Practice Recommendation for Sedation of Children in Diagnostic and Therapeutic Procedures

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Version	Effective Date
1	31 December 2013
Previous Version: Guidelines for Sedation of Children in Diagnostic and Therapeutic Procedures	Year 2000

Document Number	HAHO-COC-GL-PAE-001-v01
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Approved/ Endorsed By	Co-ordinating Committee in Anaesthesiology Co-ordinating Committee in Paediatrics
Approval Date	18 December 2013
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ACKNOWLEDGEMENT

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SECTION A: GENERAL PRINCIPLES

I. INTRODUCTION:

1. Advances in the treatment of paediatric diseases have led to an increase in the number of diagnostic or painful therapeutic procedures for which children will need effective sedation or anaesthesia. The choice between no sedation, sedation or anaesthesia will depend on the types of procedures, the characteristics of the patient, and possibly available manpower and resources of the individual hospital.

2. In adults, many procedures can be undertaken with local anaesthesia and reassurance. In children this is often not possible because the procedures are frightening, painful or need to be carried out in children with behavioural problems.

3. There are many sedation techniques available but there is insufficient guidance on which techniques are effective and what resources, including staff training are required to deliver them safely.

4. Sedation may not always be successful and occasionally the procedure has to be deferred to another day. Sedation failure is not only distressing and inconvenient for both the children and their parents; it also has major cost implications.

5. Sedation is not without risk. The risks of sedation include the following:
   - Sedation can cause unintended loss of consciousness
   - Sedation can lead to depression of protective reflexes leading to airway obstruction
   - Sedation can cause respiratory and cardiovascular depression
   - The possibility that excessive amounts of sedatives may be used to compensate for inadequate analgesia
   - Sedation may outlast the procedure
   - There are wide variations of patient's response to sedation, particularly in neonates, small infants or children with pre-existing medical conditions

6. Many diagnostic and therapeutic procedures to be performed will require adequate sedation. Examples include CT scan, MRI scan, laceration repair, lumbar puncture, orthopaedic procedures etc. In most cases, regardless of the types of procedures, young children often require at least moderate sedation for these procedures.

7. For these reasons, it is important for all medical practitioners to understand that safe sedation of children requires a systematic approach that includes the following:
   - Adequate medical supervision by experienced staff
   - Careful pre-sedation evaluation for underlying medical or surgical conditions that would place the child at increased risk from sedating medications
   - Appropriate fasting for elective procedures and a balance between depth of sedation and risk for those who are unable to fast because of the urgent nature of the procedure
   - Focused airway examination for large tonsils or anatomic airway abnormalities that might increase the potential for airway obstruction
   - Clear understanding of the pharmacokinetic and pharmacodynamic effects of the medications used for sedation
   - Appropriate training and skills in airway management
   - Age and size appropriate equipment for airway management, venous access and resuscitation
   - Appropriate medications and reversal agents

- Sufficient number of practitioners to carry out the procedure and monitor the patient
- Appropriate physiologic monitoring during and after the procedure
- Properly equipped and staffed recovery area
- Recovery to pre-sedation level of consciousness before discharge from recovery area
- Appropriate home discharge instructions

8. To ensure standards of patient care, the Clinical Coordinating Committees in Paediatrics and Anaesthesiology decided to revise the "Guideline for Sedation of Children in Diagnostic and Therapeutic Procedures", which was first published in year 2000, based on reference from current literatures, local and international guidelines, and survey of existing practices within the Hospital Authority.

II. SCOPE OF THE RECOMMENDATION:

1. This Recommendation applies to all paediatric patients who receive sedation for any diagnostic, therapeutic, or interventional procedure within the Hospital Authority.

2. This Recommendation does not apply to:
   - Children receiving general anaesthesia (GA) and monitored anaesthesia care (MAC) by anaesthesiologists within or outside operating rooms
   - Sedation of children or neonates under intensive care management in Paediatric / Neonatal Intensive Care Unit (PICU / NICU)

III. DEFINITION OF SEDATION

1. Sedation is the depression of the central nervous system and/or reflexes by the administration of drugs by any route to decrease patient discomfort without producing unintended loss of consciousness.

   A. *Minimal Sedation (Anxiolysis):*
   A 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.

   B. *Moderate Sedation (Previously called Conscious Sedation)*:
   A drug-induced depression of consciousness during which patients respond purposefully to verbal commands either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is maintained.

   C. *Deep Sedation:*
   A drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully after repeated or painful stimulation. Patients may require assistance in maintaining a patent airway and spontaneous ventilation may be inadequate.

   D. *General Anaesthesia:*
   A drug-induced loss of consciousness during which patients are not arousable, even to 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 may be required because of depressed spontaneous ventilation. Cardiovascular function may be impaired.

SEDATION CONTINUUM				
	Minimal Sedation (Anxiolysis)	**Moderate Sedation (Conscious Sedation)**	**Deep Sedation**	**General Anesthesia**
Responsiveness	Respond normally to verbal commands	Purposeful response to verbal or tactile stimulation	Purposeful response following repeated or painful stimulation	**Unarousable even with painful stimulus**
Airway	No intervention required	No intervention required	Intervention may be required	**Intervention required**
Spontaneous Ventilation	Adequate	Adequate	May be inadequate	**Frequently inadequate**
Cardiovascular Function	**Maintained**	**Usually maintained**	**Usually maintained**	**May be impaired**

Table 1: Definition of Sedation

2. The different stages of sedation represent a CONTINUUM and patients may quickly move from one level of sedation to another, resulting in the loss of the patient's protective reflexes. Therefore, medical practitioners who sedate children must be prepared to manage all levels of sedation, even if only moderate sedation is intended. There must be appropriate physiologic monitoring and continuous observation by personnel not directly involved with the procedure so that there can be accurate and rapid diagnosis of complications and initiation of appropriate rescue interventions.

IV. ASSESSMENT OF SEDATION

1. The assessment of sedation is difficult in children and depends on their verbal abilities, age, level of maturity, and underlying condition.

2. A common problem is the misinterpretation of any movement in response to touch or painful stimulus as "purposeful". Examples of purposeful movements include eyes opening, crying, saying "ouch," or pushing away the offending stimulus. Purely reflexive activities, such as the gag reflex, simple withdrawal from pain, or making inarticulate noises, do not constitute appropriate responses for the purpose of this definition. A sedated child who displays only reflex activities in response to tactile or verbal stimulation is in a state of deep sedation, and should lead to an escalation of care because airway obstruction and respiratory depression may occur.

3. Accurate assessment of the depth of sedation is important as children may move rapidly into deep sedation, which will require an escalation of monitoring and a greater degree of vigilance. Because of their user friendliness, observational scoring systems are commonly used to assess sedation depth in clinical settings. The University of Michigan Sedation Score (UMSS) is a simple clinical observational scale to assess sedation depth over the entire continuum from awake to unarousable state. It is reliable and valid in detecting changes in the level of sedation in children in clinical settings. (*Appendix A*)

SECTION B: RECOMMENDED STANDARDS

I. PRE-SEDATION ASSESSMENT

1. Before sedation, a pre-sedating evaluation shall be performed by the medical doctor in-charge of the patient or by the doctor performing the sedation as appropriate. The purpose of this evaluation is not only to document baseline status but also to determine if the patient presents any specific risk factors that may warrant optimisation and consultation of appropriate specialist before sedation. This evaluation will also screen out patients whose sedation will require more advanced airway or cardiovascular management skills and thus warrant the presence of an experienced medical practitioner or anaesthesiologist.

2. Pre-sedation assessment should include:
   - Age of the child
   - Weight of the child in kilogram
   - Allergies and previous adverse drug reactions
   - History of sedation or general anaesthesia and any complications or unexpected responses
   - Current medical history and history of co-morbidities, disorders and hospitalisation
   - Medical diseases that might increase the potential for airway obstruction, such as a history of snoring or obstructive sleep apnoea
   - Current medications
   - Baseline vital signs, including heart rate, blood pressure, respiratory rate, and body temperature
   - Physical examination, including a focused evaluation of the airway, pulmonary and cardiac status
   - American Society of Anesthesiologists (ASA) physical status evaluation. (*Appendix B*)

II. PATIENT SELECTION FOR SEDATION

1. Children who are in ASA class I or II are frequently considered appropriate candidates for sedation.

2. Children with the following medical conditions are at increased risk of complications during sedation. Presence of experienced medical practitioners or anaesthesiologist is strongly recommended.
   - ASA Physical Status III or IV
   - History of airway obstruction (e.g. large tonsils), difficult tracheal intubation, loud snoring, obstructive sleep apnoea and central apnoea. (*Appendix C*)
   - Poorly controlled asthma
   - Obesity
   - Prematurity or ex-premature infant, especially those with postconceptual age < 60 weeks. (*Appendix D)*
   - Active pulmonary, cardiovascular, gastrointestinal, neurologic problems
   - Poorly controlled seizures
   - Uncontrolled gastro-oesophageal reflux
   - Procedures requiring deep sedation
   - Sedation in patients with a full stomach
   - Severe developmental delay
   - History of failed sedation, over-sedation or paradoxical response to sedation

III. FASTING GUIDELINE

1. Patients undergoing sedation for elective procedures should NOT have fluids or solid foods for a sufficient length of time to allow for gastric emptying and prevention of aspiration during sedation.

2. For children who are NOT at increased risk of delayed gastric emptying, requiring ELECTIVE procedure under sedation, the 2-4-6-8 rule on fasting time as employed in general anaesthesia can be used:
   - Clear fluids* up to 10 ml/kg are allowed up to 2 hours prior to sedation
   - Breast milk is allowed up to 4 hours prior to sedation
   - Formula milk and solid food are allowed up to 6 hours prior to sedation
   - Heavy meal or fatty food up to 8 hours prior to sedation

   *Examples of clear fluids include water, glucose water, infant electrolyte solutions, real or artificial fruit juices without pulp, carbonated beverages, clear tea, and black coffee without any type of creamer or milk.

3. For URGENT procedures in a child who has not been fasted or who has risk factors of delayed gastric emptying or intestinal obstruction, the benefits of the procedures must be balanced against the possible risk of aspiration. Airway protection e.g. tracheal intubation by an appropriately trained practitioner should be considered; this often means the involvement of an anaesthesiologist if available.

4. Fasting duration may need to be modified for children with co-existing diseases that might affect stomach emptying (e.g. pain, abnormal autonomic function as in diabetes, obesity, reflux disease, ileus or bowel obstruction).

5. Fasting does not guarantee that gastric emptying is complete.

6. In some situations, the oral administration of contrast may be needed (e.g. for abdominal computed tomography). In such cases, the benefits of the procedure requiring oral contrast must be balanced against the possible risk of aspiration.

7. For children with gastroesophageal reflux, the use of an H2-receptor blocker or proton pump inhibitor may be advisable to minimize gastric acid secretion.

8. Before starting sedation, time of the last food and fluid intake should be confirmed and recorded.

IV. TIME-OUT

Pre-procedural pause or “time-out” of the diagnostic or therapeutic procedure should be performed according to the hospital policy. It is performed immediately before the intended procedure. The “time out” includes a process of confirmation of the correct patient, verification of informed consent, confirmation of the correct procedure and site or side of the procedure. No intravenous sedation will be administered without completion of the “time out” procedure although oral sedation may be given in ward before the “time-out”.

V. INTRAVENOUS ACCESS

1. Intravenous access when considered necessary should be established before sedation. It

should be maintained throughout procedure until the child is safe from cardiopulmonary depression.

2. Intravenous access may not be necessary for patients undergoing light to moderate sedation with oral sedating agent alone for non-invasive procedures such as echocardiography, electrodiagnosis and neuro-imaging.

VI. NON-PHARMACOLOGICAL METHOD

1. Non-pharmacological techniques such as distraction or reassurance can be effective with many children, particularly those of school age, undergoing procedures which are not painful and where parental presence in a child-friendly environment is possible.

2. Painless procedures may also be performed on small babies without any sedation after they received a feed and are provided with a warm and quiet environment. Preventing the infant from sleeping a few hours before the procedure and an oral pacifier is useful in many instances. As the infant is not fasted, the fasting guideline will need to be observed when sedative drugs are considered if the procedure fails.

VII. USE OF IMMOBILISATION DEVICES

Immobilisation devices, if used, should be applied in such a way as to avoid airway obstruction or chest restriction. The child's head position and chest respiratory excursions should be checked frequently to ensure airway patency. The child should never be left unattended.

VIII. PERSONNEL AND TRAINING

1. For patient who just received minimal to moderate sedation with oral sedating agent alone for a non-painful non-invasive procedure (e.g. transthoracic echocardiograph, electrodiagnosis and neuro-imaging), monitoring and escort may be carried out by trained healthcare personnel, if considered appropriate by the medical doctor in-charge of the patient after a pre-sedation assessment. If the child is assessed to have increase risk of sedation-related adverse events (e.g. ASA class III or IV, age < 1 year old, etc.), increase vigilance and continuous monitoring by dedicated medical staff (e.g. nurse or doctor) should be considered and arranged.

2. The healthcare personnel should have ready access to a communication system, e.g. DECT phone, intercom system or cardiac arrest call bell, as appropriate so that they can contact the medical staff whenever necessary without delay. The proper functioning of the communication system should be regularly checked as DECT phone or similar system may fail in certain underground locations e.g. MRI, tomography centre. Medical staff should be readily available to supervise the healthcare personnel if the child develops any signs of sedation-related adverse effects (e.g. over-sedation, desaturation, airway obstruction, etc.).

3. For procedures that require moderate sedation by intravenous route, there should be a medical doctor responsible for administering sedation and monitoring the patient throughout the procedure. It is a good practice to have another medical staff (usually a nurse or another doctor) to assist the sedation and monitoring. This assisting medical staff may be allowed to participate in helping the procedure, if the patient's level of sedation and vital signs are stable. In case the patient develops any significant changes in vital signs, all medical staff should give full attention to the patient.

4. In the clinical scenarios that the medical doctor administering the sedation is also responsible for performing the procedure, then the second medical staff (usually a nurse or another doctor) must be available and fully dedicated to provide CONTINUOUS monitoring of the patient's conscious level and cardio-respiratory status. In this scenario, the assisting medical staff should not participate in the procedure and must pay full attention to the patient's sedation levels and vital signs.

5. Sedation is a continuum. Some patient may progress to a state of deep sedation (with risk of airway obstruction, respiratory and cardiovascular depression) despite the original intent is moderate sedation. Increased vigilance and extra medical staff should be readily available if this occurs. The medical staff providing sedation must be competent in rescuing the patient from deep sedation and its associated complications.

6. For procedures that require a deep level of sedation, there MUST be a dedicated medical doctor responsible for administering sedation and monitoring the patient throughout the procedure (*Appendix E*). It is also ESSENTIAL to have another dedicated medical staff (usually a nurse or another doctor) to assist the sedation and monitoring. The medical staff should give full attention to the sedation process and monitoring of the patient. They should not engage in the procedure itself.

7. Procedures requiring deep level of sedation are often prolonged, painful and / or invasive (e.g. paediatric flexible bronchoscopy, upper gastrointestinal endoscopy, etc.). Deliberate obtundation of airway reflexes by local anaesthetic sprays may be needed for the procedure. The risks of deep sedation during these procedures may be indistinguishable from those of general anaesthesia. The sedation should only be carried out by EXPERIENCED medical practitioners trained to perform these procedure-specific paediatric sedation techniques. Airway protection (by tracheal intubation) should be considered, if appropriate. If tracheal intubation is needed, this often means general anaesthesia (by anaesthesiologist) or intensive care management is required.

8. Individual hospitals should identify the commonly performed diagnostic or therapeutic procedures in children that ROUTINELY require deep level of sedation. Accreditation of medical staff should be considered as appropriate, before they are allowed to perform sedation for these procedures. Alternatively, provision of regular general anaesthesia or monitored anaesthetic care (MAC) session or anaesthesiologist-led sedation service should be considered by the hospitals, if appropriate.

9. If the patient has any serious or unstable medical condition, the appropriate specialist should be consulted to optimise the patient's condition prior to any planned procedure under sedation. The involvement of an experienced medical staff or anaesthesiologist should be considered to provide sedation or general anaesthesia as appropriate. Admission and monitoring in PICU should also be considered.

10. Medical staff responsible for pre-sedation assessment, provision of sedation, and monitoring of the children for sedation must be competent in the following areas:
    - Good conception of the basic physiology of the sedation process
    - Understanding and familiarity with the proper drug dosages for children and properties of the various sedative agents
    - Ability to recognise and manage adverse reactions and overdoses of sedative drugs
    - Possession of skills in airway management, provision of respiratory support, and cardiovascular resuscitation. At least one of medical staff is required to have attended the relevant training courses in paediatric sedation or life support. Medical staff providing paediatric sedation is encouraged to comply with continuous education programs in paediatric sedation.

11. Healthcare personnel responsible for monitoring and escort of children under the influence of sedative medication should receive appropriate training in the following areas:
    - Assessment of levels of sedation
    - Observation of vital signs (including skin colour, respiratory rate, pulse rate, SpO_2 monitoring and blood pressure monitoring, as appropriate)
    - Recognition and immediate first-aid care of the common sedation-related adverse effects, e.g. cyanosis, complete or partial airway obstruction, apnoea, hypoventilation, bradycardia, desaturation, nausea / vomiting, oversedation etc
    - Transport monitors (e.g. portable pulse oximeter, ECG, BP; as appropriate) should be used

IX. FACILITIES AND MONITORING

1. The procedure should be performed in a location with adequate space, staff and equipment to deal with any possible cardiopulmonary emergency. All equipment and drugs must be checked and maintained on a scheduled basis. It is critical that a complete range of sizes of emergency and monitoring equipment be available for children of all ages and sizes.

2. The requirement list should include:
    - Adequate area and lighting for procedure and resuscitation
    - An operating table, bed or trolley, which can be tilted, should preferably be available
    - O_2 cylinder and suction and appropriate size suction catheters
    - A defibrillator should be available in close proximity. Defibrillation paddles for children should be available
    - Intravenous and airway management equipment (*Appendix F*)
    - Emergency medications
    - Physiological Monitoring:
        - ✧ Continuous pulse oximetry with appropriate probes for the children
        - ✧ Blood pressure measuring device with appropriate paediatric cuffs
        - ✧ ECG as appropriate. Appropriate ECG electrode size for neonate, infants and children should be available
        - ✧ A means for the monitoring of respiration/ventilation, either visually or by continuous end tidal CO_2 (capnography) monitor
        - ✧ Continuous end tidal CO_2 (capnography) monitor can detect apnoea, hypopnoea and hypoventilation in children undergoing sedation. Hypoxia and desaturation is frequently preceded by low or absent CO_2. However, capnography is often not available outside operating room and most medical practitioners outside anaesthesia are often unfamiliar with the equipment. Further studies are needed to determine if routine monitoring with capnography can reduce the frequency of hypoxia in children undergoing sedation
        - ✧ A stethoscope

3. Continuous monitoring of oxygen saturation and heart rate, regular observation with time-based documentation of the vital signs, level of sedation and ventilatory function should be carried out until the patient meets discharge criteria.

X. ADMINISTRATION OF MEDICATIONS

1. All medications should be checked according to hospital policy before being administered. (*Appendix G*)

2. Sufficient time must elapse between doses to allow the effect of each dose to be assessed before additional drug administration.

3. When drugs are administered by non-intravenous routes, allowance should be made for the time for drug absorption before supplementation is considered.

4. Concomitant uses of opioid analgesic will aggravate the sedative-induced respiratory depression of patient.

5. Appropriate dose reduction is necessary if both sedatives and analgesic are used.

XI. DOCUMENTATION

1. Adequate documentation of all aspects of patient evaluation and monitoring is essential for high quality patient care. Using a standardized Sedation Form can facilitate the documentation.

2. This documentation shall include, but is not limited to:

A. Pre-sedation Preparation:
- Pre-sedation medical evaluation
- Fasting Status
- Consent

B. Sedation Record –A Time-based Flow Sheet
- Dosage, route, and time of administered drugs
- Patient's response to medication and the procedure
- Patient's vital signs, physiological data and level of sedation
- Any oxygen supplementation, its flow rate and duration, and method of administration
- Any interventions such as oxygen or intravenous therapy and the patient's response
- Any untoward reactions and their management

C. Post-sedation Monitoring and Discharge Criteria
- The criteria for discharge from the sedation area and disposition of the child are specified

XII. MANAGEMENT AFTER THE PROCEDURE

1. After the procedure, continuous monitoring of patient is mandatory until the following criteria are met:
   - Patient has a patent airway
   - Patient shows protective airway and breathing reflexes
   - Patient is haemodynamically stable
   - Patient is easily roused

2. Monitoring is preferably carried out in a recovery area near the procedure site.

3. If a recovery area is not available, the patient should be escorted back to the ward for continuous monitoring. During transport, the vital sign should also be monitored continuously by medical staff. Oxygen supplementation should be considered during

transport. Suitable resuscitative equipment (e.g. manual resuscitative bag/valve/mask, airway devices, etc.) and emergency medications should be prepared and carried. For patient who just received moderate sedation with oral sedating agent (Chloral Hydrate) alone, the escort may be carried out by trained healthcare personnel if patient is assessed to be stable by appropriate medical staff.

XIII. HOME DISCHARGE

Ensure that all of the following criteria are met before the child is discharged to home:

- Cardiovascular function and airway patency are satisfactory and stable
- The patient is alert, and protective reflexes are intact
- The patient can talk (if age-appropriate)
- The patient can sit up unaided (if age-appropriate)
- For a very young or handicapped child incapable of the usually expected responses, the pre-sedation level of responsiveness or a level as close as possible to the normal state of the child should be achieved
- The state of hydration is adequate
- The child should be accompanied by a parent or a responsible adult who should not be the driver
- The responsible adult should be provided with information on what to look out for after sedation and on how to obtain medical advice if problems arise

XIV. QUALITY ASSURANCE PROGRAM

1. It is good practice to have hospital or departmental quality assurance (QA) program in paediatric sedation. The QA can be a continuous or one-off program, as appropriate. For example, an audit may be designed to look into incidence and circumstances of sedation-related adverse events (e.g. sedation failure, hypoxic events, resuscitations, etc.) to identify areas that can be improved.

2. Patient care areas where sedation is performed should have policies for reporting complications encountered during sedation to the relevant quality assurance committee. Institutional policies on reporting of sentinel events, major untowards events, incidents and near misses should also be followed.

SECTION C: CHOICE OF DRUGS FOR DIFFERENT PROCEDURES AND DRUGS INFORMATION

I. CHOICE OF DRUGS FOR DIFFERENT PROCEDURES

1. Painless procedures that require immobilization. *(refer to Graph 1-2)*

Examples: CT, MRI, DMSA scan, DTPA scan, bone scan and radiotherapy. Sedation is usually not required for co-operative children above 8 years of age. Extra care with reduction of the recommended dosage may be required in patients with pre-existing CNS depression.

A. First Line Drugs:

Oral Chloral Hydrate	It works best for children below 2 years old and effect is unsatisfactory for children above 5 years of age
Neonate	➢ 30-50mg/kg 30-45mins before procedure ➢ Use the lower dose for at risk or premature neonates ➢ Do not repeat dose
Child 1 month - < 6 years	➢ 50-75mg/kg (max 1g) 30-45mins before procedure ➢ Higher dose up to 100mg/kg (max 2g) may be used

Intravenous Midazolam	Intravenous Midazolam is often used instead of chloral hydrate for children above 5 years of age
Child 1 month - 6 years	➢ 0.05-0.1 mg/kg, titrate and repeat doses if necessary after 2-3mins (max total dose = 0.4 mg/kg or 6mg)
Child over 6 years	➢ 0.1 mg/kg, titrate and repeat if necessary after 2-3mins (max total dose = 0.4 mg/kg or 10mg)

B. Second Line Drugs: *(If first line fails)*

Midazolam	Refer to midazolam under first line drugs

Intravenous Ketamine	
Neonate	➢ 0.2-1 mg/kg/dose ➢ May repeat 0.5mg/kg/dose as needed after 10mins
Children	➢ 1-2 mg/kg, use smaller doses (0.5-1 mg/kg) for sedation of minor procedures ➢ Additional boluses of 1 mg/kg after 10 minutes ➢ Up to maximum total dose of 2-4 mg/kg IV ➢ Atropine 0.01-0.02 mg/kg IV or IM may be given to reduce salivation

Should the above measures fail, the procedure may have to be postponed and referral to an anaesthesiologist be considered.

Paediatric Sedation for Non-Painful Procedure

Graph 1

First Line Drugs

Chloral Hydrate *(Preferred for children < 5 yrs)*	***Midazolam*** *(Preferred for children > 5 yrs)*
Neonate ➢ 30-50mg/kg 30-45mins before procedure ➢ Use the lower dose for at risk or premature neonates ➢ Do not repeat dose	**Child 1 month - 6 years** ➢ 0.05-0.1 mg/kg, titrate and repeat doses if necessary after 2-3mins (max total dose = 0.4 mg/kg or 6mg)
Child 1 month - < 6 years ➢ 50-75mg/kg (max 1g) 30-45mins before procedure ➢ Higher dose up to 100mg/kg (max 2g) may be used	**Child > 6 years** ➢ 0.1 mg/kg, titrate and repeat if necessary after 2-3mins (max total dose = 0.4 mg/kg or 10mg)

Paediatric Sedation for Non-Painful Procedure

Graph 2

Second Line Drugs:
(If first line drug fails)

Midazolam	***Ketamine***
Child 1 month-6 years ➢ 0.05-0.1 mg/kg, titrate and repeat doses if necessary after 2-3mins (max total dose = 0.4 mg/kg or 6mg)	**Neonate** ➢ 0.2-1 mg/kg/dose ➢ May repeat 0.5mg/kg/dose as needed after 10mins
Child > 6 years ➢ 0.1 mg/kg, titrate and repeat if necessary after 2-3mins (max total dose = 0.4 mg/kg or 10mg)	**Children** ➢ 1-2 mg/kg, use smaller doses (0.5-1mg/kg) for sedation for minor procedures ➢ Additional boluses of 1 mg/kg after 10 minutes ➢ Up to maximum total dose of 2-4 mg/kg IV ➢ Atropine 0.01-0.02 mg/kg IV or IM may be given to reduce salivation

2. Painful Short Procedures (refer to Graph 3)

Examples: biopsies with or without image guidance (CT, ultrasound or fluoroscopy), reduction of intussusception, bone marrow aspiration, lumbar puncture and pleurocentesis.

Midazolam can be given together with local anaesthetic or fentanyl, or ketamine

A. *Midazolam*

0.05 - 0.1 mg/kg IV initially, titrate and repeat if necessary after 2-3 minutes, up to a maximum dose of 0.4 mg/kg, together with local anaesthetic.

OR

B. *Fentanyl*

0.5 - 1 microgram/kg IV. If no respiratory depression is observed in 5 minutes, carefully titrate with ***midazolam*** 0.05 - 0.1 mg/kg IV boluses up to a maximum dose of 0.2 mg/kg (for midazolam).

OR

C. *Ketamine*

1 mg/kg IV with additional bolus doses of 0.5-1 mg/kg up to a maximum total dose of 2-4 mg/kg IV over 20 minutes for difficult patients. Ketamine may also be given IM at 2-4 mg/kg. Atropine 0.01-0.02 mg/kg IV or IM may be given to reduce salivation. ***Midazolam*** 0.025mg/kg may be added for prevention of hallucination.

Paediatric Sedation for Painful Short Procedure

Graph 3

Option 1

Midazolam 0.05- 0.1mg/kg IV initially, titrate and repeat if necessary after 2-3mins, up to a maximum dose of 0.4 mg/kg, together with local anaesthetic.

Option 2

Fentanyl 0.5 - 1 microgram/kg IV. If no respiratory depression is observed in 5 minutes, carefully titrate with ***midazolam*** 0.05 - 0.1 mg/kg IV boluses up to a maximum dose of 0.2 mg/kg (for midazolam).

Option 3

Ketamine **(for sedation and analgesic)** 1 mg/kg IV with additional bolus doses of 0.5-1 mg/kg up to a maximum total dose of 2-4 mg/kg IV over 20 minutes for difficult patients.

Ketamine may also be given IM at 2-4 mg/kg.

Atropine 0.01- 0.02 mg/kg IV or IM may be given to reduce salivation.

Midazolam 0.025mg/kg may be added for prevention of hallucination.

Should the above measures fail, the procedure may have to be postponed and referral to an anaesthesiologist be considered.

II. COMMONLY USED DRUGS FOR SEDATION

A. Chloral Hydrate

1. Chloral hydrate is one of the most widely used sedatives in neonates and children younger than 5 years of age. It is widely used to facilitate non-painful diagnostic procedures such as EEG and CT or MRI.

2. An oral dose of 50 mg/kg is used for brief procedures (15 minutes or less) while 75 mg/kg is required for sedation of children for MRI which is a noisy procedure lasting for more than 30 minutes.

3. The onset of action is 30 minutes and the duration of action is 4 to 8 hours.

4. Side effects occur in 5-10% of children including vomiting (the drug is irritating to mucous membrane) and paradoxical excitation.

5. The disadvantage is that sedation is not successful in 10% of the children and it is not as effective in older children. It is best for children below 2 years old and unsatisfactory for those above 5 years of age.

6. Although it has a long safety record, it can cause respiratory depression due to airway obstruction, and deaths had been associated with its use alone and when combined with other sedating medications. One large series showed a 0.6% incidence of respiratory depression especially at larger doses (75 - 100 mg/kg).

7. Its effect is primarily mediated by the active metabolite trichloroethanol (TCE), which is formed by the liver and erythrocytes. TCE has a half-life of 10 hours in toddlers, 28 hours in term infants, and 40 hours in preterm infants.

8. The prolonged effects of chloral hydrate warrant a longer period of post-sedation observation; chloral hydrate can also cause side effects after discharge, which include motor imbalance (31%), gastrointestinal effects (23%), agitation (19%), and restlessness (14%).

9. The unpredictable onset and active metabolites dictate that this drug (as well as all sedatives for sedation) is given only in facilities capable of resuscitation (i.e. hospital setting) and that discharge is allowed only when the child meets discharge criteria.

B. *Midazolam*

1. Midazolam is a short acting, water-soluble benzodiazepine which should be administered intravenously. Nasal administration causes irritation and absorption after rectal administration is irregular. These routes of administration should be avoided.

2. With intravenous use the onset of action is within minutes, duration of action is 1-2 hours which is the shortest among benzodiazepines.

3. Benzodiazepines produce mild respiratory depression and upper airway obstruction. Respiratory depression may become severe in compromised children or in children with tonsillar hypertrophy.

4. It can be used as a single agent in immobilising children for radiological examination.

5. It is often used alone or in combination with analgesics or local anaesthesia in painful or distressing procedures for sedation and amnesia.

6. The effect of midazolam and other benzodiazepines can be reversed by flumazenil, a competitive antagonist, at doses from 0.01 mg/kg (up to max of 0.2 mg) every minute to a maximum cumulative dose of 0.05 mg/kg or max of 1 mg intravenously (max 2 mg in ICU setting).

C. *Ketamine*

1. Great precaution should be taken by non-anaesthesiologists using this drug for sedative/analgesic effects because of the associated potential risks which are often life threatening and critical.

2. Chemistry
   - Ketamine is a non-barbiturate anaesthetic agent and is a derivative of phencyclidine.

3. Clinical Uses
   - Ketamine can be used as an induction agent for general anaesthesia; as a sedative agent for short diagnostic and therapeutic procedures; or as an analgesic for painful procedures.

   - Ketamine produces a clinical state of 'dissociative anaesthesia', which is a trance-like cataleptic state through dissociation between the cortical and limbic system. During dissociative anaesthesia, patient's eyes may remain open with a disconnected stare and probable nystagmus. These actions produce a combination of sedation, amnesia and analgesia making it useful for paediatric painful and painless procedures.

4. Other Pharmacological Effects

   A. Central Nervous System:
   - Ketamine can cause nystagmus, increase in muscle tone and spontaneous involuntary limb movement.
   - It elevates intracranial pressure through cerebral vasodilatation and increase systemic perfusion pressure.
   - Seizures may be precipitated in susceptible patients.
   - Hallucinatory emergence occurs in up to 50% adults but in less than 10% in young children. Excessive noise or stimulation should be avoided during recovery.
   - Such adverse reactions could be prevented in older children by administration of benzodiazepines which however will prolong recovery due to synergistic effect.

   B. Respiratory System:
   - Ketamine preserves laryngeal and pharyngeal reflexes when given within recommended dose range.
   - However, it stimulates salivary and tracheobronchial secretions and also sensitizes cough and gag reflexes. Life threatening side effects, such as laryngospasm and aspiration can occur during sedation using ketamine. Concomitant use of an anticholinergic, e.g. atropine 0.01 mg/kg IV (neonates) / 0.02 mg/kg IV (1 month – 12 years; minimum 0.1 mg max 1.2 mg), is usually recommended to decrease the airway secretion. Ketamine should not be used in patients with upper/lower respiratory tract infection or excessive salivation.

   - Although spontaneous respiration, muscle tone of the tongue and larynx, cough and swallowing reflexes are usually preserved by ketamine, adverse

effects such as apnoea, respiratory depression with decrease respiratory rate and tidal volume, as well as desaturation have been reported. These complications can occur during rapid intravenous bolus of exceptionally high doses (e.g. 2 mg/kg) causing conversion to general anaesthesia, and also in ill or preterm infants.

- Ketamine causes potent relaxation on bronchial smooth muscle, making it an ideal anaesthetic and analgesic agent in patients with asthma.

C. Cardiovascular System:

- Ketamine has sympathomimetic actions through inhibiting reuptake of catecholamines, thus resulting in mild to moderate increases in blood pressure, heart rate, and cardiac output.
- However, its direct vasodilatory effects (through smooth muscle relaxation) may result in hypotension in the critically ill who has depleted catecholamine stores.
- There is no conclusive evidence that ketamine increases pulmonary vascular resistance, thus the use of ketamine in children with cyanotic congenital heart diseases is controversial.

D. Others:

- Ketamine can cause increase in intra-ocular pressure and also nausea and vomiting.

5. Recommended Dose and Administration

- Ketamine is commonly given through intravenous or intramuscular route. It can also be given by oral, rectal or intranasal routes at higher dose but with less predictable onset of action and recovery times.
- For sedation and analgesia using ketamine, the recommended dose for intravenous use is 1 mg/kg IV with additional bolus doses of 0.5-1 mg/kg, up to a maximum total dose of 2-4 mg/kg IV over 20 minutes for difficult patients. Ketamine may also be given IM at 2-4 mg/kg. For longer procedures, infusion of 10-20 microgram/kg/min may be required. Lower dose (e.g. 0.5 mg/kg) to be used if adjuvant sedatives (e.g. midazolam) are also given.
- The onset times vary with the route of administration (30-60 seconds for IV; 5-20 minutes for IM).

6. Precautions

- Unless appropriate monitoring, personnel with appropriate training in advanced life support, resuscitative equipment and drugs are readily available, ketamine should not be administered in high bolus doses at and above 1.5mg/kg.
- Ketamine is contraindicated in intracranial hypertension, head injury, eyeball injury, glaucoma and hydrocephalus.
- Ketamine should be used cautiously in patients with underlying heart diseases e.g. severe HOCM.

D. Fentanyl

1. Fentanyl has replaced morphine and pethidine as the opioid of choice for analgesia/sedation for procedures in children.

2. Intravenous fentanyl is a potent pure opioid (i.e., 100 times more potent than morphine) with no amnesic properties.

3. Its high lipid solubility allows for onset within 30 seconds and a peak effect at 2 to 3 minutes. It has a brief clinical duration of 20 to 40 minutes when given in small doses owing to its rapid redistribution to skeletal muscle, fat and other inactive sites. It has no active metabolites.

4. Fentanyl's clearance is decreased and its half-life is increased in preterm and term infants.

5. Its pharmacological effects can be fully reversed by opioid antagonists and is frequently used with a short-acting anxiolytic (such as midazolam).

6. Doses must be given in small aliquots and carefully titrated to avoid chest wall and glottic rigidity.

7. When carefully titrated and appropriately monitored, fentanyl has few adverse effects.

8. Chest wall rigidity is a centrally mediated idiosyncratic reaction that can interfere with respiratory function. The mechanism of action is partially modulated by GABA pathways at the spinal level. It can be reversed with naloxone or muscle relaxants.

9. Chest wall rigidity is quite rare and has only been described when higher doses (3 to 4 microgram/kg) were given in boluses for sedation in neonates.

10. Other adverse reactions from fentanyl include bradycardia, dysphoria, delirium, nausea, vomiting, pruritus, urinary retention, hypotension, and smooth muscle spasm. Close post-procedural observation is required because respiratory depression can outlast analgesia.

III. COMMONLY USED DRUGS FOR REVERSAL

A. Flumazenil

1. Flumazenil is a specific benzodiazepine receptor antagonist and will rapidly reverse the sedative and respiratory effects of benzodiazepines.

2. Children who are taking benzodiazepines for epilepsy may develop seizure rapidly if flumazenil is given. It should also be used with caution in patients with benzodiazepine dependence.

3. The recommended dose of flumazenil is 0.01 mg/kg (up to max of 0.2 mg) every minute to a maximum cumulative dose of 0.05 mg/kg or max of 1 mg intravenously (max 2 mg in ICU setting).

4. Antagonism begins within 1 to 2 minutes and lasts approximately 1 hour.

5. Because re-sedation after 1 hour may occur, the child must be carefully monitored for at least 2 hours. Repeat dose of flumazenil may be necessary.

6. It should be noted that flumazenil will not antagonize respiratory depression due to opioids.

7. Flumazenil should not be administered for the routine reversal of the sedative effects of benzodiazepines but reserved for reversal of respiratory depression.

B. *Naloxone*

1. Mu-receptor opioid antagonist specifically reverses the respiratory and analgesic effects of opioids and should be readily available when opioids are used.

2. It should not be used for routine reversal of the sedative effects of opioids but reserved for reversal of respiratory depression or respiratory arrest.

3. It may be given intravenously or intramuscularly. The initial dose for respiratory depression is 10 microgram/kg titrated to effect every 2 to 3 minutes. Up to 100 microgram/kg may be required for severe respiratory depression or respiratory arrest.

4. Adverse reactions from reversal of analgesia include pain, tachycardia, hypertension, delirium, and pulmonary edema.

5. Children on long-term opioid therapy should be given opioid reversal agents in low doses and with extreme caution because withdrawal seizures and delirium may occur.

6. Children given naloxone may again have opioid effects after 1 hour. *If naloxone is used, then the child should be observed for a minimum of 2 hours*. Repeat dose of naloxone may be necessary.

IV. COMMONLY USED LOCAL ANAESTHETIC DRUGS

General Principles and Maximum Recommended Doses:

1. Local anaesthetics play a critical role in analgesia for painful procedures and greatly reduce requirements for systemic opioid when administered topically or by local infiltration.

2. For local skin infiltration, local anaesthetic solution containing adrenaline 1: 200,000 (5 microgram/ml) is often used as a vasoconstrictor to lengthen the duration of blockade, decrease bleeding, and reduce systemic toxicity by decreasing vascular uptake. The toxicity of local anaesthetic is additive when used in combination. No more than the maximum amount (mg/kg) should be drawn up in a syringe so as to avoid accidental overdose.

3. *Solutions with adrenaline **must not** be used in parts of the body with compromised blood supply or supplied by end-arteries, such as **fingers, toes, nose, ears or penis**. There is a possibility of producing arterial vasoconstriction and subsequent ischaemic gangrene distal to the site of injection.*

4. Local anaesthetic can obtund airway reflexes when sprayed in the mouth for bronchoscopy or gastrointestinal endoscopy.

A. Lignocaine

1. Lignocaine is the most commonly used local anaesthetic drugs by non-anaesthesiologists.

2. Lignocaine has a rapid onset and a medium duration of action. The onset of action is 1 – 5 minutes following subcutaneous infiltration.

3. The rate of absorption depends on the dose, the route of administration and the vascularity of the injection site. For example, intercostal blocks give the highest peak plasma concentrations, while abdominal subcutaneous injections give the lowest.

4. The addition of adrenaline considerably slows the absorption of lignocaine. Peak plasma concentrations are reduced by 50% following subcutaneous injection if adrenaline 1: 200 000 (5 microgram/ml) is added.

5. Injection should always be made slowly with frequent aspirations to avoid inadvertent intravascular injection which can produce cerebral symptoms even at low dose. Drowsiness may be early signs of CNS toxicity.

6. Signs and symptoms of toxicity include restlessness, anxiety, tinnitus, dizziness, blurred vision and tremors.

7. It is recommended that the dose of Lignocaine at any one time should not exceed 4 mg/kg (plain solution) or 7 mg/kg (solutions with adrenaline).

8. Lignocaine is also available as a 10% topical spray which delivers 10mg of Lignocaine on each actuation. The maximum recommended dose is 3mg/kg (e.g. up to 6 metered doses for a child weighing 20 kg).

Maximum Recommended Dose of Lignocaine by Infiltration

Local Anaesthetic	Maximum dose (mg/kg)	Maximum dose by volume (ml/kg)
1% (10 mg/ml) Lignocaine (plain)	4	0.4
2% (20 mg/ml) Lignocaine (plain)	4	0.2
1% (10 mg/ml) Lignocaine with adrenaline 1 in 200,000	7	0.7
2% (20 mg/ml) Lignocaine with adrenaline 1 in 200,000	7	0.35

For example, 1% Lignocaine (plain solution, without adrenaline) contains 10 mg/mL Lignocaine. A 10 kg child can receive a maximal dose of 4mg/kg i.e. 40 mg, i.e. maximum 4 ml of 1% Lignocaine may be given subcutaneously.

This suggested maximal dose serves only as a guide. Toxic doses vary between patients.

B. EMLA Cream

1. EMLA cream is a *E*utectic *M*ixture of *L*ocal *A*nesthetics (Lignocaine 2.5% and Prilocaine 2.5%).

2. When placed on the skin for 60 minutes, it is useful for reducing the pain of skin incision, intravenous cannula insertions and lumbar punctures.

3. Absorption of large amounts of Prilocaine can cause methemoglobinaemia.

4. It should be applied only to normal intact skin in appropriate doses.

5. Dosage:
   - The dose should not exceed 1 gram per 10 cm^2 of application area.
   - Age 0-3 month: the maximum application area is 10 cm^2 (1 gram) over maximum of 1 hour.
   - Age 3-12 month: the maximum application area is 20 cm^2 (2 gram) over maximum of 1 hour.

- Age 1-6 year: the maximum application area is 100 cm^2 (10 gram) over maximum of 5 hour.
- Age 6-12 year: the maximum application area is 200 cm^2 (20 gram) over maximum of 5 hour.

6. The duration of action is 1 to 2 hours after the cream is removed.

7. Adverse reactions include erythema, itching, rash, and methemoglobinaemia. It also causes blanching of the skin, which can make intravenous access difficult.

8. It is contraindicated in neonates with gestational age of < 37 weeks and in children with congenital or idiopathic methemoglobinaemia, or in infants under the age of 12 months who are receiving treatments with methemoglobinaemia-inducing drugs (e.g., Phenytoin, Phenobarbital, and Sulfonamides). Patients with glucose-6-phosphate dehydrogenase deficiency are also more susceptible to drug induced methaemoglobinaemia, therefore, caution is advised.

C. Ametop Cream

1. Tetracaine 40mg/g (4% w/w) gel. Tetracaine is rapidly absorbed from mucus membranes (within 3 minutes) and should never be applied to inflamed, traumatised, or highly vascular surfaces.

2. Child over 1 month to under 5 years: max 1 tube (1.5g; equivalent to 40mg Tetracaine) should be applied at separate sites at a single time. Maximum cumulative dose for children < 5 year old is 2 tubes in 24 hours.

3. Child 5-18 years: max 5 tubes applied at separate sites at a single time.

4. Avoid in neonates and premature infants < 44weeks PCA.

5. Application of Ametop gel can be repeated after a minimum of 5 hours if necessary.

6. One tube of Ametop can cover an area of up to 30 cm^2.

7. After applying the gel, the area should be covered with a dressing and the dressing should be removed and the gel wiped off after 30-45 minutes. **Ametop gel should not be left on for more than 1 hour.**

8. The duration of action of Ametop is 4 – 6 hours.

9. Store Ametop in a refrigerator at 2 – 8 ^oC.

10. Adverse effects include erythema, oedema and pruritis of the application site, rarely blistering of skin may occur.

SECTION D: APPENDICES AND REFERENCES

APPENDIX A

University of Michigan Sedation Scale (UMSS)

Score	Characteristics
0	Awake and alert
1	Minimally sedated: tired/sleepy, appropriate response to verbal conversation and/or sound
2	Moderately sedated: somnolent/sleeping, easily aroused with light tactile stimulation or a simple verbal command
3	Deeply sedated: deep sleep, arousable only with significant physical stimulation
4	Unarousable

APPENDIX B

American Society of Anesthesiologists (ASA) Physical Status Classification

Class I	A normal healthy patient
Class II	A patient with mild systemic disease (e.g. a child with controlled reactive airway disease)
Class III	A patient with severe systemic disease (e.g. a child who is actively wheezing)
Class IV	A patient with severe systemic disease that is a constant threat to life (e.g. a child with status asthmaticus)
Class V	A moribund patient who is not expected to survive without the operation (e.g. a patient with severe cardiomyopathy requiring heart transplantation)
Class VI	A declared brain-dead patient whose organs are being removed for donor purposes

APPENDIX C

Factors That May Be Associated with Difficulty in Airway Management Include, but Are Not Limited to:

- Previous problems with anesthesia or sedation
- Stridor
- Snoring or apnea
- Dysmorphic facial features (e.g., Pierre Robin syndrome, trisomy 21)
- Craniofacial abnormalities
- Significant obesity (especially involving the neck and facial structures)
- Short neck, limited neck extension, large neck mass
- Tracheal deviation
- Small mouth, protruding incisors, loose or capped teeth, high arched palate
- Macroglossia
- Tonsillar hypertrophy
- Nonvisible uvula
- Micrognathia
- Retrognathia
- Trismus

APPENDIX D

Calculation of Post- Conceptual Age

Gestational age is the time between conception and birth. Actual age is the time since birth.
Post-Conceptual Age (PCA) = Gestational age + Actual age

Example: PCA = Gestational age 33 weeks + 17 weeks old = 50 weeks

A widely accepted guideline is to admit and monitor all infants younger than 60 weeks post-conceptual age for 12 to 24 hours after anaesthesia and surgery. In general, the younger the patient's gestational and post-conceptual ages, the greater the risk for postoperative apnoea attack.

Similar precaution may be advised for infant with PCA < 60 weeks after sedation and procedure.

APPENDIX E

Paediatric Flexible Bronchoscopy

1. Paediatric flexible bronchoscopy is often performed in ICU, bronchoscopy suite or other high dependency environment because of the monitoring capability and experience of the clinicians and nursing staff.

2. Topical Lignocaine is applied to pharynx and tracheobronchial tree, usually by spray, nebuliser or atomizer device.

3. Atropine is often administered as an antsialagogue.

4. IV sedation by Ketamine, Midazolam and Fentanyl have been used with varying success.

5. Many of these children have significant comorbidity. Some of these children may already be intubated and receiving ventilatory support in ICU.

6. Availability of dedicated experienced medical staff to provide sedation, airway support and monitoring is essential to allow the bronchoscopist to focus on the procedure itself.

7. If available, dedicated anaesthesiologist to administer intravenous or inhalational anaesthesia and to manage airway is recommended. The use of a variety of airway device (facemask, laryngeal mask airway, intubation or spontaneous breathing tubeless technique) may allow flexibility to the bronchoscopist.

APPENDIX F

Emergency Equipment † That May Be Needed to Rescue a Sedated Patient:

Intravenous Equipment

- IV cannulae (e.g., 24-, 22-, 20-, 18-, 16-gauge)
- Tourniquets
- Alcohol wipes
- Adhesive tape
- Assorted syringes (e.g., 1-, 3-, 5-, 10-mL)
- IV tubing
- Paediatric drip set
- Adult drip set
- Extension tubing
- Injection port or 3-way stopcocks
- IV fluid e.g. Lactated Ringer solution, Normal saline solution, etc
- IV needles (e.g., 25-, 23-, 21-, and 18-gauge)
- Intraosseous needle
- Sterile gauze pads

Airway Management Equipment

- Face masks (infant, child, small adult, medium adult, large adult)
- Self-inflating breathing bag and valve set (infant, child, adult)
- Oropharyngeal airways (size 000, 00, 0, 1, 2, 3, 4)
- Nasopharyngeal airways (available in sizes 12F to 36F. Alternatively, for infants and small children, a shortened endotracheal tube may be used.)
- Laryngeal mask airways (sizes 1, 1.5, 2, 2.5, 3, and 4)
- Laryngoscope handles (with extra batteries)
- Laryngoscope blades
  - ✧ Straight (Miller) No. 0, 1, 2, and 3
  - ✧ Curved (Macintosh) No. 1, 2 and 3
- Endotracheal tubes (2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, and 6.0 uncuffed and 5.0, 5.5, 6.0,6.5. 7.0. 7.5 and 8.0 cuffed)
- Stylet (appropriate sizes for endotracheal tubes)
- Water soluble lubricant e.g. KY Jelly
- Suction catheters (appropriate sizes for endotracheal tubes)
- Yankauer-type suction
- Gastric tubes
- Nebuliser with medication kits
- Gloves (sterile and nonsterile, latex free)

† The choice of emergency equipment may vary according to individual or procedural needs.

APPENDIX G

Drugs* That May Be Needed to Rescue a Sedated Patient

- Adrenaline (1:10 000)
- Amidorane
- Atropine
- Chlorpheniramine
- Diazepam
- Dopamine
- Dobutamine
- Ephedrine
- Flumazenil
- Glucose (10% or 50%)
- Hydrocortisone
- Lignocaine (cardiac Lidocaine, local infiltration)
- Metoclopramide
- Naloxone
- Oxygen
- Ondansetron
- Rocuronium
- Salbutamol (intravenous and for inhalation)
- Sodium bicarbonate
- Suxamethonium

* The choice of emergency drugs may vary according to individual or procedural needs.

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醫院管理局
HOSPITAL AUTHORITY

Paediatric Sedation

PRE-SEDATION ASSESSMENT

Patient's Particulars
(Please attach patient's gum label)

Diagnosis: Procedure:

Date of Procedure: Location of Procedure:

Body Weight (Kg) : if applicable: BH (m): BSA (m^2):

Prematurity <37 weeks □ No □ Yes (< 60 week Post-conceptual age) □ Yes (> 60 week PCA)

ASA: I healthy / **II** Mild systemic disease / **III** Severe systemic / **IV** Life Threatening/ **V** Moribund

CURRENT MEDICAL HISTORY	**PHYSICAL EXAMINATION**
Heart Disease: □ No □ Yes:	Airway Abnormalities: □ No □ Large Tongue □ Receding Chin □ Loud Snoring □ Other:
Lung Disease: □ No □ Yes:	
Active / Recent URTI: □ No □ Yes:	CVS Abnormality: □ No □ Yes:
CNS Disease: □ No □ Yes:	Respiratory Abnormality: □ No □ Yes:
Bleeding Tendency: : □ No □ Yes:	Neurological Abnormality: □ No □ Yes:
GI Reflux: □ No □ Yes:	Presence of Loose Teeth: □ No □ Yes:
Obstructive sleep/Central apnoea □ No □ Yes:	
Previous Sedation Failure □ No □ Yes:	Other Abnormal P/E: □ No □ Yes:
Other Disease: □ No □ Yes:	Details if tick Yes:
Details if tick Yes:	

Infection Precaution: □ None / Standard □ Contact □ Droplet □ Airborne

Baseline Vital Signs BP: _____/_____ mmHg HR/P: _____/min Temp: _____℃
RR: _____/min (SpO_2_____% □ Room Air □ O_2____L/min)
Consciousness level: □ Alert □ Drowsy □ Confused □ Comatous

CURRENT MEDICATIONS:

DRUG ALLERGY: □ No □ Yes. → Please specify

SUMMARY: Risk of Sedation □ Low Risk □ Moderate Risk □ High Risk

SEDATION PLAN: □ Oral Sedation □ IV Sedation □ Oral +/- IV Sedation
□ Need ICU Support □ Need GA □ OTHER:

FASTING PLAN:

IF ORAL SEDATION IS PLANNED:	IV Cannulation before Oral Sedation □ No □ Yes
O2 after oral sedation: □ No □ Yes _____L/min	Monitoring required after Oral sedation □ No □ Yes
Escort by □ HCA □ Nurse □ Doctor	□ HR □ SpO_2 □ RR □ Consciousness □ OTHER

Doctor doing the Pre-Sedation Assessment

Name: Signature: Date: Time:

醫院管理局
HOSPITAL AUTHORITY

Paediatric Sedation

PAEDIATRIC SEDATION MEDICATION

Patient's Particulars
(Please attach patient's gum label)

ORAL SEDATION PLAN (To be filled in by the doctor in-charge)

BW (Kg):

KNOWN DRUG ALLERGY
□ YES – Drugs:

□ NO

Doctor's signature:

Code

RED DOT
for (Allergy / Alert)

USUAL DOSE OF CHLORAL HYDRATE

Neonate 30-50mg/kg **30-45min before procedure**. Use the lower dose for at risk or premature neonates. Do not repeat dose.

Child 1 month - < 6 years 50-75mg/kg (max 1g); **30-45min before procedure**; higher dose up to 100mg/kg (max 2g) may be used. Use the lower dose for sick child.

PRESCRIPTION							ADMINISTRATION			
Time to be given	**Date to be given**	**Drug**	**Dose**	**Route**	**Dr's Signiture**	**Code**	**Date**	**Time**	**Given by**	**Checked by**
		CHLORAL HYDRATE								

IV SEDATION CHECKLIST (if IV Sedation is planned)

To be filled in by the doctor / nurse administering intravenous sedation on the day of procedure

Age or size appropriate airway equipment

ETT size: _____	□ No	□ Checked
Mask Size	□ No	□ Checked
Oral Airway Size	□ No	□ Checked
Self-inflating Bag / Valve	□ No	□ Checked
Suction	□ No	□ Checked
Direct Laryngoscopy	□ No	□ Checked
IV patency	□ No	□ Checked

Reversal drugs:

Flumazenil available □ No □ Yes

(0.01 mg /kg up to 0.2 mg every min to a max cumulative dose of 1 mg intravenously)

Naloxone available □ No □ Yes

(10 microgram/kg, titrate to effect every 2 to 3 min)

E Trolley/Resuscitation Box available □ No □ Yes

Other Resuscitative Drugs □ No □ Yes

MONITORING PLAN □ HR □ RR □ BP □ SpO_2 □ Sedation Score □ Other: Specify:-

Signature:	Name/Rank:	Time:	Date:

*** TIME OUT** (* if **not** using separate procedure-specific Time Out Form); please tick the box if checked
□ Patient's Name & ID □ Procedure □ Site/Side of procedure (if applicable) □ Valid Consent

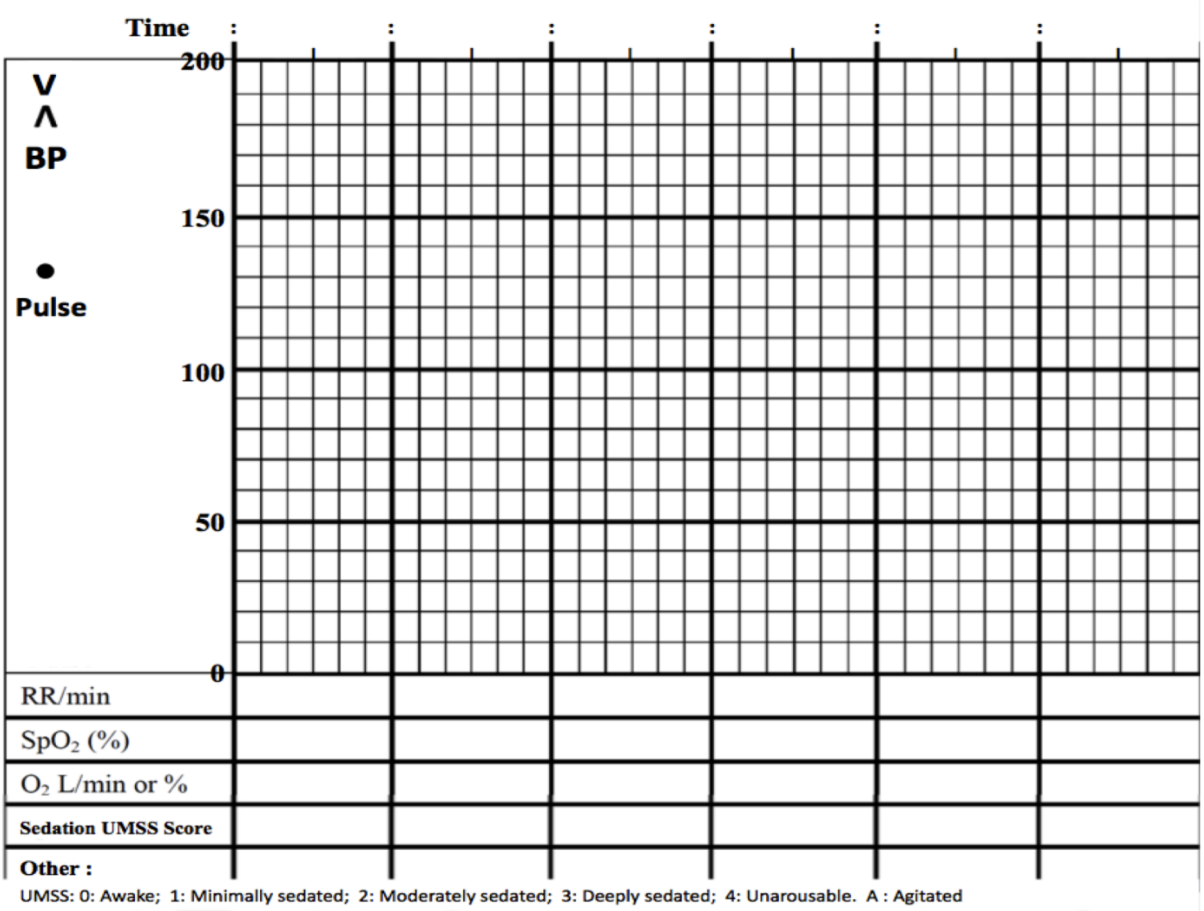
Operator's Signature	Signature of Doctor Administering IV Sedation	Signature of Nurse /Assistant	Date	Time

醫院管理局 HOSPITAL AUTHORITY	Paediatric Sedation **PAEDIATRIC SEDATION RECORD**	Patient's Particulars (Please attach patient's gum label)

Date: Fasting Time: Body Weight:

Name of Doctor (if applicable):	**Signature:**
Name of Nurse / Assistant:	**Signature:**

Time	Drugs / Fluid	Dose / Volume	Route	Given by	Checked by



OTHER NOTES / EVENTS

醫院管理局 HOSPITAL AUTHORITY	Paediatric Sedation **RECOVERY PHASE**	Patient's Particulars (Please attach patient's gum label)

Immediate Sedation Outcome: □ Intended level of sedation obtained □ Failed sedation □ Deeper level of sedation obtained than intended □ Any airway intervention other than simple chin lift □ *Adverse event occurred requiring treatment □ # Reversal agent given (*# Monitoring must be continued for a minimum of 2 hours after use of Naloxone or Flumazenil)* □ Recovery phase > 2 hours (Slow to wake up)	Other Events/ Comments:

Checklist for Discharge to Ward

Patient is able to maintain airway, breathing well and SpO2 satisfactory			□ Yes	□ No	
BP / heart rate / RR are stable	□ Yes	□ No	Patient is easily arousable	□ Yes	□ No
Continue O_2 supplement to ward	□ Yes	□ No	Continuous SpO_2 in ward	□ Yes	□ No
Monitoring in ward: SpO_2 / BP /P / RR / Conscious level every _____hr			□ 24 hour in-patient observation needed: e.g. *children with obstructive sleep apnoea*		
Other Notes / Plan: **Checked by:_____(Name/Rank) Signature:_____ Time:_____ Date:_____**					

Checklist for Discharge Home

□ All vital signs (temp, HR, BP and RR) have returned to normal levels

□ Patient is awake (or has returned to baseline level of consciousness)

□ Nausea, vomiting and pain have been adequately managed

□ Discharge information explained to patient or parent

Discharge information sheet given? □ Yes □ No

Other Notes:

Checked by:_____ (Name/Rank) Signature:_____ Time:_____ Date:_____