Overview

Introduction

The recommendations in this document are intended for all children sedated throughout ADHB (but predominantly Starship), with the exception of:

- Paediatric Intensive Care (PICU)
- Neonatal intensive care (NICU)
- The administration of sedative/analgesic agents by any route when they are administered for:
  
  1. Chronic anxiety and/or depression
  2. Seizure management
  3. Pain management if no simultaneous procedure is performed.

Scope

Each location in which procedures are performed under sedation needs to develop its own approved guidelines, including suitable drugs and regimes for sedation appropriate to the clinical profile of the patients that they routinely treat.

These guidelines are intended for use in patients who are generally healthy or have only mild systemic disease.

The following patients should not be sedated without the involvement of senior medical staff, department of anaesthesia, PICU or NICU as appropriate:

- More severely ill patients
- Ex-premature infants (less than 60 weeks post conecptual age)
- Neonates (< 4 weeks of age)

Definition

Sedation means the sedation of a patient for diagnostic, interventional, medical or surgical procedures, with or without local anaesthesia, for the purpose of producing a degree of sedation without loss of consciousness.

Sedation includes the administration, by any route, of all forms of drugs which result in depression of the central nervous system (see sedation terminology).
SEDATION IN CHILDREN

Indications

Sedation should be employed for procedures that children find stressful or painful. Non-pharmacological techniques to achieve anxiolysis (behavioral anxiolysis) should always be considered. In many instances these can eliminate the requirement for drug sedation. Topical anaesthetics where appropriate, such as Ametop/EMLA should be used as these will reduce the amount of sedation required.

The drug(s) used will depend on:

- The age of the patient
- The procedure
- The goals of sedation

Risks

Sedation is not without risk because of:

- Potential for unintentional loss of consciousness (i.e. loss of verbal contact with the patient), which carries the same risks as general anaesthesia
- Depression of protective airway and pain reflexes
- Depression of respiration
- Depression of the cardiovascular system
- Wide variety and combinations of drugs which may be used, with the potential for drug interactions
- Possibility of excessive amounts of these drugs being used to compensate for inadequate analgesia
- Individual variations in response to the drugs used, particularly in children, and those with pre-existing medical disease
- Wide variety of procedures performed
- Differing standards of equipment and staffing at the locations where these procedures may be performed

The drugs and techniques used should provide a margin of safety wide enough to render loss of consciousness unlikely.

Variability of effects

It is important to recognise the variability of effects which may occur with sedative drugs, however administered, and that over-sedation, airway obstruction or cardiovascular complications may occur at any time.

If sedation is not easily achieved, the case should be cancelled and rebooked with an alternative plan e.g. with the assistance of an airway-skilled physician or for a general anaesthetic.
Contraindications:

These can be relative or absolute.

Patient risk factors for adverse events have been shown to include patients less than one year of age and ASA physical status III & IV.

In paediatric patients this could include:
• Congenital heart disease (associated with cyanosis or CHF) – see ASA physical status classification
• The neurologically impaired (with poor pharyngeal co-ordination)
• Severe obesity
• Airway abnormalities (including an intercurrent URTI).

Deep Sedation should not be used in the following circumstances without expert assistance:
• Neonates (<4 weeks) or Ex Prem infants less than 60 weeks post conceptual age.
• ASA Physical status 3 or 4 (severe cyanotic CHD or CHF - cardiologist must be present).
• Airway abnormalities which may cause obstruction (patients with stridor, craniofacial abnormalities).
• Obstructive sleep apnoea.
• Neurologically impaired or raised ICP.
• Severe obesity.

Sedation is unlikely to be successful in patients:
• Requiring prolonged sedation (>45mins) or excessively painful procedures.
• In whom sedation has failed in the past for the same procedure.

Pre Sedation Evaluation

A directed history taking and physical examination should precede sedation.

Relevant history includes:
• Acute illness/injury
• Prior illness e.g. recent URTI
• Medications
• Drug allergies
• Nil by Mouth status
• Weight
• Previous sedation experiences, drugs used etc

Physical Examination for:
• Airway abnormalities
• Respiratory rate and oxygen saturation
• Heart rate and blood pressure
• Level of consciousness / Baseline Sedation Score
**SEDATION IN CHILDREN**

**NBM / Fasting Recommendations for Elective Procedures**

**Moderate Sedation**

Fasting not mandatory but preferably no solids or liquid 2 hours prior

**Deep Sedation**

Any planned sedation method where the child may not retain the ability to respond appropriately to verbal stimuli

Clear fluids - 2 hours
Non-clear fluids or Solids - 4 hours

**Procedures Relating to Sedation**

**Informed consent**

Informed consent should be obtained for sedation as well as the procedure

**Documentation**

- Consent form signed
- Sedation Record (CR8762) completed as appropriate including the prescription of sedative agent(s) to be used
- Section 29 Consent form filled out if Chloral hydrate used

**Responsible Physician**

If a physician is not performing the procedure, a designated responsible physician must be available within the hospital to be able to manage complications. This physician must be available until the expected peak effect of sedation has passed and during any period where the sedation score is greater than 2 (i.e. does not arouse to voice or light touch).

The practitioner administering sedation requires sufficient knowledge to be able to:

- Understand the actions of the drugs being administered
- Detect and manage appropriately any complications arising from these actions. In particular medical practitioners administering sedation must be skilled in airway management and cardiovascular resuscitation
- Anticipate and manage appropriately the modification of sedative drug actions by any concurrent therapeutic regimen or disease process which may be present
Independent Observer

For procedures requiring deep sedation one individual must be present whose primary responsibility is the observation and monitoring of the patient. This person may also perform minor, interruptible tasks, but their primary responsibility is to remain focused on the patient's airway patency, cardio respiratory status and level of sedation.

This staff member must have undergone training in, and be competent at, basic life support.

IV ‘short acting’ sedatives should only be administered by an airway-skilled physician (defined as an appropriate registrar/specialist from the department of anaesthesia, PICU, or children’s emergency department, who is capable of advanced paediatric life support). Specifically, IV propofol should not be administered outside of a highly monitored environment (such as PICU or Starship operating rooms) unless under the direct supervision of a specialist anaesthetist.

Equipment

In any circumstances where a patient may be sedated the following age appropriate equipment must be available:

- Suction apparatus with Yankeur sucker attached.
- Oxygen with age appropriate mask and tubing.
- Self inflating resuscitation bag.
- Standard hospital resuscitation trolley with age appropriate equipment e.g. oral airways, ET tubes, IV cannulae, emergency medications/reversal agents (in the immediate area).
- Audible pulse oximeter.
- Blood pressure monitoring equipment.
- An emergency call system to summon additional help.
- Facilities for observation until the child has recovered from sedation to a point where it is safe to be discharged from that area.

Monitoring

Monitoring should be tailored to the level of sedation required. Patients are at highest risk immediately after the end of a procedure when procedural stimuli are discontinued.

Moderate Sedation

As a minimum the patient should have a sedation score performed at:

- baseline
- after the administration of the drug
- on completion of the procedure
- during early recovery
- at completion of recovery.

If at any time the patient progresses to a deeper level of sedation than responding to voice (sedation score >2) then monitoring should be as per deep sedation.
SEDATION IN CHILDREN

Deep Sedation

The patient should be monitored continuously for:

- Oxygen saturation
- Airway Patency

And every 5 mins:

- Respiratory rate
- Heart rate
- Sedation score (deferred for a ‘reasonable’ period if stimulating the child would be likely to interfere with the satisfactory completion of a diagnostic procedure e.g. CT, ECHO).

Note: Blood pressure monitoring is recommended but not considered mandatory. An initial blood pressure is advisable.

IV access

IV access is not mandatory for patients undergoing oral sedation. However when deeper levels of sedation are anticipated (such as chloral hydrate), or the patient has significant comorbidity, IV access is encouraged. As a minimum the expertise/equipment for rapid establishment of IV access must be immediately available.

Transport

Ideally patients should not be transported around the hospital while under deep sedation. Circumstances where this might be acceptable would include travelling short distances (e.g. within Starship from a ward to radiology suite). In such circumstances these patients must have:

- Continuous audible pulse oximetry
- Portable suction, a self-inflating resuscitation bag-mask with oxygen.
- A competent staff member present continuously throughout the transport. That person must be able to monitor the patient as previously described and know how to initiate resuscitation/call for help.

Call for Help

Help should be summoned if Staff are seriously worried about the patient regardless of the criteria below:

- Obstructed breathing occurs that is not responsive to simple airway maneuvers.
- SpO2 <90% (or <60% if known cyanotic congenital heart disease) despite supplemental oxygen.
- Resp Rate change by >6/min from baseline.
- Heart Rate >160 or <60/min.
- Marked/sudden decrease in sedation score.
SEDATION IN CHILDREN

Resuscitation/Call For Help Procedure:

- Call for help: Ring emergency bell or initiate 777
- Stimulate patient with verbal/painful stimuli
- Airway: assess/manage and administer O2 at 8-10 L/min.
- Breathing: assess/manage e.g. with bag/mask ventilation.
- Circulation: support as needed.
- Observe patient and monitor oximeter readings for signs of changes in oxygen saturation.

Recovery and Discharge

Monitoring

All patients must be monitored until they are no longer at risk of cardio respiratory depression. The recovery area must have:

- Enough space for a bed and observer
- Oxygen
- Suction
- Access to emergency equipment

If the child is to be recovered in an area different from the area of the procedure, the same equipment and monitoring must be available. The child should be monitored as for deep sedation until meeting the criteria for discharge to a non-monitored environment. A transfer to a 'high care' area (such as PACU, PICU) should be considered if there were difficulties or antagonists were required.

Criteria for discharge from immediate sedation area

Criteria for discharge from the immediate sedation area i.e. to a non-monitored area:

- Oxygen saturation >95% on air (or back to pre-sedation level).
- Airway patency and protection satisfactory (including ability to take a deep breath/cough freely).
- Sedation score 1 or 2 (i.e. arouses with voice or light touch stimuli).
- RR, HR back to pre-sedation levels.
- At least 2 hours have passed since the administration of any sedation reversal agents.

Criteria for Discharge from Hospital

All of the above, plus:

- Patient orientated and can talk (if age appropriate) or back to pre-sedation level.
- Patient can sit unaided (if age appropriate).
- Patient can tolerate oral fluids without vomiting.
- A responsible adult is available to care for the patient and discharge instructions given.
SEDATION IN CHILDREN

Examples of Sedation Regimens

Sedation requirements can be broadly categorized as shown in the table below

<table>
<thead>
<tr>
<th>Procedure Type</th>
<th>Example</th>
<th>Goal</th>
<th>Suggested Sedative or Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Invasive</td>
<td>CT Echocardiography EEG</td>
<td>Motion Control</td>
<td>Chloral hydrate PO (if under 20kg) Midazolam PO +/- PO Ketamine (if &gt;20kg)</td>
</tr>
<tr>
<td></td>
<td>Ultrasonography Skeletal Survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mildly Painful &amp; Stressful</td>
<td>IV Cannulation LP Venesection NGT insertion ICD removal Port access Urinary catheter MCU Dressing changes Foreign body removal pH probe insertion</td>
<td>Analgesia Anxiolysis Sedation Motion control</td>
<td>Topical/Local analgesia Midazolam PO +/- PO Ketamine Nitrous oxide - Entonox - Nitrous oxide 50% oxygen 50%</td>
</tr>
<tr>
<td>Painful Procedures</td>
<td>Suture of lacerations Simple fracture reduction Joint relocation</td>
<td>Analgesia Anxiolysis Sedation Motion Control</td>
<td>Topical/Local analgesia IV Fentanyl/Morphine, Midazolam or Ketamine Nitrous oxide - Entonox - Nitrous oxide 50% oxygen 50%</td>
</tr>
</tbody>
</table>

NOTE:
Paradoxical agitation may occur after the administration of some agents. In these cases the procedure should be cancelled and rebooked with an alternative plan.

Sedation terminology

Minimal sedation (anxiolysis)
A drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination might be impaired, ventilatory and cardiovascular functions are unaffected.

Moderate sedation (formerly conscious sedation)
A drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation. Reflex withdrawal from a painful stimulus is not considered a purposeful response. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.
SEDATION IN CHILDREN

Dissociative sedation
A trance-like cataleptic state induced by the dissociative drug ketamine characterised by profound analgesia and amnesia, with retention of protective airway reflexes, spontaneous respirations, and cardiopulmonary stability.

Deep sedation
A drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully following repeated or painful stimulation. The ability to independently maintain ventilatory function could be impaired. Patients might require assistance in maintaining a patent airway and spontaneous ventilation might be inadequate. Cardiovascular function is usually maintained.

General anaesthesia
A drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation. The ability to independently maintain ventilatory function is often impaired. Patients often require assistance in maintaining a patent airway, and positive pressure ventilation might be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function can be impaired.

ASA* Physical Status Classification

<table>
<thead>
<tr>
<th>Description</th>
<th>Examples</th>
<th>Suitability for Sedation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Healthy</td>
<td>Unremarkable medical history</td>
<td>Excellent</td>
</tr>
<tr>
<td>2 Mild systemic disease</td>
<td>Mild Asthma, Acyanotic CHD, Controlled Epilepsy, Controlled IDDM</td>
<td>Generally good</td>
</tr>
<tr>
<td>3 Severe systemic disease</td>
<td>Severe Asthma, CHD with cyanosis or CHF, Poorly controlled epilepsy, Poorly controlled IDDM</td>
<td>Intermediate to poor (Consider benefit vs risk)</td>
</tr>
<tr>
<td>4 Severe systemic disease</td>
<td>Advanced respiratory, cardiac, hepatic or renal insufficiency</td>
<td>Poor (benefits rarely outweigh risks)</td>
</tr>
<tr>
<td>5 Moribund</td>
<td>Septic shock, severe trauma</td>
<td>Extremely poor.</td>
</tr>
</tbody>
</table>

*Sedation Score

1. Awake and alert.
2. Sleeping but easily arouses to voice or light touch.
3. Aroused to loud voice or shaking.
4. Aroused with painful stimuli only.
5. Unrousable

*American Society of Anesthesiologists
SEDATION IN CHILDREN

References:


Cote C. Adverse Sedation Events in Pediatrics: Analysis of Medications Used for Sedation. Pediatrics 2000; 106 (4)


Guidelines on Sedation and/or Analgesia for Diagnostic and Interventional Medical, Dental or Surgical Procedures (PS9) Australian and New Zealand College of Anaesthetists. 2012.

Mehta et al. EEG Sedation for Children with Autism. Developmental and Behavioral Pediatrics 2004; 25(2) 102-4


Associated ADHB documents

Conscious Sedation Procedural - Adult
Fasting Prior to General Anaesthesia for Elective Surgery and/or Procedures - Paed
Informed Consent
Pain Management - Procedural - Paed
Resuscitation of Children (Paediatric Code Blue)
Sedation - Clinical Neurophysiology - Neurophysiology

Clinical forms
CR8762 Starship Sedation Record
CR8817 Children's Emergency Department Procedural Sedation Form