Moderate (Conscious) Sedation Protocol

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Objectives

- Sedation definitions
- Pre-operative evaluation
- Drugs utilized
- Airway management
Minimal Sedation

• Does not mandate implementation of Conscious Sedation Policy
• Patient maintains
  – Normal respiration
  – Normal eye movement
  – Normal response to command, and
  – Normal or baseline mental orientation
Moderate Sedation

• Protective reflexes are intact
• Airway remains patent
• Spontaneous ventilation is adequate
• Patient responds to physical stimulation or verbal command
• No adverse effect on cardiorespiratory function
Deep Sedation

- Use of medication to induce a level of depressed consciousness from which the patient is not easily aroused

- Can result in partial or complete loss of protective airway reflexes

- Need for airway support

- Beyond the scope of this policy
Pre-Operative Evaluation of Cardiopulmonary Diseases

• Patients with moderate to severe heart or lung disease will have decreased ability to tolerate deviations from normal levels of consciousness
• They can easily decompensate during mild hypoxia or hypercarbia
• Consider Anesthesiology consult for such patients
American Society of Anesthesiologists Classification

- ASA 1: No health problems.
- ASA 2: Mild to moderate systemic disease
- ASA 3: Severe systemic disease
- ASA 4: Severe systemic disease that is a constant threat to life
- ASA 5: Moribund patient not expected to survive without procedure
Airway Assessment

• Mallampati class
• Difficult airway anatomy
• History of difficult intubation
• Disease states associated with a difficult airway
Mallampati Classification

Class I: can see soft palate, entire uvula, tonsils, & posterior pharynx

Class II: can see soft palate, part of uvula, & posterior pharynx

Class III: can see soft palate & base of uvula

Class IV: can see hard palate only

Class III or IV suggests a difficult intubation
Diseases with Difficult Airways

• Acquired
  – Obesity/Sleep apnea
  – Rheumatoid arthritis
  – Ankylosing spondylitis
  – Airway tumors
  – Airway infections
  – Acromegaly
  – Burn patients

• Congenital
  – Pierre Robin
  – Treacher Collins
  – Down’s syndrome
  – Goldenhar’s
Difficult Airway Anatomy

- Short/fat neck
- Decreased mobility of the airway joints
- Dental overbite or small mandible
- Large tongue
- Distortion in the airway (extrinsic or intrinsic)

Difficult anatomy may make mask/bag ventilation difficult or impossible
## NPO Guidelines

<table>
<thead>
<tr>
<th>Age</th>
<th>Solids/Breast Milk/Formula</th>
<th>Clear Liquids</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6 months</td>
<td>4 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>6 months-adult</td>
<td>6 hours</td>
<td>2 hours</td>
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Possible Anesthesiology Consults

• Patient has failed conscious sedation in past
• Medically or psychologically unstable (ASA class III, IV, V)
• Complicated airway (MP class III or IV, difficult anatomy)
• Patients with recent oral intake
• Pregnant patients
Moderate Sedation Risks

- Respiratory depression
- Loss of airway
- Vomiting/aspiration
- Arrhythmias
Arrhythmias

- Sinus bradycardia: sedation may cause a drop in heart rate
- Sinus tachycardia: may due to pain, hypoxia, or hypercarbia
- PVCs: may be due to hypoxia or hypercarbia
- SVT
Equipment needed

- Pulse oximeter
- Oxygen source
- Ambu-bag with mask and oral airway
- Laryngoscopes with Miller and Mac blades
- Endotracheal tubes with stylet
- Functioning suction with Yankauer tip
- ECG monitor
Equipment needed

• Emergency “Code Alpha” Cart w/defibrillator
• Standard resuscitative drugs
• Anesthesia emergency drugs
  – Narcan (naloxone)
  – Romazicon (flumazenil)
  – Succinylcholine (Anectine)
Intra-procedure monitoring

- $\text{SaO}_2$ (via pulse oximetry)
- Blood pressure
- EKG monitor (rhythm & rate)
- Respirations
- Level of consciousness
The steep part of curve occurs at 90% $O_2$ sat. resulting in a rapid drop in $O_2$ sat.

<table>
<thead>
<tr>
<th>$PaO_2$ (mmHg)</th>
<th>$O_2$ saturation (%)</th>
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<tbody>
<tr>
<td>30</td>
<td>60%</td>
</tr>
<tr>
<td>40</td>
<td>75%</td>
</tr>
<tr>
<td>60</td>
<td>90%</td>
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</table>
Intra-procedure

• Patient should be responsive to physical and verbal stimuli at all times
• If unresponsive, patient has become deeply sedated
• Stop procedure
• Initiate appropriate airway management
• Defer further administration of sedatives until patient returns to moderate sedation
Airway Obstruction

Loss of airway muscle tone in anesthetized patient leads to obstruction
Airway Obstruction: Recognition

- Respirations
  - Labored
  - Paradoxical chest movement
  - Tachypnea
  - Inspiratory stridor
  - Snoring (partial), No breath sounds (complete)
  - Decreased O\textsubscript{2} sats
Airway Obstruction: Recognition

• Neuro: Restlessness, decreased mental status, unconscious
• Skin: Cyanosis
• Vitals: Tachycardia, bradycardia, hypertension
One-handed Mask Technique

For airway maintenance consider:
- raising head position
- head extension/chin lift
- jaw thrust
- oral or nasal airway placement
Two-handed Mask Technique

(When patient is difficult to mask/bag ventilate)

With one person to squeeze ventilation bag and the other to obtain proper mask fit
Benzodiazepines

- Produce amnesia, sedation, anxiolysis
- Anticonvulsants
- Minimal effects on circulation
- Diazepam (Valium) – $T_{1/2}$ is 25–30 hours
- Lorazepam (Ativan) – $T_{1/2}$ is 10–20 hours
- Midazolam (Versed) – $T_{1/2}$ is 1–4 hours
Midazolam (Versed)

• Dosing: 0.02–0.03 mg/kg...max 0.1 mg/kg
• For 70 kg patient: 2 mg incrementally; max of 7 mg
• 1–3 minutes onset; Clinical duration: ~ 20 - 40 minutes
• No pain on injection
Romazicon (flumazenil)

- A benzodiazepine receptor antagonist
- Treat overdoses of benzodiazepines with 0.2 mg IV per minute (maximum single dose is 1 mg)
- Rapid reversal with large boluses may result in arrhythmias, hypertension, agitation or seizures
Opioids

• Drugs that bind to opioid receptors and produce
  – Analgesia – desired effect
  – Euphoria – clinically useful but potentially dangerous
  – Respiratory depression – depresses medullary ventilation centers.
  – Other side effects: Nausea, pruritis, orthostatic hypotension.
Opioids

- Opioids (morphine, Demerol, fentanyl) produce a rapid and sustained dose-dependent depression of ventilation. They depress the medullary respiratory drive centers’ response to CO₂.
- The CO₂ response curve is shifted to the right, ie, a higher CO₂ is required to stimulate ventilation.
CO2 Response Curve to Narcotics
Factors that Potentiate Respiratory Depression

• Drugs
• COPD
• Obesity
• Obstructive Sleep Apnea
Opioids

• Opioids do not reliably produce unconsciousness but they can make a semi-conscious patient apneic.

• It is possible to have a patient that responds to stimuli (voices, sternal rub) but will not breath.
Opioids: Some I.V. dosing Guidelines

• Morphine: 0.025–0.05 mg/kg max of 0.1 mg/kg
  i.e. 70 Kg patient: 1.75–3.5 mg, max of 7 mg
• Mederidine (Demerol): 0.5–1.0 mg/mg, Max 50–100 mg
• Fentanyl: 1–2 mcg/kg, max 3 mcg/kg
Opioids : Agonist / Antagonists

• Nubain partially stimulates some opioid receptors and inhibits others.
• There should be a “ceiling” on the analgesia and respiratory depression, i.e. after 0.15 mg / Kg (max 10mg) is administered, no further analgesia nor respiratory depression SHOULD occur. However, clinically significant respiratory depression CAN OCCUR.
• Can precipitate severe withdrawal symptoms or a pain crisis (if on chronic pain meds)
Naloxone (Narcan)

- A pure narcotic agonist that reverses the respiratory depression caused by narcotics
- Reverses respiratory depression AND analgesic effects of opioids
- Rapid reversal with a large bolus is undesirable
- Titrate 0.05 mg – 0.1 mg to effect
- Half-life about 30 min
- Pulmonary edema, narcotic withdrawal symptoms, and pain crisis (if on chronic opioids) are possible
Opioids with Benzodiazepines

• Versed and Fentanyl together with have a synergistic effect on sedation and respiratory depression.

• Use extreme caution when using these two drug families together !!!!!!
Local anesthetics for infiltration

- **Bupivicaine**
  - Max dose 3 mg/kg (max total = 250 mg)
  - Increased cardiac toxicity vs other local anesthetics
- **Lidocaine**
  - Max dose : 3-4 mg / kg without epinephrine
  - When injected with epinephrine : 5-7 mg / kg
  - Max dose = 500 mg
Pediatrics - Anatomical Airway Differences

- Large head
- Large tongue
- Short neck
- Larynx more cephalad

- Epiglottis long and stiff
- Cricoid is narrowest part of airway
  - ETT may pass larynx but not trachea
- Narrow trachea
Pediatric Airway

Complicating Anatomical Factors in Infants

Narrow Nares
Large Tongue
High Glottis
Slanting Vocal Cords
Narrow Cricoid Ring

Large Occiput
Why am I a difficult airway?
Pediatric Sedatives

• Oral Agents
  – Chloral Hydrate: This drug should NOT be given at home.
    • Initial Dose 25–75 mg/kg.
    • Max dose 100 mg/kg.
    • Do not exceed 2 gm. In neonates, do not exceed 50 mg/kg
    • Onset: 20-30 minutes
    • Duration: 30-60 minutes
Pediatric Sedatives

• Oral Agents
  – Midazolam (Versed): 0.5 mg/kg mixed with 5cc or less of flavored tylenol elixir up to a max of 10 mg of Versed.
  – Onset: 15-20 minutes
  – Duration: 60-90 minutes
Pediatric Sedatives

- Nasal Versed: 0.3 mg/kg drawn up in a 1cc syringe.
- Drip (without needle) into the nose with child lying down and head back. (Beware this may agitate patient)
- May administer slowly to improve uptake but works fine when squirted all at once.
- Useful for children too young, or unwilling, to drink.
Pediatric Sedatives

• Intramuscular Agents; Ketamine mixed with Atropine
  – Atropine: 0.02 mg/kg mixed with ketamine.
  – Ketamine: Stimulates salivary and tracheobronchial secretions. This may cause laryngospasm. Therefore, always administered mixed with atropine.
  – Ketamine may cause hallucinating emergence reactions and “nightmares” in children over 6 years of age.
Pediatric Sedatives

• Intramuscular Ketamine: About 2mg/kg IM for moderately painful procedures.
• May repeat dose AFTER waiting 10-15 minutes for MAX of 4 mg/kg.
• Onset: 5–20 minutes
• Duration: 20–30 minutes.
Pediatric Sedatives: Intravenous Agents

- Midazolam (Versed): 0.05 mg/kg, Max 0.1 mg/kg
- Onset: 2-3 minutes
- Duration: 20-40 minutes
Pediatric Sedatives: Intravenous Agents

- Morphine: 0.05–0.1 mg/kg, Max dose 0.2 mg/kg
- Onset 2-3 minutes
- Duration 30-180 minutes
- Caution: Asthmatics – Histamine release
- Caution: Respiratory depression – especially in neonates
Pediatric Sedatives: Intravenous Agents

• Fentanyl: 1–2 mcg/kg, Max 3 mcg/kg
• Onset: 1–3 minutes
• Duration: 30–180 minutes
• Caution: Very potent respiratory depressant
• Caution: May cause chest wall rigidity
Pediatric Sedative Reversal Agents

• Flumazenil (Romazicon): Reverses midazolam
  – 0.01 mg/kg, repeated Q minute up to 1 mg
  – Onset: 1–2 minutes
  – Duration: 15–90 minutes
  – Caution: Re-sedation may occur due to short half life: Avoid premature discharge
Pediatric Sedative Reversal Agents

• Naloxone (Narcan): Reverses opioids

  • 1–2 mcg/kg, repeated Q 1 minute (up to 10 mcg/kg) if no effect.

  • Caution: Re-sedation may occur due to short half life: Avoid premature discharge