Pediatric Moderate and Deep Sedation

Introduction:

This Pediatric Procedural Sedation guideline serves as a quick reference to Advocate's System SedationPolicy. The purpose of procedural sedation is to manage pain, anxiety and limit excessive movement. It is important to utilize non-pharmacologic approaches such as child life, swaddling, distraction as well as topical anesthetics when performing a sedation.

The Advocate System Sedation Policy, as well as all appropriate references, can be found here

History:

The general health of each patient undergoing sedation needs to be considered, with attention to past personal and family history of adverse events related to sedation. When possible the clinician should obtain the following histories:

- Adverse events with anesthesia or sedation
- Allergies
- Current medications
- History of upper airway problems, snoring, and/or obstructive sleep apnea (OSA)
- Cardiac or pulmonary diagnoses including asthma
- Current or recent illness, including viral symptoms
- Review of systems focused on pulmonary, cardiac, renal and hepatic function
- Developmental delays
- Craniofacial abnormalities
- Last oral intake

PHYSICAL STATUS CLASSIFICATION OF THE AMERICAN SOCIETY OF ANESTHESIOLOGISTS (ASA)

Status	Disease State
I	A normal healthy patient
II	A patient with mild systemic disease *(Examples include mild asthma, well-controlled diabetes)*
III*	A patient with severe systemic disease *(Examples include heart disease that limits activity, poorly controlled essential hypertension,diabetes mellitus with complications, chronic pulmonary disease that limits activity)*
IV*	A patient with severe systemic disease that is a constant threat to life *(Examples include congestive heart failure, advanced pulmonary, renal or hepatic dysfunction)*
V*	A moribund patient who is not expected to survive without the operation *(Examples include massive trauma, ECMO)*

*Consider anesthesia consultation for ASA Class III or above.

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Physical Examination:

Physical exam should focus on upper airway, lungs, cardiovascular system and neurologic exam.

- Upper airway: assess Mallampati classification, dentition, neck mobility, tonsillar hypertrophy andcraniofacial abnormalities
- Habitus- body mass index >35
- Head and Neck- short neck, limited neck extension, decreased hyoid-mental distance (<3fingers in an adult size patient), tracheal deviation or dysmorphic facial features
- Mouth- decreased mouth opening, loose teeth, high arch palate, macroglossia, tonsillar hypertrophy
    - 0: Tonsils fit within the tonsillar fossa (not depicted in picture below)
    - 1+: Tonsils <25% of the pharyngeal space
    - 2+: Tonsils <50% of the pharyngeal space
    - 3+ Tonsils <75% of the pharyngeal space
    - 4+ Tonsils > 75 % of the pharyngeal space
    - **Tonsillar hypertrophy greater than 2+ has been associated with increased risk of airwayobstruction*
- Jaw: micrognathia, retrognathia, trismus, mobility
- Lungs: work of breathing, lung sounds
- Heart: heart sounds and peripheral perfusion
- Neurologic status: baseline mental status, ability to control airway, muscle tone and signs of focal neurologic deficits

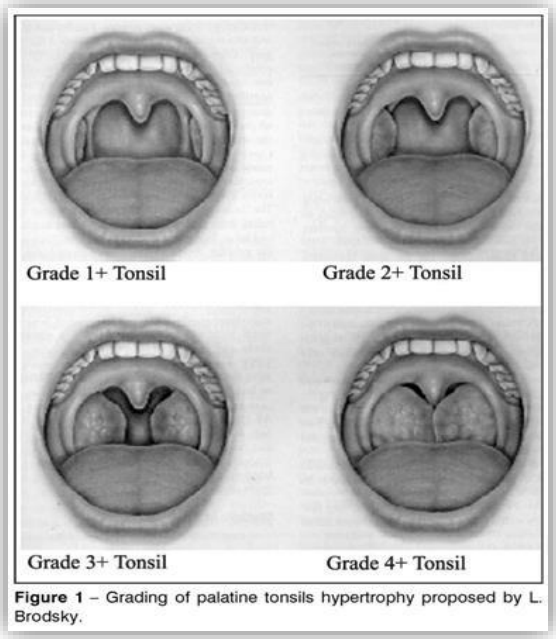

Figure 1 – Grading of palatine tonsils hypertrophy proposed by L. Brodsky.

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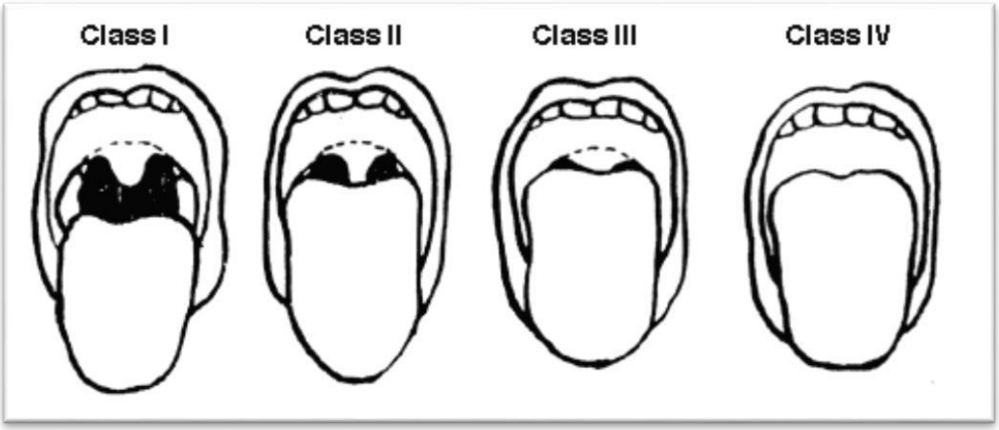
Mallampati classification:



- Class I – the entire tonsillar pillars are visualized
- Class II- the uvula but not the tonsillar pillars are visualized
- Class III- only part of the uvula and soft palate are visualized
- Class IV- only the hard palate is visualized

*For patient is a Mallampati of 3 or greater may consider consultation for anesthesia

NPO Status:

- The provider will utilize ASA guidelines for NPO after carefully assessing the risk benefit based on each individual patient and type of procedure to be performed. NPO status is documented onthe record.

*References for ASA guidelines for sedation and NPO status are provided at the end of thisguideline for ease of access.

Pre-Procedure:

- Informed consent should be obtained for all sedation encounters
- Urine Pregnancy Test for all patients ≥10 years of age
- Obstructive Sleep Apnea screening for all patients ≥ 2 years of age
- Equipment:
  - Suction: size appropriate suction catheters and functioning suction apparatus
  - Oxygen: adequate oxygen supply and functioning flow meters or other devices
  - Airway: size appropriate airway equipment, nasopharyngeal and oropharyngeal airways, laryngoscope blades, endotracheal tubes, stylets, facemask, bag-valve-mask
  - Pharmacy: sedation medications, reversal agents, medication for resuscitation
  - Monitors: telemetry, pulse oximetry, blood pressure, ETCO2
- Sedation Record
- Non-pharmacologic approaches such as child life, swaddling, distraction, and topical anestheticswhen appropriate

Intra-procedure:

- Monitoring should be continuous and documented every 5 minutes

Post-procedure:

- Monitoring every 15 minutes for minimum of 30 minutes and until patient returns to baseline
- A post-procedure note is required for all sedations. It should be clearly documented as postsedation note. Requirements include but not limited to:
  - Respiratory function, including respiratory rate, airway patency, and oxygen saturation
  - Cardiovascular function, including heart rate and blood pressure
  - Mental status
  - Temperature
  - Pain
  - Nausea and vomiting
  - Postoperative hydration
- Intraservice time (billable time) should be documented in the medical record

Discharge Criteria:

- It is important to ensure that a patient is not under the effects of any sedating medications prior to discharge as to avoid an adverse event. As such, the child should be alert and their vital signs should be at baseline. Ambulatory children should be able walk with assistance and without dizziness. Medication-induced vomiting should be controlled and a child should be able to tolerateoral liquids. They should be discharged into the care of a responsible adult with post-sedation anticipatory guidance

Overview of Medications:

Please note when choosing sedation medication, the provider should consider the length of procedureand the degree of discomfort/pain with the procedure.

Sedative Anxiolytic Drugs				
Agent	**Route**	**Dose**	**Onset**	**Comments/Side Effects**
Midazolam	IV	0.05-0.1 mg/kg *(max 2mg)*	1 min	• No analgesia • Short acting (15-30 min)
	PO	0.25- mg/kg *(< 50 kg: max 5 mg)* *(50 kg and greater: max 10 mg)*	10-20 min	• No analgesia • Bitter Taste
	IN	0.2 mg/kg *(max 10 mg)*	5-10 min	• No analgesia • Burning feeling in nostrils • Must use atomizer for administration
Lorazepam	IV/PO	0.05-0.1 mg/kg (max 2 mg)	IV: 2-3 min PO: 20 min	• No analgesia • Longer acting (1-2h) • Not ideal for shorter procedures

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Selective Hypnotic Drugs				
Agent	**Route**	**Dose**	**Onset**	**Comments/Side Effects**
Dexmedetomidine	IV	1-3 mcg/kg over 10 min *(max 100mcg)* 1-2 mcg/kg/h *(max 100mcg/h)*	10 min	• Central alpha 2 agonist • Cooperative sleep • Less respiratory depression • Hypotension, bradycardia • Utilize drip for longer procedures • Prolonged recovery phase
	IN	2 mcg/kg *(max 100 mcg)*	15-20 min	
Propofol	IV Bolus	0.5-1 mg/kg	20 sec – 1 min	• Works through $GABA_A$ receptor Antiemetic, anxiolytic, amnestic, hypnotic and anesthetic • No analgesia • Short acting • Respiratory depression, hypotension, laryngospasm • Pain at site of infusion • Avoid in soy and/or egg allergy
	IV Infusion	50-150 mcg/kg/min		
Ketamine	IV	0.5-1 mg/kg (initial dose) *(max 100 mg)* 0.5 mg/kg (repeat dosing) *(max 50 mg)*	1 min	• Dissociative state • Provides analgesia • Rapid onset, short duration 10-15 min when repeated doses are not given • Caution in psychiatric illness or open globe injuries • Sympathomimetic: tachycardia, hypertension, tachypnea • Emergence phenomena – may warrant benzodiazepines before or after administration • May cause laryngospasm • Consider antiemetic
	IM	2-4 mg/kg	5 min	• Long duration of action, may last up to -2-3 hours

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Sedative Analgesic Drugs				
Agent	**Route**	**Dose**	**Onset**	**Comments/Side Effects**
Fentanyl	IV	0.5-1 mcg/kg *(max 50 mcg)*	1-2 min	• Short acting opioid • May cause apnea, or rigid chest syndrome especially if given rapidly via IV push
	IN	1-2 mcg/kg *(max 100 mcg)*	2-5 min	• No analgesia • Burning feeling in nostrils • Must use atomizer for administration
Ketamine	IV	0.5-1 mg/kg (initial dose) *(max 100 mg)* 0.5 mg/kg (repeat dosing) *(max 50 mg)*	1 min	• Dissociative state • Provides analgesia • Rapid onset, short duration 10-15 min when repeated doses are not given • Caution in psychiatric illness or open globe injuries • Sympathomimetic: tachycardia, hypertension, tachypnea • Emergence phenomena – may warrant benzodiazepines before or after administration • May cause laryngospasm Consider antiemetic
	IM	2-4 mg/kg	5 min	• Long duration of action, may last up to 2-3 hours

Sedative Reversal Drugs			
Agent	**Route**	**Dose**	**Comments/Side Effects**
Flumazenil	IV	*0.01 mg/kg (max 0.2 mg)*, Max single dose 0.2 mg. May repeat every minute to max total dose 0.05 mg/kg or 1 mg	• Benzodiazepine induced over-sedation • Caution with seizure disorder, may cause status epilepticus • Duration of action 60 min • Repeat doses may be required
Naloxone	IV	0.01mg/kg *(max 0.2 mg)* *Respiratory Depression Dosing*	• Opioid induced over-sedation • Duration 20-60mins • Repeat dosing may be needed
	IV	0.1mg/kg *(max 2 mg)* *Respiratory Arrest Dosing*	• Opioid induced over-sedation • Duration 20-60mins • Repeat dosing may be needed

References

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2. ASA Physical Status Classification System. ASA Guidelines, Statements, Clinical Resources. Last amended: December 13, 2020. https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-system.
3. Green SM, MD MGR, Kennedy RM, EdM BSKM. Clinical Practice Guideline for Emergency Department Ketamine Dissociative Sedation: 2011 Update. Ann Emerg Med. Elsevier Inc; 2011 May 1;57(5):449–61.
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5. Green SM, Roback MG, Miner JR, Burton JH, Krauss B. Fasting and Emergency Department Procedural Sedation and Analgesia: A Consensus-Based Clinical Practice Advisory. Ann Emerg Med. 2007 Apr;49(4):454–61. Society for Pediatric Sedation, Sedation Provider Course 2020