

Procedural Sedation

Emergency Department

Center for Clinical Excellence



Goals of sedation:

- Optimize patient's safety and welfare
- Minimize physical discomfort and pain
- Control anxiety, minimize psychological trauma, and facilitate event-related amnesia
- Modify behavior and/or movement to allow safe completion of procedure
- Return patient to appropriate condition for safe discharge/transfer from ED

Definitions:

Procedural sedation: Use of anxiolytic, sedation, hypnotic, analgesic, and/or dissociative medication(s) to attenuate anxiety, pain, and/or motion. These agents are administered to facilitate amnesia, patient comfort and/or decreased awareness and safety during a diagnostic or therapeutic procedure.

Moderate sedation: Patient is easily arousable and responds purposefully to verbal commands. No interventions are needed to maintain the airway. Spontaneous ventilation is adequate and cardiovascular function is usually maintained.

Deep Sedation: Patients cannot be easily aroused and respond purposely to repeated painful stimuli. Ability to maintain airway may be affected. Spontaneous ventilation may be inadequate and cardiovascular function is usually maintained.

Dissociative Sedation is defined as a trance-like state wherein the patient may remain somewhat awakebut unaware of pain and retains little to no memory of the event. Airway reflexes remain intact.

ASA Classification

ASA Classification:

- ASA I = Normal healthy patient
- ASA 2= Mild systemic disease
- ASA 3= Severe systemic disease
- ASA 4= Severe systemic disease that is a constant threat to life

ASA PS	Definition	Pediatric Examples, including but not limited to:
Classification		
ASA I	A normal healthy patient	Healthy (no acute or chronic disease), normal BMI percentile for age
ASA II	A patient with mild systemic disease	Asymptomatic congenital cardiac disease, well controlled dysrhythmias, asthma without exacerbation, well controlled epilepsy, non-insulin dependent diabetes mellitus, abnormal BMI percentile per age, mild/moderate OSA, oncologic state in remission, autism with mild limitations
ASA III	A patient with severe systemic disease	Uncorrected stable congenital cardiac abnormality, asthma with exacerbation, poorly controlled epilepsy, poorly controlled insulin dependent diabetes mellitus, morbid obesity (BMI > 40), malnutrition, severe OSA, oncologic state, renal failure, muscular dystrophy, cystic fibrosis, history of organ transplantation, brain/spinal cord malformation, symptomatic hydrocephalus, premature infant PCA <60 weeks, autism with severe limitations, metabolic disease, difficult airway, long term parenteral nutrition. Full term infants <6 weeks of age.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Symptomatic congenital cardiac abnormality, congestive heart failure, active sequelae of prematurity, acute hypoxic-ischemic encephalopathy, shock, sepsis, disseminated intravascular coagulation, automatic implantable cardioverter-defibrillator, ventilator dependence, endocrinopathy, severe trauma, severe respiratory distress, advanced oncologic state

American Society of Anesthesia (ASA) Classification

https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-

<u>system</u>



Physical Exam

A full physical exam with focus on airway, breathing and circulation should be completed to determine appropriateness for procedural sedation in the Emergency Department (ED).

Physical feature/action	Clinical finding of difficult airway
Upper incisor length	Longer = less available space for laryngoscope blade and endotracheal tube
Alignment of incisors	Overriding of maxillary incisors or under riding of mandibular incisors
Protrusion of mandible	Inability to protrude the mandible incisors in front of the maxillary incisors
Mouth opening	Distance between upper and lower incisors less than 2 patient
	Mallampati class 3 or 4 view (see below)
Palate	High arch or narrow
Submandibular space	Narrow, indurated or firm
Thyromental distance	Less than 3 patient finger breadths
Length of neck	Short
Neck size	Increased circumference
Neck range of motion	Limited mobility (flexion, extension, and lateral rotation)

Physical features that may predict a difficult airway:

Krishna SG, Bryant JF, Tobias. Management of the difficult airway in the pediatric patient. J Pediatr Intensive Care 2018;7:115-125.

Mallampati Score



Class 1: Tonsillar pillars, uvula and palate are all visible **Class 2:** Partial visibility of the tonsillar pillars, uvula and soft palate **Class 3:** Base of the uvula, soft and hard palate visible **Class 4:** Only hard palate is visible

Kumar HVM, Schroeder JW, Gang Z. Sheldon SH. Mallampati score and pediatric obstructive sleep apnea. J Clin Sleep Med. 2014;10(9):985-990.



NPO Status

It is recommended that a patient ingest nothing by mouth at least 2 hours prior to sedation.

Patients undergoing procedural sedation or general anesthesia fall under NPO guidelines for the Department of Anesthesiology & Pain Medicine. The practitioner should consider the risks vs the benefits in the timing of the procedure in relation to oral intake. In specific circumstances, non-adherence to these guidelines is acceptable in the Emergency Department as dictated by the patient's status and the urgency of the procedure.

Ketamine has a low risk of depressing protective airway reflexes and is a preferred agent when the urgency of a procedure supersedes adherence to NPO guidelines.

Common Procedures Requiring Sedation in the Emergency Department

Anticipated duration of procedure should be < 30 minutes

- Extremity fracture and / or dislocation reduction
- Abscess incision and drainage
- Wound care (laceration repair, burns, foreign body removal, dressing changes)
- Dental procedures
- Lumbar puncture



Why do we use sedation?

- Your child needs to have a procedure that may be painful
- Your child may need to hold still during the procedure

Are there potential side effects or complications?

- Serious effects are very rare
- Some patients breathe very slowly, stop breathing all together or vomit
- Therefore:

We monitor your child very closely with a doctor and a nurse We always have oxygen available We have rescue equipment to help your child breathe, if needed

What happens before the procedure?

- Your child will have an IV placed
- We will carefully watch your child's heart rate, breathing, blood pressure, and oxygen levels
- We use chest stickers, a blood pressure cuff, and a "pulse ox"
- We will place a cannula in the nose after the sedation starts to further monitor your child's breathing

Who will be in the room?

- An ER provider to give the sedation medication and make sure your child responds well
- Another doctor to perform the procedure
- An ER nurse to monitor your child and record what happens

How long will it take?

- Once the team is ready and an IV is placed, it usually takes about 75 minutes:
- 5 minutes for the sedation medicine to start working
- 25 minutes to perform the procedure
- 45 minutes to full wake up and be ready to go home

All of this may take longer, depending on your child the type of procedure



Ketamine-Specific Details for Families

Sedation Medications

Agent	Starting Dose – Pediatric & Adult	Onset (min)	Duration (min)	Advantages	Disadvantages	Administration and Other Consideration
Fentanyl	IV: 1 mcg/kg (max 100 mcg) Intranasal: 1.5-2 mcg/ kg (max 100 mcg)	IV: 1-2 IN: 5-10	30-60	 Rapid onset Short duration Minimal CV effects 	 Chest wall rigidity (when given rapidly in large doses) Analgesic properties only 	• Administer IV over 3-5 min
Midazolam	IV: 0.05-0.1 mg/kg (max individual dose: 2 mg; repeat as needed) Intranasal: 0.2-0.4 mg/kg (max 10 mg)	IV: 1-5 IN: within 10	30-120 avg duration shorter for intranasal (~23 min)	 Rapid onset Short duration Multiple routes 	 Respiratory depression Moderate duration Sedative properties only 	• Administer IV over 2 min
Nitrous Oxide	Inhaled: 30%-70% concentration	1-2	3-5	 Rapid onset Minimal CV effects 	 Emesis Expansion of gas-filled structures 	 Will require a 3-5 min oxygen washout
Propofol	IV: 1-2 mg/kg IV initial, followed by 0.5 mg/kg every 3 to 5 min to maintain sedation	<1	3-10	 Rapid onset Antiemetic Short duration 	 Hypotension Respiratory depression Injection pain Sedative properties only 	 Administer over 20-30 seconds Must be administered by an approved provider (not RN) SHAKE VIALS prior to use
Ketamine	IV: 1-2 mg/kg; repeat in 0.5-1 mg/kg increments Q5-15min PRN No <i>total</i> max dose IV but 100 mg IV max given at each interval Intramuscular: 4-5 mg/kg	~1 (IV) ~5 (IM)	10-15 (IV) 15-30 (IM)	 Preserved airway reflexes Predictable (IV) Provides analgesia and sedation 	 Emergence phenomena Emesis Laryngospasm Hypertension Tachycardia Increased secretions 	 Administer induction over 1-3 min; rapid administration can cause apnea/laryngospasm Must be administered by an approved provider (not RN) Administration of ondansetron IV prior to start of procedural sedation may be beneficial in reducing vomiting during and post procedure Metabolism is inversely proportional to age (younger patients may require more frequent dosing and higher cumulative doses) Use of atropine or glycopyrrolate in routine sedations is generally not necessary
Ketamine- Propofol (Ketofol)	IV: 1:1 admixture dosing: 0.5 mg/kg ketamine IV and 0.5 mg/kg propofol IV administered simultaneously IV	1-3	10-15	 Airway preservation Hemodynamic stability Rapid recovery Use together offsets hemodynamic effects of each individual agent Provides analgesia and sedation 	 Same as for each individual drug Note: ketamine alone is preferred over ketofol in children due to higher risk of severe adverse events requiring provider intervention 	 Must be administered by an approved provider (not RN) Higher ratios (1:3 or 1:4) are associated with higher rates of BVM utilization Mixed by physician (not pharmacy)
Etomidate	IV: 0.1-0.2 mg/kg IV; repeat Q5min PRN	<1	Dose dependent: 2-5	 Rapid onset Short recovery Minimal CV effects 	 Respiratory depression Myoclonus Sedative properties only 	 Administer over 30-60 seconds Potential for adrenal suppression; caution in septic patient; low risk with single dose



What is ketamine?

- Ketamine is given through an IV. This means it is given intravenously, directly into a vein.
- This medicine sedates and controls pain
- Your child may look awake while on ketamine and even talk. However, your child will not be aware of what's happening and will not remember it.

What are the common side effects of ketamine?

- Vomiting can occur after Ketamine. Your provider can give a medicine to help with this.
- We sometimes see:
 - Shaking of the eyes
 - Body movement and stiffening
 - Drooling and tearing
 - A rash that comes and goes
 - Rarely we see an "emergence reaction" which is when:
 - Patients wake up confused and disoriented
 - Sometimes they have bad dreams
 - Although this can be scary to watch, it is not harmful to the child



Pre-sedation Assessment

All required areas are to be completed by the practitioner or delegate:

- Blood pressure, heart rate, pain assessment, respiratory rate, temperature and intended level of sedation.
- Procedure related benefits / risks, options and alternatives explained and accepted.
- A history and physical is complete, a diagnostic history is documented, the airway is assessed to ensure patency and normal breathing without any clinical evidence of upper or lower respiratory tract obstruction, and a risk assessment is completed with an ASA score assigned.
- A pregnancy test is suggested for all menstruating females and any girls older than 12 years of age.

NCH ED Safety Checklist & Time Out

All activity suspended and room quiet for all portions of the safety checklist

 Sedation Provider Confirms All team members in room Sedation provider & RN & proceduralis Pre-procedure assessment completed Equipment in room Monitor: HR, RR, SPO₂, ETCO₂ Functioning suction & catheter BVM with O₂ tubing Non-rebreather 	st	 Sedation Provider Verbalizes Name & medical record number from armband (RN confirms with electronic medical record) Procedure and laterality NPO status Allergies Weight of the patient Medication 	
 Functioning O₂ Medications planned and concentration Special Equipment IV access 	Any concerns? Everyone Agree? (All must verbalize agreement)		

Algorithm

Time Out

- Team Introductions
- All validating documentation such as history and physical, radiologic exams, and consult reports must be available when applicable
- Confirm:

Practitioner or delegate has completed pre-sedation assessment Any special equipment required for the procedure is available Name & medical record number on arm band consistent with medical record Verify consent form completed NPO status Allergies Patient weight Medications planned and concentration



Capnography

- Utilizing end tidal CO₂ (ETCO₂) during procedural sedation is recommended by the American Academy of Pediatrics and the American College of Emergency Physicians.
- The normal ETCO₂ range is 35-45 mmHg
- Changes in ETCO₂ waveform (capnography) may be detected in patients with respiratory depression before hypoventilation or hypoxemia is noted and facilitates more rapid detection of hypoventilation and apnea than clinical assessment alone.
- In multiple randomized controlled trials, patients monitored with capnography in addition to standard care experienced significantly fewer episodes of hypoxia.
- To avoid agitation, consider placing ETCO₂ on the patient immediately after induction of sedation.
- Oxygen supplementation (2L/min) via the ETCO2 nasal cannula may decrease the incidence of hypoxia during procedural sedation.



2007;50:172-181.

Algorithm

Monitoring During Sedation

Pre-sedation:

- Blood pressure
- Heart Rate
- Respiratory Rate
- Oxygen saturation

During sedation:

Monitored continuously with audible alarms and recorded every 5 minutes:

- Heart Rate
- Respiratory Rate
- Blood Pressure
- ETCO2

Level of sedation is recorded at a minimum of every 15 minutes

Post sedation:

Monitored continuously with audible alarms and recorded every 15 minutes until stable and back to baseline status:

- Heart Rate
- Respiratory Rate
- Blood Pressure
- ETCO2

Sedation level and pain assessment are recorded every 15 minutes until stable and back to baseline state



Airway Rescue



Discharge / Transfer Criteria

Discharge/transfer when post sedation stability achieved:

- Cardiovascular Return to baseline heart rate and blood pressure
- Airway/Respiratory
 Can take a deep breath and cough well
 Return to baseline respiratory rate and depth
- Interactive State

Can talk, lift head up unaided, has controlled movement of extremities, can follow commands, is awake, alert, oriented for age or has returned to pre-sedation state

Quality Measures

Process Measures:

•

Utilization of ETCO2 monitoring during sedations (goal >90%) Order set utilization

Outcome Measures:

Incidence of hypoxia during the sedation (goal < 10%)



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Clinical Pathway Development

This clinical pathway was developed using the process described in the NCH Clinical Pathway Development Manual Version 6, 2022. Clinical Pathways at Nationwide Children's Hospital (NCH) are standards which provide general guidance to clinicians. Patient choice, clinician judgment, and other relevant factors in diagnosing and treating patients remain central to the selection of diagnostic tests and therap y. The ordering provider assumes all risks associates with care decisions. NCH assumes no responsibility for any adverse consequences, errors, or omissions that may arise from the use or reliance on these guidelines. NCH's clinical pathways are reviewed periodically for consistency with new evidence; however, new developments may not be represented, and NCH makes no guarantees, representations, or warranties with respect to the information provided in this clinical pathway.

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