, Walsh T. A systematic review of the impact of sedation practice in the ICU on resource use, costs and patient safety. Crit Care. 2010;14(2):R59. http://www.ncbi.nlm.nih.gov/pubmed/20380720

[xi] Propofol, IV (short-term sedation: second line option): The South African Society of Anaesthesiologists. South African Society of Anaesthesiologists Sedation Guidelines, 2015. South Afr J AnaesthAnalg 2015;21(2)S1-S36.http://www.sasaweb.com/content/images/SAJAA_V21N2_1665_Sedation_Guideline.pdf

Propofol, IV (short-term sedation: second line option): South African Medicines Formulary. 12th Edition. Division of Clinical Pharmacology. University of Cape Town, 2016.

[xii] Propofol, IV: Ostermann ME, Keenan SP, Seiferling RA, Sibbald WJ. Sedation in the intensive care unit: a systematic review. JAMA. 2000 Mar 15;283(11):1451-9. http://www.ncbi.nlm.nih.gov/pubmed/10732935