Paediatric Sedation: Keep it Safe!

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What is Sedation?

- 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.

- Sedation is required to facilitate unpleasant diagnostic or minor surgical procedures.

Hong Kong Academy of Medicine: Guidelines on Procedural Sedation
• Sedation is not a set of discrete, well-defined stages but a continuum where there is the transition from complete consciousness through the various depths of sedation to general anaesthesia.

• In patients of any age, attempts at moderate sedation can rapidly and unpredictably become deep sedation or general anaesthesia.
Different from adult?
Paediatric Patient

• Respiratory physiology – hypoxic more readily.
• Pharmacology differs from adult.
  – Age specific recommendation e.g. chloral hydrate: 30-50mg/kg in neonate, 50-75mg/kg - 1 month to <6 years.
• Psychology – Parent & child.

*Practice Recommendation for Sedation of Children in Diagnostic and Therapeutic Procedures. Hospital Authority 2013*
Ideal Sedating agent?

• NIL!
• All sedatives and narcotics have caused problems even in ‘recommended doses’.
Risks of Sedation

- Protective reflexes - obtunded, airway obstruction may occur at any time.
- A wide variety of drugs, with potential adverse interactions, may be given.
- Absorption, distribution and efficacy of drugs – difficult to predict.
- Unpredictable individual variation in response to drugs.
- Excessive sedatives - compensate for analgesia.
- Sedation may outlast the procedure.

Hong Kong Academy of Medicine: Guidelines on Procedural Sedation
Non-pharmacological techniques for painless procedures
School age children (>5 years old)

- Distraction / reassurance.
- Child friendly.
- Parental presence.
Small infant

- Sleep deprivation.
- After a feed.
- Warm / quiet environment.
Children aged 4 months to 5 years, require deep sedation / general anaesthesia.
## Statistics on Some Common Paediatric Procedures Performed in HA in 2008

<table>
<thead>
<tr>
<th>Age</th>
<th>Bronchoscopy</th>
<th>OGD</th>
<th>ERCP</th>
<th>MRI/CT</th>
<th>Radiotherapy</th>
<th>Colonoscopy</th>
<th>Angiography (excluding CC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 3months</td>
<td>59</td>
<td>1</td>
<td>0</td>
<td>3542</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4months - 5years</td>
<td>71</td>
<td>21</td>
<td>3</td>
<td>9163</td>
<td>58</td>
<td>16</td>
<td>214</td>
</tr>
<tr>
<td>6-12 years</td>
<td>23</td>
<td>73</td>
<td>3</td>
<td>10160</td>
<td>14</td>
<td>24</td>
<td>110</td>
</tr>
<tr>
<td>Total</td>
<td>153</td>
<td>95</td>
<td>6</td>
<td>22865</td>
<td>72</td>
<td>41</td>
<td>324</td>
</tr>
</tbody>
</table>

In 2008, there were a total of 23556 procedures done in children (as tabled) in HA hospitals. Other common procedures like LP, change of dressings in burn patients, EEG, eye examinations, wound care, removal of sutures ..... etc are not included in the above statistics.
Number of Paediatric Sedation Procedures by Anaesthesiologists in 2015 (Jan 15 - Dec 15)

- Bronchoscopy
- OGD
- MRI/CT
- Radiotherapy
- Colonoscopy
- Angiography (exclude CC)

Age Groups:
- <=3 months
- 4 months - 5 years
- 6-12 years
Who provide Paediatric Sedation in HA?

• Paediatricians, anaesthesiologists, paediatric surgeons, orthopaedic surgeons ....etc.
• Mostly residents, sometimes AC / houseman /consultant.
• Variable training.
What happened when sedation went wrong?
Critical incident analysis of sedation-related adverse events.

- 95 incidents – 60 deaths / neurologic injury.

Contributing factors:
- Inadequate resuscitation.
- Inadequate monitoring.
- Inadequate pre-sedation medical evaluation.
- Lack of an independent observer.
- Medication errors.
- Inadequate recovery.
What are the measures to enhance safety in paediatric sedation?
Practice Recommendation for Sedation of Children in Diagnostic and Therapeutic Procedures

FOR HAHO INTERNAL CIRCULATION ONLY

<table>
<thead>
<tr>
<th>Version</th>
<th>Effective Date</th>
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<tbody>
<tr>
<td>1</td>
<td>31 December 2013</td>
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</tbody>
</table>

Previous Version:
Guidelines for Sedation of Children in Diagnostic and Therapeutic Procedures

Year 2000
Pre-sedation Assessment

• *All* patients should be evaluated prior to procedure for their risk and suitability for sedation.

• Medical history:
  – major illness
  – congenital defect
  – recent or current illness
  – allergy history
  – use of medication
  – past history of sedation or anaesthesia

• General examination – pulmonary / cardiac status.

• Baseline HR, BP, RR and temp.
for sedation
Airway problems like difficult airway

Tumour inside oral cavity (2 days old)

Mucopolysaccharidosis
Obstructive Sleep Apnoea
The Morbidly Obese
Invasive / painful procedures
– deep sedation / general anaesthesia is required
Past failed sedation or paradoxical reaction to sedation
Prematurity or ex-premature infants <60 weeks post-conceptual age
Active pulmonary, cardiovascular, GI or neurologic problems
ASA 3 and Greater

The American Society of Anesthesiologists’s (ASA) classification of physical status:

1. A normal healthy patient.
2. A patient with mild systemic disease (eg. A child with controlled reactive airway disease)
3. A patient with severe systemic disease (eg. A child who is actively wheezing)
4. A patient with severe systemic disease that is a constant threat to life (eg. A child with status asthmaticus)
5. A moribund patient who is not expected to survive without the operation (eg. A patient with severe cardiomyopathy requiring heart transplantation)
Presence of anaesthesiologist / experienced medical practitioner is recommended!
Fasting Guideline

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.

<table>
<thead>
<tr>
<th>Ingested material</th>
<th>Minimum fasting period (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear fluids (10mls/kg)</td>
<td>2</td>
</tr>
<tr>
<td>Breast milk</td>
<td>4</td>
</tr>
<tr>
<td>Infant formula, non-human milk, light meal</td>
<td>6</td>
</tr>
<tr>
<td>Heavy meal or fatty food</td>
<td>8</td>
</tr>
</tbody>
</table>

*Practice Recommendation for Sedation of Children in Diagnostic and Therapeutic Procedures. Hospital Authority 2013*
Sedationist

• Qualified individual “competency-based education, training and experience”.
• Sound knowledge of the drugs / antidotes.
• Able to rescue the patient from the next level of sedation / anaesthesia.
• Practitioner intending to induce moderate sedation are competent to manage a compromised airway and inadequate oxygenation and ventilation.
• Practitioner intending to induce deep sedation are competent to manage an unstable cardiovascular system as well as a compromised airway and inadequate oxygenation and ventilation.
• Present throughout the procedure.
• Completely dedicated to that task.
Facilities and Equipment

- Adequate area and lighting for procedure and resuscitation

- Provision of an Emergency Cart for resuscitation equipment and drugs.

- Defibrillator readily available.

- A stethoscope
Basic airway management equipment

1) Source of compressed O2.

2) Source of suction.

3) Self-inflating breathing bag-valve set.

4) Age appropriate facemasks, oropharyngeal airway, nasal airway and suction catheters.
• **Advanced airway management equipment**
  – Laryngoscope handles (tested) and blades (age appropriate)
  – Endotracheal tubes
  – Stylets (appropriate sizes for endotracheal tubes)

• **Intravenous equipment**
  – Catheters / IV sets / IV fluids / syringes and needles.

• **Emergency medications**
  – Adrenaline
  – Atropine
  – Ephedrine
  – Lignocaine
  – Glucose
  – Hydrocortisone
  – Diazepam
  – Pharmacological antagonists: Naloxone and Flumazenil.

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Monitoring

• Pulse oximeter – HR, SpO2.
• Blood pressure.
• ± ECG / RR.
• ETCO2 if available for deep sedation.
Documentation

Use of standardized form and record.

1) Pre-sedation:
   • Pre-sedation medical evaluation
   • Fasting Status
2) Sedation record – time base.
• vital signs.
• level of sedation.
• drugs given.
• oxygen supplementation.
• untoward reactions and their management.
Recovery and post procedure care

3) Post-sedation monitoring, discharge criteria and status, disposition of the child.

- Awakened while still fully monitored.
- Continued monitoring of SpO2.
- Sedated child should never be left unobserved.
- Remained in recovery area till cardiovascular and respiratory stability are assured.
Paediatric Sedation Course

• In 2014, COC (Paediatrics) in conjunction with HKCA.
• Simulation-based Training for Enhancing Sedation Safety in Children having Diagnostic & Therapeutic Procedure.
• Held at Simulation Centre at NDH.
Paediatric Sedation Course

• Pre-course web-based lectures followed by quiz.
• 12 provider courses: 112 doctors & 111 nurses.
• Mainly for paediatricians and nurses.
• Mandatory for trainees in paediatric.
• Extend to staff in other specialties.
Summary

• Paediatric sedation can be risky.

• Adoption of measures to enhance safety and adequate staff training are important to keep paediatric sedation safe in the Hospital Authority.
thank you!