Procedural Sedation for Patients with Known and Suspected OSA

http://www.sasmhq.org
Outline

• Procedural sedation
• Levels of sedation and impact on physiologic functions
• Pre procedure assessment and planning
• Procedural factors: medications, positioning, airway issues
• Post procedure management
Procedural Sedation

• Procedural sedation outside of the operating room is increasingly common
• Patients with known or suspected OSA and/or obesity are at increased risk of sedation-related complications
Procedural Sedation

- ASA closed claim review found highest risk areas to be GI suite, cardiology, and radiology
- Most events involve monitored anesthesia care (MAC) or sedation, not general anesthesia
- Respiratory events proportionally twice as likely than the OR setting

Procedural Sedation

• Patients presumed at increased risk:
  – Obese
  – Higher ASA physical status (≥3)
  – OSA

Current Evidence

• Cardiac Procedures
  – Limited evidence
  – Points to increased risk for need for airway interventions, need for PAP

• Interventional Radiology
  – Limited literature
  – OSA risk factor for respiratory events

Current Evidence

- GI procedures
  - Literature mixed regarding OSA risk factor for outcomes
  - Recent meta-analysis did not reveal increased risk

# Continuum of Depth of Sedation, Levels of Sedation/Analgesia

<table>
<thead>
<tr>
<th>Affected Physiologic Function</th>
<th>Level of Sedation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimal (Anxiolysis)</td>
</tr>
<tr>
<td></td>
<td>Moderate (Conscious)</td>
</tr>
<tr>
<td></td>
<td>Deep</td>
</tr>
<tr>
<td></td>
<td>General Anesthesia</td>
</tr>
<tr>
<td>Neurologic Responsiveness</td>
<td>Normal response to verbal stimulation</td>
</tr>
<tr>
<td></td>
<td>Purposeful response to verbal or tactile stimulation</td>
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<tr>
<td></td>
<td>Purposeful response after repeated or painful stimulation</td>
</tr>
<tr>
<td></td>
<td>Unarousable, even with painful stimulus</td>
</tr>
<tr>
<td>Airway Patency/Spontaneous Ventilation</td>
<td>Unaffected</td>
</tr>
<tr>
<td></td>
<td>Adequate</td>
</tr>
<tr>
<td></td>
<td>May be impaired</td>
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<tr>
<td></td>
<td>Frequently impaired</td>
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<tr>
<td>Cardiovascular function</td>
<td>Unaffected</td>
</tr>
<tr>
<td></td>
<td>Usually maintained</td>
</tr>
<tr>
<td></td>
<td>Usually maintained</td>
</tr>
<tr>
<td></td>
<td>May be impaired</td>
</tr>
</tbody>
</table>
Sedation-Pathophysiology

• Airway issues during sedation
  – Airway patency impairment
  – OSA may increase risk of obstruction
  – Detection of subtle airway obstruction requires continuous observation
  – Minute ventilation and EtCO$_2$ monitoring helpful.
Sedation-Pathophysiology

• Obesity
  – Supine position may increase risk of obstruction
  – Options to rescue from over sedation with adjuncts such as oral and nasal airways should be considered prior to procedure
Pre Procedure

• Screening for OSA risk can aid in planning for possible respiratory decompensation
• STOP-BANG can be utilized
• Discussion of possible use of PAP intra-procedure if needed
• Education and engagement of the patient and family members improve PAP compliance and may lead to better outcomes.
Pre procedure

• Guidelines for outpatient procedures by ASA, SAMBA, SASM have been developed

• Include pre-screening, limiting opioids, close monitoring intra- and post-procedure

SASM Guidelines Intraop: A and A;2018;127(3):967-987
ASGE Guidelines: GI Endosc 2018:87(2);327-337
Procedural Factors

• Airway issues
  – Does patient have severe OSA, morbid obesity, or anatomic airway abnormalities?
  – If so, what are the rescue plans?
  – Is there a skilled airway provider available, if needed for backup?
  – Is there access to airway in case of need for airway manipulation?
  – Is emergency equipment (including bag-mask ventilation) available?
Procedural Factors

• Positioning
  – If able to provide sedation in non-supine position, this is optimal (lateral, back up etc.)
    • This will aid in decreased risk of obstructive episodes
  – Is PAP a consideration if respiratory decompensation occurs?
  – Minute ventilation and EtCO$_2$ monitoring will allow for continuous ventilatory monitoring
Intraprocedural Maneuvers

• Over sedation may lead to upper airway obstruction
• Stimulation to arouse patient
• Jaw thrust can be performed to alleviate obstruction
• Bag mask ventilation with mask seal is secondary option
• Laryngospasm may occur
  – May require sustained positive pressure maneuver
  – Succinylcholine may be needed if refractory
Intraprocedural Maneuvers

- Continued obstruction or desaturation warrant pausing of procedure
- Oral or nasal airway may be placed to assist with ventilation
- Decrease or stop sedation can be considered for rescue
Procedural Medications

- Respiratory events found to be most common reason for major adverse events in non-operating room sedation
- Optimizing medications to limit respiratory depression and obstruction will enhance safety
- Have reversal agents available for opioids (naloxone) and benzodiazepines (flumazenil)
Procedural Medications

• Opioids
  – Utilize short acting opioids, and minimize dosage
  – Consider infusions that have short duration such as remifentanil (onset 60-90 sec, duration 5 min)

• Benzodiazepines
  – Given with opioids, significantly increase risk of respiratory depression and obstruction
Procedural Medications

- Propofol
  - GABA mediated
  - Sedation only, devoid of analgesic effect
  - Can use as bolus or infusion
  - Increased risk of respiratory depression with increasing bolus or infusion rate
  - Potentiated respiratory depression with opioids, benzodiazepines
  - Short duration of action-onset 30-40 sec, duration 6-10 min
Procedural Medications

• Dexmedetomidine
  – Alpha 2 agonist with sedative and analgesic properties
  – Longer onset time (5-15 minutes) and duration (60-120 minutes)
  – Minimal respiratory depression, which is major advantage
  – May cause bradycardia or hypotension
  – Hypertension may be seen with bolus dose
Procedural Medication Adjuncts

- Ketamine
  - Sedation with minimal respiratory effects
  - Analgesia
  - Onset 1-2 min, duration 15-20 minutes
  - Infusion or bolus dose
  - Possible side effects
    - Tachycardia and hypertension with larger doses
    - Dysphoria or hallucinations (analog of PCP)
Procedural Medication Adjuncts

- Can utilize other agents for analgesic effects, and decrease need for opioids
- Can be prescribed to be taken PO pre-procedure;
  - Acetaminophen
  - NSAIDS
    - Ibuprofen
    - Celecoxib
    - Ketorolac
# Commonly Utilized Medications for Procedural Sedation and Analgesia

<table>
<thead>
<tr>
<th>Medications</th>
<th>Typical doses (IV Bolus or PO)</th>
<th>Typical Dose (Infusion)</th>
<th>Onset of effect</th>
<th>Peak Effect</th>
<th>Duration</th>
<th>Respiratory Depressant Effect</th>
<th>Evidence</th>
<th>Reversal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opioids</strong></td>
<td></td>
<td></td>
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<tr>
<td>Fentanyl</td>
<td>0.5-0.7 mcg/kg</td>
<td>Infusion not commonly used for sedation</td>
<td>1-2 min</td>
<td>3-5 min</td>
<td>30-60 min</td>
<td>More pronounced when combined with benzos and other sedative agents</td>
<td>Naloxone</td>
<td></td>
</tr>
<tr>
<td>Alfentanil</td>
<td>3-8 mcg/kg</td>
<td>0.5-1 mcg/kg/min</td>
<td>90 sec-2.5 min</td>
<td></td>
<td></td>
<td>As above</td>
<td></td>
<td>Naloxone</td>
</tr>
<tr>
<td>Remifentanil</td>
<td>0.5-0.7 mcg/kg</td>
<td>0.02 - 0.05 mcg/kg/min</td>
<td>90 sec.</td>
<td>10-15 min</td>
<td></td>
<td>More pronounced when combined with benzodiazepines and other sedatives. Also despite decreasing obstructive episodes in OSA pts, increases central sleep apnea and resultant drop in oxygen saturation.</td>
<td>Bernard, CM</td>
<td>Naloxone</td>
</tr>
<tr>
<td>Propofol</td>
<td>0.2-0.4 mcg/kg</td>
<td>50-100 mcg/kg/min</td>
<td>15-30 sec..</td>
<td>40 sec.</td>
<td>6-10 min</td>
<td>Dose-dependent respiratory depression which is more pronounced when combined with other sedative agents.</td>
<td>Ankietty, S</td>
<td>No reversal agent</td>
</tr>
<tr>
<td>Benzodiazepines (Midazolam)</td>
<td>0.01-0.02 mg/kg</td>
<td>N/a</td>
<td>2 min</td>
<td>5-10 min</td>
<td>20 min for amnestic effect, 2hrs for sedative effect</td>
<td>Ankietty, S</td>
<td>Flumazenil</td>
<td></td>
</tr>
<tr>
<td>Dexmedetomidine</td>
<td>0.5-1 mcg/kg</td>
<td>0.1-0.7 mcg/kg/hr</td>
<td>&lt; 5 min</td>
<td>15 min.</td>
<td>60-120 min</td>
<td>Less resp. depression, sedation effect is by alpha-2 agonism</td>
<td>Gertler, R</td>
<td>a2-AR antagonist atipamezole</td>
</tr>
<tr>
<td>Ketamine</td>
<td>0.1-0.3 mg/kg</td>
<td>2-5 mcg/kg/min</td>
<td>1-2 min</td>
<td>5 min.</td>
<td>10-15 min</td>
<td>Only when combined with benzodiazepines</td>
<td>Gorlin, AW Ehsan Z</td>
<td>No reversal agent available</td>
</tr>
</tbody>
</table>
## Multimodal Analgesic Adjuncts

<table>
<thead>
<tr>
<th>Medications</th>
<th>Typical doses (IV Bolus or PO)</th>
<th>Typical Dose (Infusion)</th>
<th>Onset of effect</th>
<th>Peak Effect</th>
<th>Duration</th>
<th>Respiratory Depressant Effect</th>
<th>Evidence</th>
<th>Reversal</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>NSAIDs</em></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ibuprofen (po)</td>
<td>400-600 mg</td>
<td>N/A</td>
<td>30 min</td>
<td>1-2 hrs</td>
<td>6-8 hrs</td>
<td>Devoid of respiratory depressant effects</td>
<td>Cillo, JE</td>
<td>No reversal agent available</td>
</tr>
<tr>
<td>Celecoxib (po)</td>
<td>400 mg</td>
<td>N/A</td>
<td>30 min</td>
<td>3 hrs</td>
<td>12 hrs</td>
<td>Devoid of respiratory depressant effects</td>
<td>PubChem</td>
<td>No reversal agent available</td>
</tr>
<tr>
<td>Ketorolac (IV)</td>
<td>15-30 mg bolus</td>
<td>N/A</td>
<td>10 min</td>
<td>6-8 hrs</td>
<td></td>
<td>Devoid of respiratory depressant effects</td>
<td>Brown E</td>
<td>No reversal agent available</td>
</tr>
<tr>
<td>Acetaminophen (po)</td>
<td>500-1000 mg po</td>
<td>N/A</td>
<td>30-45 min</td>
<td>1-1.5 hrs</td>
<td>4-6 hrs</td>
<td>Devoid of respiratory depressant effects</td>
<td></td>
<td>No reversal agent available</td>
</tr>
<tr>
<td>Acetaminophen IV</td>
<td>1000mg IV bolus over 10-15 min.</td>
<td>N/A</td>
<td>15 min</td>
<td>30 min-1 hr</td>
<td>6 hrs</td>
<td>Devoid of respiratory depressant effects</td>
<td></td>
<td>No reversal agent available</td>
</tr>
</tbody>
</table>
Post Procedure

• Sedation medications may still be in effect when stimulation of procedure is completed

• Ongoing ventilatory monitoring to be continued until neurologic function recovers
Post Procedure

• Avoid ongoing opioids following procedure and use adjunctive analgesics
• If ongoing obstruction, use PAP
• As per guidelines for outpatient surgery, minimal sedating medications for home
• Observation by others at home if opioids needed

ASA guidelines: Anesth 2014;120(2):268-286
Conclusions

• Non operating room sedation is associated with risks for respiratory events
• OSA, obesity, ASA ≥ 3 associated with risks
• Pre-screen for high risk patients
• Optimize positioning, PAP if able
• Utilize short acting sedatives with least respiratory effects as possible