

## SEDATION FOR DIAGNOSTIC AND THERAPEUTIC PROCEDURES

### Definitions

- *Sedation* – reduces state of awareness but does not relieve pain
- *Analgesia* – reduces the perception of pain

### Levels of sedation

- Procedural sedation means minimal or moderate sedation / analgesia.
- *Minimal* sedation (anxiolysis) – drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.
- *Moderate* sedation / analgesia – drug-induced depression during which patient respond to verbal commands either alone or accompanied by light tactile stimulation. The airway is patent and spontaneous ventilation is adequate. Cardiovascular function is adequate.

### Note:

- avoid deep sedation and general anesthesia in which the protective airway reflexes are lost and patients need ventilatory support.
- some children may require general anesthesia even for brief procedures whether painful or painless because of their level of distress.

### Indications

Patients undergoing diagnostic or therapeutic procedures.

### Contra-indications

- blocked airway including large tonsils or adenoids
- increase intracranial pressure
- reduce level of consciousness prior to sedation
- respiratory or cardiovascular failure
- neuromuscular disease
- child too distressed

### Patient selection

The patients should be in class I and II of the ASA classification of sedation risk.

Class I – a healthy patient

Class II – a patient with mild systemic disease, no functional limitation

### Preparation

Consent

Light restraint to prevent self injury

### Facilities

Oxygen source

Resuscitation equipment

ECG monitor

Defibrillator

Suction

Pulse oximeter

Non-invasive BP monitoring

### Personnel

At least a senior medical officer, preferably PALS trained.

A nurse familiar with monitoring and resuscitation

## Fasting

- recommended for all major procedures:
  - Nil orally: no solid food for 6 hours
  - no milk feeds for 4 hours
- may allow clear fluids up to 2 hours before, for infants

## Venous access

Vein cannulated after applying local anaesthesia for 60 minutes.

## Sedation for Painless Procedures

- *Non-pharmacologic measures* to reduce anxiety
  - behavioural management, child friendly environment
- *Medication*
  - oral Chloral hydrate (drug 1 in table) may be used.

*Note: - opioids should not be used.*

- *sedatives such as benzodiazepine and dissociative anaesthesia ketamine should be used with caution and only by experienced senior medical officers.*
- *a few children may need general anaesthesia and ventilation even for painless procedure such as MRI brain if the above fails.*

## Sedation for Painful Procedures

- *Non-pharmacologic measures* to reduce anxiety
  - behavioural management, child friendly environment
- *Local anaesthesia*
  - Topical : Lignocaine EMLA ® 5% applied with occlusive plaster for 60 minutes to needle puncture sites, e.g. venous access, lumbar puncture, bone marrow aspiration.
  - subcutaneous Lignocaine infiltrated to the anaesthetised area prior to prolonged needling procedure, e.g. insertion of chest drainage.
- *Medications (refer Table 1)*

Many sedative and analgesic drugs are available; however, it is advisable to use the following frequently used medications:

- narcotics (analgesia) also have sedative effects
  - Morphine
  - Fentanyl
  - Naloxone (narcotic reversal)
    - for respiratory depression\* caused by narcotics.
- Benzodiazepines (sedatives) have no analgesia effects
  - Midazolam
  - Diazepam
  - Flumazenil (benzodiazepine reversal)
    - can reverse respiratory depression\* and paradoxical excitatory reactions

*\*provide bag-mask positive pressure ventilation whilst waiting for reversal agent to take effect.*

- general dissociative anaesthesia
  - Ketamine (to be used by senior doctors preferably in the presence of an anaesthesia doctor)
- adverse effects include
  - o increased systemic, intracranial and intraocular pressures
  - o hallucinogenic emergence reactions (more frequent in older children)
  - o laryngospasm
  - o excessive airway secretions.

*Table 1. Drug dosages used for sedation and analgesia in children*

Drug	Dose	Onset of action	Duration of action
Chloral hydrate	Oral 25 - 50 mg/kg; maximum 2g. For higher doses, i.e. 50 -100 mg/kg, please consult paediatrician or anaesthesiologist.	15 - 30 mins	2 -3 hours
<i>Narcotics</i>			
Morphine	IV 0.05 - 0.1 mg/kg	5 - 10 mins	2 - 4 hours
Fentanyl	IV 1 - 2 mcg/kg	2 - 3 mins	20 -60 mins
<i>Benzodiazepines</i>			
Midazolam	IV 0.05 - 0.1 mg/kg, max single dose 5 mg; may repeat up to max total dose 0.4 mg/kg (10 mg)	1 -2 mins	30 - 60 mins
Diazepam	IV 0.1 - 0.2 mg/kg	2 - 3 mins	30 - 90 mins
Ketamine	IV 0.5 - 2.0 mg/kg	1 - 2 mins	15 - 60 mins
<i>Reversal agents</i>			
Naloxone	Repeated small doses IV 1 - 10 mcg/kg every 1 to 2 mins		
Flumazenil	IV 0.01 - 0.02 mg / kg every 1 -2 minutes up to a maximum dose of 1 mg		

### Post sedation monitoring and discharge

Patient can be discharged when:

- vital signs and SaO<sub>2</sub> normal
- And*
- arousable
  - baseline level of verbal ability and able to follow age-appropriate commands
  - sit unassisted (if appropriate for age)

### References

1. PALS Provider Manual. *American Heart Association 2002, Chapter 15, p 379-396.*
2. Safe sedation of children undergoing diagnostic and therapeutic procedures. *Scottish Intercollegiate Guidelines Network SIGN, May 2004.*
3. Guideline statement 2005: Management of procedure-related pain in children and adolescents. *Paediatrics & Child Health Division, The Royal Australian College of Physicians.*