

Procedural Sedation

Emergency Department

Center for
Clinical Excellence

Inclusion Criteria

- Need for moderate, deep or dissociative sedation
- [American Society of Anesthesia Physical Classification System \(ASA\) I or II](#)
- Case-by-case consideration for patients with ASA III and no exclusion criteria
- Age $\geq$ 6 months
- No hypoxia
- Normal level of consciousness
- Anticipated duration of procedure < 30 min

Patient history

- Age
- Weight, (height if BMI indicated)
- Allergies & medications
- Medical history (snoring, obstructive sleep apnea, systemic conditions)
- Pregnancy status
- Previous sedation/anesthesia complications
- Family history of sedation/anesthesia complications
- Last oral intake of solids & liquids

Exclusion Criteria

- **Discretion of ED attending**
- [BMI > 40](#)
- Known difficult airway
- Symptomatic hydrocephalus
- ASA $\geq$ IV
- Pregnancy
- Peri-oral trauma/burns that would hinder emergent airway support

Physical exam

Focus on airway and respiratory status

Exclusion considerations:

- Obstructive sleep apnea
- Sedation requiring prone positioning
- Burns requiring PICU admission

Off Pathway

Discuss alternative treatment plan with consultant & family

Patient appropriate for ED procedural sedation? Consider [sedation huddle for burns](#)

[Information provided to family & sedation consent obtained?](#)

Yes

Place IV
Proceed with sedation

[NPO Guidance](#)

[Common Procedures for ED Sedation](#)

[Sedation Goals and Definitions](#)

[Sedation Medications](#)

[Ketamine-Specific Details for Families](#)

Pre-procedure Needs and Considerations

Equipment:

- Cardio-respiratory monitoring
- [Capnography](#)
- Wall suction and catheter
- Oxygen
- BVM with appropriate fitting mask
- Non-rebreather
- Crash cart with intubations bag

Required personnel:

- Proceduralist
- Sedation provider
- Sedation nurse

Cultivate calm, quiet environment:

- Consider Child Life

Ketamine premedication:

- Consider using ondansetron in adolescents to minimize post-procedural vomiting
- Consider delaying ketamine until 30 min after pre-procedure opioid administration to minimize desaturations
- Consider [midazolam](#) premedication to minimize emergence delirium

Safety Checklist & Time out

- Nurse to confirm [pre-sedation assessment](#) completed by provider
- Name & medical record number on arm band consistent with electronic medical record
- Procedure and laterality
- NPO status
- Allergies
- Patient weight
- Medication(s) planned and concentration
- Calm, quiet environment

Team & family must verbalize agreement

[Airway Rescue](#)

[Monitoring](#)

[Discharge / Admit](#)

Sedation Goals & Definitions

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. Per NCH policy, the use of multiple anxiolytics or analgesics concurrently for the purpose of providing sedation increases the risk of deeper sedation and should be automatically considered moderate sedation with respect to monitoring. For example, nitrous oxide and PO/IN/IV midazolam qualifies as moderate sedation and should follow the policies of this clinical pathway.

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 awake but unaware of pain and retains little to no memory of the event. Airway reflexes remain intact.

[Algorithm](#)

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 Classification	Definition	Pediatric Examples, including but not limited to:
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-practice-parameters/statement-on-asa-physical-status-classification-system>

[Algorithm](#)

Physical Exam

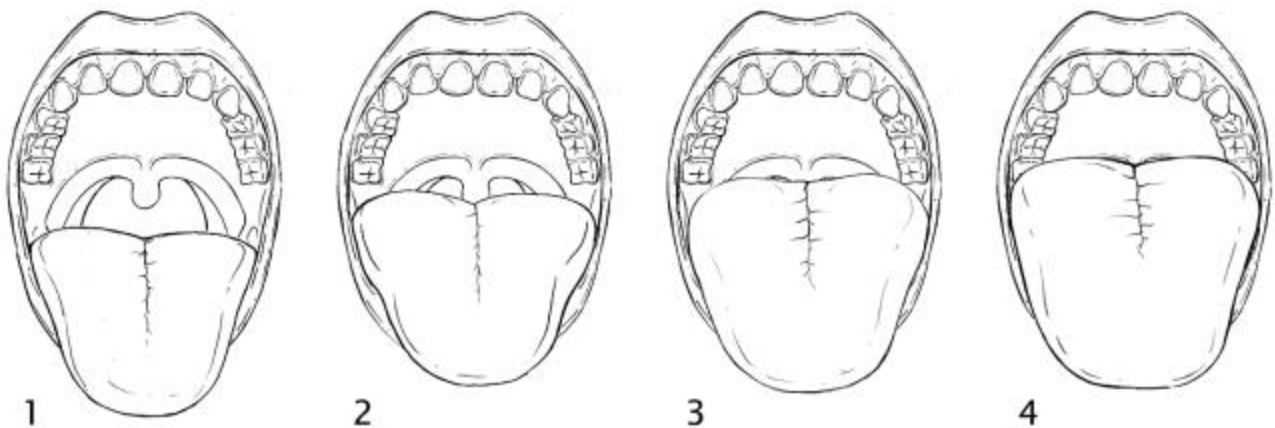
A full physical exam with focus on airway, breathing and circulation should be completed to determine appropriateness for procedural sedation in the Emergency Department (ED).

Physical features that may predict a difficult airway:

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 fingerbreadths 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)

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.

[Algorithm](#)

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.

[Algorithm](#)

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

[Algorithm](#)

Pre-Burn Sedation Huddle

- Discuss with proceduralist about the anticipated length of the procedure.
- Encourage proceduralist to complete important parts of procedure first in case procedure extends longer than anticipated or if complications with sedation arise.
- If more complex procedure or concern that procedure might last longer than 30 minutes than encourage proceduralist to ask for more backup assistance (ex: more burn nurses, pediatric surgery resident, or suture ortho specialists).
- Discuss a plan to stop sedation if needed for patient safety and will allow the proceduralist to complete important parts of procedure.

[Algorithm](#)

Consent: Discussing Sedation with Families

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

[Algorithm](#)

[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: 0.025-0.1 mg/kg (max individual dose: 2 mg; repeat as needed) Intranasal: 0.2 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

Algorithm

Ketamine Details to Discuss with Families

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

[Algorithm](#)

Midazolam Premedication

A minority of patients (between 12% and 50%) experience emergence phenomenon from ketamine. Midazolam can help to counteract some of the potential adverse effects associated with ketamine such as:

- **Psychomimetic effects:** hallucinations, vivid dreams, agitation, and emergence delirium
- **Cardiovascular effects**
- **Nausea and Vomiting**

Other potential benefits of combining midazolam with ketamine for sedation:

- **Enhanced Sedation and Analgesia:** The combination provides synergistic sedative and analgesic effects
- **Improved Amnesia:** Benzodiazepines contribute to anterograde amnesia
- **Reduced Ketamine Dose:** The synergistic effect allows for the use of lower doses of ketamine, which may further minimize side effects.

Important considerations when using benzodiazepines with ketamine:

- **Potential for Respiratory Depression:** While ketamine alone generally preserves respiratory function, the addition of benzodiazepines, which are central nervous system depressants, can increase the risk of respiratory depression, especially at higher doses or when combined with other respiratory depressants. Careful monitoring is essential.

Dosing:

Midazolam 0.025-0.05 mg/kg/dose IV (max 2.0 mg) to be administered prior to ketamine.

[Algorithm](#)

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.

[Algorithm](#)

NCH ED Time Out and Safety Checklist

All activity suspended and room quiet for all portions of the Time Out

Sedation Provider Confirms

- All team members in room
 - Sedation provider & RN & proceduralist
- Pre-procedure assessment completed
- All validating documentation such as history and physical, radiologic exams, and consult reports are available when applicable
- Equipment in room
 - Monitor: HR, RR, SPO₂, ETCO₂
 - Functioning suction & catheter
 - BVM with O₂ tubing
 - Non-rebreather
 - Functioning O₂
- Medications planned and concentration
- Special Equipment
- IV access
- Consent form completed

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

**Any concerns? Everyone Agree?
(All must verbalize agreement)**

Burn Sedations:

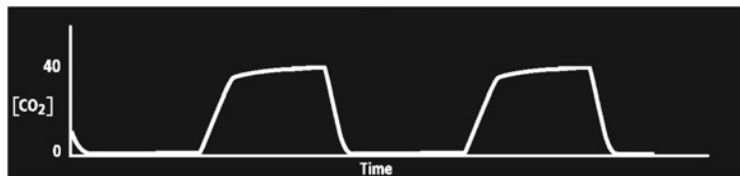
- Discuss with proceduralist the anticipated length of the procedure
- Encourage proceduralist to complete important parts of procedure first in case procedure extends longer than anticipated or if complications with sedation arise
- If more complex procedure or concern that procedure might last longer than 30 minutes then encourage proceduralist to ask for more backup assistance (ex: more burn nurses, pediatric surgery resident, or suture ortho specialists)
- Discuss a plan to stop sedation if needed for patient safety and will allow the proceduralist to complete important parts of procedure

[Algorithm](#)

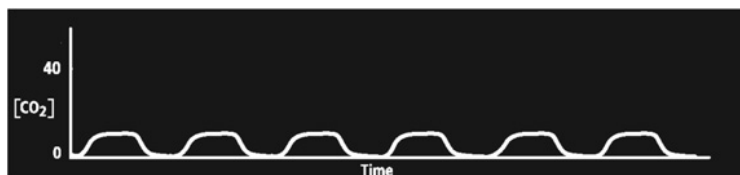
Capnography

- Utilizing end tidal CO_2 (ETCO_2) during procedural sedation is recommended by the American Academy of Pediatrics and the American College of Emergency Physicians.
- The normal ETCO_2 range is 35-45 mmHg
- Changes in ETCO_2 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 ETCO_2 on the patient immediately after induction of sedation.
- Oxygen supplementation (2L/min) via the ETCO_2 nasal cannula may decrease the incidence of hypoxia during procedural sedation.

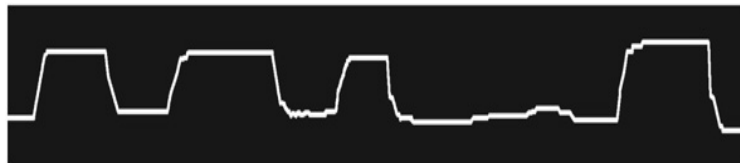
Capnographic Airway Assessment for Procedural Sedation and Analgesia



Normal



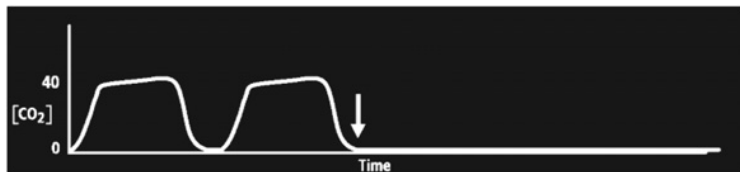
Hyperventilation



Physiologic
Variability



Bronchospasm



Complete Airway
Obstruction

Krauss B. Hess DR. Capnography for Procedural Sedation and Analgesia in the Emergency Department. Ann Emerg Med. 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

[Algorithm](#)

Airway Rescue

Reposition airway, perform jaw thrust
Larson maneuver (laryngospasm)

Unsuccessful

Apply bag-mask ventilation

Unsuccessful

Insert airway adjunct (eg, OPA, NPA)

Unsuccessful

Consider deepening sedation if
laryngospasm suspected

Unsuccessful

Administer paralytic and perform tracheal
intubation

Unsuccessful

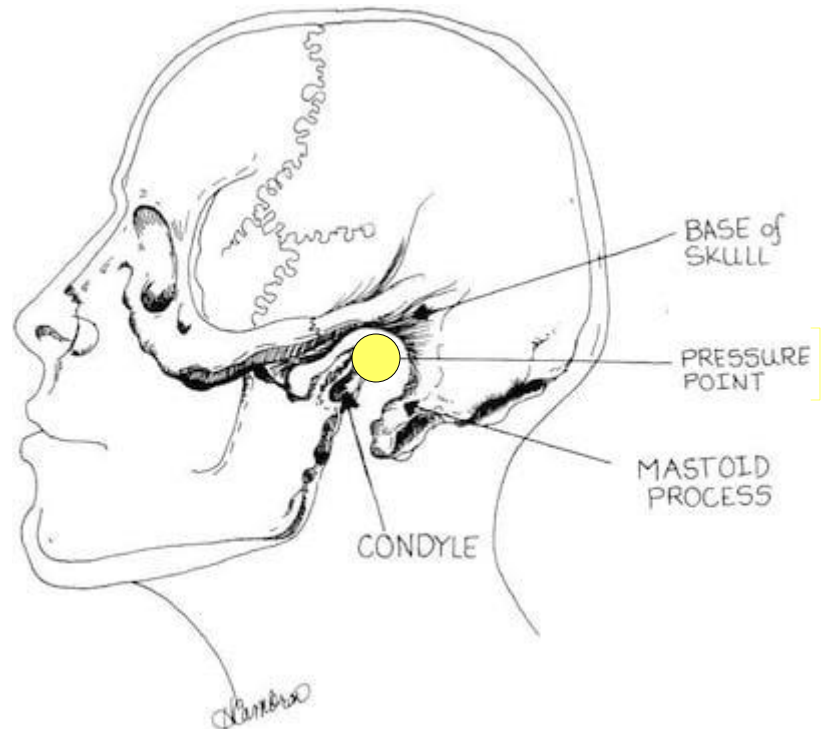
Consider applying local anesthetic to glottis
if laryngospasm suspected

Unsuccessful

Perform surgical airway

Larson maneuver

Vigorous jaw thrust with pressure between the posterior ramus of the mandible and anterior to the mastoid process to reverse laryngospasm.



Lin, M. Pediatrics, Tricks of the Trade. Laryngospasm notch maneuver. Dec 1, 2010.

Kern J, Guinn A, Mehta P. Procedural Sedation in the Emergency Department. Emergency Medicine Practice. June 2022, Vol 24, Issue 6. Photo courtesy of Joshua Kern.

[Algorithm](#)

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

[Algorithm](#)

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%)

[Algorithm](#)

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Algorithm

Pathway Team & Process

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Advisory Committee Date: *August, 2022*

Origination Date: *August, 2022*

Revision Date: *June, 2025*

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 therapy. The ordering provider assumes all risks associated 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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