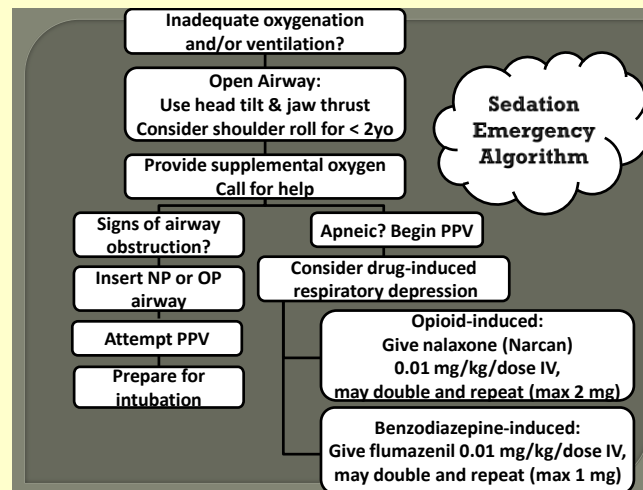


## Medications

- **Ketamine:**
  - Dosing
    - 0.5 to 1 mg/kg IV q 3 to 5 min, max 2 mg/kg
  - Adjuncts
    - Glycopyrrolate (anticholinergic)  
0.005 – 0.01 mg/kg IV x 1, max 0.1 mg
    - Consider supplementing with midazolam (may also reduce emergence delirium)
  - Pharmacodynamics:
    - Onset: Within 30 seconds
    - Duration: 1 to 2 hours
    - Dissociative anesthetic and analgesic
    - Minimal respiratory depression
- **Midazolam (Versed):**
  - Dosing
    - IV: 0.05 – 0.1 mg/kg/dose IV q3-5 min, Max 0.2 mg/kg or 6 mg/total dose
    - PO: 0.25 – 0.5 mg/kg/dose x 1, Max 20 mg/dose
    - Intranasal: 0.2 – 0.4 mg/kg/dose q10 min
  - Pharmacodynamics:
    - Onset (min): 1 to 3 IV, 10 to 30 PO, 5 IN
    - Duration: 1 to 2 hours
    - Sedative, anxiolytic and amnestic
    - Reversible with flumazenil (see graphic)
- **Pentobarbital (Nembutal):**
  - Dosing
    - 1 – 3 mg/kg/dose IV q 3 to 5 min
    - Max 100 mg/dose, 8 mg/kg/total dose
  - Pharmacodynamics:
    - Onset: 3 to 10 minutes
    - Duration: 1 to 3 hours
    - Hypnotic, no analgesia or amnesia

## Sedation Teaching Points

- The individual performing a procedure cannot also safely sedate a patient. A second provider whose sole responsibility is the sedation is key.
- All sedatives may cause respiratory depression. Drug combinations increase the risk of side effects.
- Evaluate for hypoventilation if there are changes in respiratory rate or pulse oximetry.
- Sedation related hypotension occurs commonly. Consider giving a NS bolus.
- Hepatic or renal insufficiency may prolong sedative metabolism and excretion.
- Only narcotics and benzodiazepines have antagonists.



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## Walter Reed – Bethesda

### Pediatric Sedation Unit

September 2011

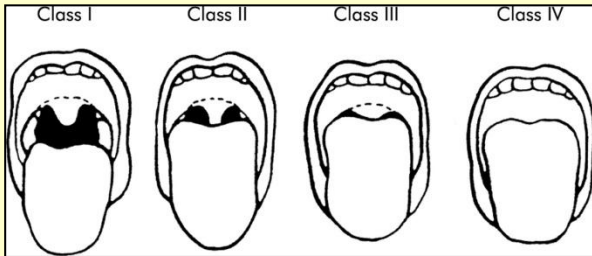
#### Pediatric Moderate Sedation / Analgesia Protocols

#### Prerequisites

- **Always ask:** Is the study truly needed *and* will it require sedation to be accomplished?
  - Minimize risk – think safety first!
- **Obtain a pre-sedation history:**
  - Past medication history including adverse reactions to anesthesia (malignant hyperthermia), sedation, or failed sedation
  - URI within last 4 weeks
  - Increased risk of respiratory depression:
    - < 60 weeks post-conceptual age
    - History of apnea or chronic lung disease
    - Renal, liver, or neuromuscular disease
    - Polypharmacy
  - Other sedation concerns:
    - Neck instability (Trisomy 21)
    - Anticipated difficult IV access
  - Acute respiratory illness: Increased risk of complications so consider rescheduling.
  - Current medications, meds in the last 48 hours, and allergies (inc. latex, contrast)
  - NPO status:
    - Clear liquids: 2 hours
    - Breast milk: 4 hours
    - Formula/Non-clear liquid: 6 hours
    - Solids: 8 hours
    - Excludes meds and study contrast, which may represent added aspiration risk.

- **Perform a pre-sedation physical:**

- Airway Assessment: Evaluate for airway abnormalities that may prevent either easy BVM ventilation or easy intubation.
- Mallampati Classification: The higher the score, the more potential of difficulty that in the event of the need to intubate.



- ASA Classification: ASA I or II only. ASA III and above and any patient who fails airway screening require Anesthesia and/or Critical Care consultation.

ASA Physical Status Classification System	
ASA Class	Description
I	Healthy, no underlying organic disease
II	Mild or moderate systemic disease that does not interfere with daily routines (e.g. well-controlled asthma, essential hypertension)
III	Organic disease with definite functional impairment (e.g. severe steroid-dependent asthma, insulin-dependent diabetes, uncorrected congenital heart disease)
IV	Severe disease that is life-threatening (e.g. head trauma with increased intracranial pressure)
V	Moribund patient, not expected to survive
E (suffix)	Physical status classification appended with an "E" connotes a procedure undertaken as an emergency (e.g. an otherwise healthy patient presenting for fracture reduction is classified as ASA physical status 1 E).

- **Essentris H&P and re-eval within 24 hours**
- **Signed informed consent**
- **Essentris orders**
- **Weight-based emergency drug sheet**

### Monitors & Personnel

- Electronic monitors are not a substitute for a provider performing direct evaluation.
- Minimum appropriate monitoring includes continuous HR, RR and SpO2. Non-invasive capnography (ETCO<sub>2</sub>) is required.
- Observe and record vitals including BP and LOC every 5 minutes, to include ETCO<sub>2</sub>.
- Appropriate personnel include an independent practitioner and at least one RN (monitor/recovery assistant), both PALS certified.
- Suction, oxygen, airway adjuncts (OPA/NPA), BVM, reversal agents, vascular access devices, and code cart should all be readily available.
- Sedation is a continuum. Always be prepared to rescue a patient from the next level.

- **Alternatives:** Propofol (Diprivan) and dexmedetomidine (Precedex) are potential alternative sedatives but require Critical Care and/or Anesthesia consultation.

### Medications (Alphabetical)

- **Chloral hydrate\*\* (If <18 mo and < 12 kg):**
  - Dosing:
    - Contraindicated in neonates
    - 50 mg/kg PO for infants < 6 months
    - 75 – 100 mg/kg PO for older infants
    - After 20 min, may add 25mg/kg
    - Max 1 g/dose, 2 g/day
  - Pharmacodynamics:
    - Onset: 10 to 20 minutes
    - Maximum effect: 30 to 60 minutes
    - Duration: 4 to 8 hours, rarely up to 40h
    - “Antanalgesic,” no analgesia or amnesia
    - PR unreliable; N/V common with PO

### Medication Algorithm Options

	Low immobility	High immobility
Low pain	<p>Goal: Cooperation → Sedative</p> <p>Ex.: Echo, U/S, CT</p> <p>Meds: Chloral hydrate Midazolam only</p>	<p>Goal: Sleep → Hypnotic</p> <p>Ex.: MRI, Nuc Med</p> <p>Meds: Chloral hydrate ± Midazolam Pentobarbital ± Midazolam</p>
High pain	<p>Goal: Cooperative/Comfortable → Analgesia + Sedation/Anxiolysis</p> <p>Ex.: Lac repair, CT / CVC insertion</p> <p>Meds: Fentanyl ± Midazolam Ketamine ± Midazolam ± Propofol</p>	<p>Goal: Cooperative/Analgesia → Sedation + Analgesia</p> <p>Ex.: BMA/biopsy, endoscopy, LP</p> <p>Meds: Ketamine ± Midazolam Fentanyl ± Midazolam ± Propofol</p>

- **Sedation adjunct**

- Diphenhydramine (Benadryl)  
0.5 - 1 mg/kg IV x 1, max 50mg

- **Fentanyl:**

- Dosing:
  - 0.5 - 1 mcg/kg/dose IV over 3-5 minutes
  - May repeat q 3 – 5 minutes
  - Max 50 mcg/dose, 3 mcg/kg/total dose
- Pharmacodynamics:
  - Onset: Almost immediately
  - Duration: 30 to 60 minutes
  - Sedation and analgesia
  - Antagonist: Nalaxone (Narcan) reverses both sedation and analgesia, so for mild reversal start with low dose and titrate up (0.001 mg/kg/dose IV, double and repeat q 1 min to effect).