Performing safe and effective procedural sedation in children requires the same foundational elements as other age groups – skilled personnel, an equipped setting and a structure to manage patients across the sedation continuum. However, children have unique developmental and physiologic vulnerabilities that require special consideration when planning and performing sedation.

**PEDIATRIC CONSIDERATIONS**

**DEVELOPMENTAL**
- Children are often fearful during the pre-sedation period:
  - DO provide a simple explanation, distraction (games, music, video/TV) and/or visual imagery
  - DO allow a family member to stay at the bedside with the child as they are being sedated
  - DO allow the family to stay in the room while the procedure is being performed

**ANATOMIC**
- Children are at higher risk of airway obstruction.
- Small caliber and floppy airways are subject to collapse when relaxed; larger tongues can occlude airways.
- The young child’s large occiput places the head and neck in flexed position when supine:
  - DO evaluate airway alignment and maintain a neutral sniffing position; a roll under the shoulders may be helpful
  - DO consult anesthesia to perform sedations for all patients who are American Society of Anesthesiologists (ASA) classification ≥ 3 or who have a high risk airway by exam

**PHYSIOLOGIC**
- Children have higher oxygen consumption because of increased metabolic rates and less alveolar space.
- Decreased respiratory rate in sedation can cause significant respiratory compromise.
- Circulatory response to hypoxia in young children is bradycardia.
- Normal parameters for heart rate, respiration and blood pressure vary based on age.
- Early recognition and treatment of adverse events prevents events requiring significant intervention and sedation accidents:
  - DO administer weight-based dosing of sedation medications
  - DO monitor patients as appropriate for the depth of sedation; know age-appropriate vital signs
  - DO have the equipment, skill and personnel to detect and rescue patients from events such as oxygen desaturation, apnea, laryngospasm
  - DO use capnography if patient was pre-oxygenated and/or direct visualization of the chest wall is not possible

**FASTING**
- The duration of pre-procedural fasting is controversial
- It is unclear whether strict adherence to ASA fasting guidelines is necessary to maintain patient safety however there is insufficient evidence to suggest that they can safely be disregarded.
- Truly emergent procedures should not be delayed to wait for fasting guidelines to be fulfilled, but the risk of aspiration increases as you pass through the sedation continuum.
- DO consider using ketamine if deep sedation is required in the unfasted patient as protective airway reflexes are retained.

**POST SEDATION CARE**
- Monitor until the patient is able to perform their baseline (developmentally appropriate) activities (speech, motor, cognitive) as well as tolerate oral intake.
NON-PAINFUL PROCEDURES (EG. DIAGNOSTIC IMAGING)

MODERATE TO DEEP SEDATION

GOAL: Reliable motion control without analgesia

» Pentobarbital: Effective and reliable in all ages with intravenous (IV) dosing; physician administered/monitored.
  » Caution: a) respiratory depressant but generally tolerated in healthy children; b) induction agitation can be seen. **Dose**: IV 2-4 mg/kg over 30-45 sec; after 5 minutes if not asleep, give 1-2 mg/kg.

» Propofol: Effective and reliable with quick recovery; physician administered/monitored.
  » Caution: a) advanced airway skills are needed; b) protective airway reflexes not maintained, consider adequate fasting. **Dose**: 1 mg/kg slow push (1-2 min); additional doses 0.5 mg/kg.

» Midazolam: Safe in all ages; registered nurse administered/monitored.
  » Caution: a) not for studies where complete motion control is required; b) if possible, administer on the bed where imaging test will be performed as movement can arouse the patient. **Dose**: intranasal (IN) 0.2-0.3 mg/kg (IN max 1 mL per nostril); IV 0.05-0.1 mg/kg.

MINOR PAINFUL PROCEDURES (EG. LACERATION REPAIR, DENTAL EXTRACTION)

MILD TO MODERATE SEDATION

GOAL: Anxiolysis and moderate analgesia

» Intranasal Fentanyl + Midazolam: Does not require IV access; no lower age limit.
  » Caution: a) midazolam burns, administer fentanyl first; b) administer with an atomizer to improve absorption.
  » **Dose**: fentanyl 1.5 mcg/kg IN + midazolam 0.2-0.3 mg/kg IN (max 1 mL per drug per nostril).

» Nitrous Oxide: Analgesic and amnestic properties with quick onset; patients must be cooperative (> 4 years).
  » Caution: Do not use if acute asthma exacerbation, suspected pneumothorax/other trapped air or head injury with altered level of consciousness. **Dose**: Minimum 30% oxygen; self-administered via demand valve.

MAJOR PAINFUL PROCEDURES (EG. ORTHOPEDIC REDUCTION, COMPLEX LACERATION REPAIR)

DISSOCIATIVE OF DEEP SEDATION

GOAL: Profound analgesia and motion control

» Ketamine: Most common agent in pediatric ED sedation. Do not use: age < 3 months or known schizophrenia.
  » Caution: a) laryngospasm: risk increased with active asthma, upper respiratory infection and procedures involving posterior pharynx; b) vomiting occurs commonly; administer ondansetron pre-procedure in age > 5 years. Significant recovery agitation occurs rarely. **Dose**: IV 1.5 mg/kg slow push; additional doses of 0.5-1.0 mg/kg. Intramuscular 4-5 mg/kg; single 2-2.5 mg/kg additional dose. NOTE: No additional benefit has been demonstrated from pre-treatment with atropine and/or midazolam in ketamine sedations.

» Propofol+ Fentanyl: Shorter recovery times; anti-emetic.
  » Caution: Advanced airway skills are needed. **Dose**: propofol 1mg/kg slow push (1-2 min) + fentanyl 1mcg/kg; additional doses: propofol 0.5 mg/kg; fentanyl 0.5-1 mcg/kg.

» Ketamine + Propofol: Theorized to reduce adverse events compared to single agent sedation with short recovery.
  » Caution: see above cautions for ketamine and propofol respectively. **Dose**: IV ketamine 0.5 mg/kg followed by propofol 0.5-1 mg/kg. Additional doses: ketamine 0.5 mg/kg, propofol 0.5-1 mg/kg.

INFORMATION ON DRUG DOSING & ADMINISTRATION IS CURRENT AS OF THE WRITING OF THIS DOCUMENT; PLEASE REFER TO YOUR HOSPITAL FORMULARY FOR MORE DETAILED INFORMATION