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Editor's Note: To read more about this publication and the background and methodologies for practice guideline development, go to: <http://www.ebmedicine.net/introduction>

Current Guidelines For Procedural Sedation In The Emergency Department

This edition of *EM Practice Guidelines Update* reviews 3 clinical policies relating to sedation and analgesia in the emergency department (ED). The first 2 guidelines provide a framework for safe practice in all age groups. The final guideline discusses issues particular to the sedation of the pediatric patient.

Practice Guideline Impact

- Proper preparation prevents poor performance. Gathering all the equipment necessary to deal with possible catastrophes before the procedure makes catastrophes less likely to occur.
- Minimal and moderate sedation are appropriate for procedures that require only anxiolysis and enhanced patient comfort—procedures that in a less compassionate ED might be performed with no sedation at all.
- Most painful procedures requiring sedation in the ED need deep—rather than moderate—sedation. Choose agents with a duration of action that matches the duration of stimulation to avoid postprocedure oversedation.
- If supplemental oxygen is used, strong consideration should be given to monitoring ventilatory status with quantitative continuous end-tidal CO₂ (ETCO₂). If this is not available, the patient should be either kept on room air or have their ventilations monitored by a second practitioner whose sole role is to perform the sedation.
- While aspiration is infrequent and recent food intake is not a contraindication to procedural sedation, the timing and size of the last meal should guide drug choices and depth of sedation.

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Prior to beginning this activity, see "Physician CME Information" on page 11.

Practice Guidelines For Sedation And Analgesia By Non-Anesthesiologists: An Updated Report By The American Society Of Anesthesiologists Task Force On Sedation And Analgesia By Non-Anesthesiologists¹

Anesthesiology. 2002;96(4):1004-1017.

Link: <http://www.asahq.org/publicationsAndServices/sedation1017.pdf>

The practice guidelines abstracted here were created by the American Society of Anesthesiologists (ASA) Task Force on Sedation and Analgesia by Non-Anesthesiologists. Individual authors were listed; any possible conflicts of interest were not stated in the guideline; sources of funding are not mentioned. The Task Force was composed of 10 anesthesiologists from the private and public sector, a gastroenterologist, and methodologists from the ASA Committee on Practice Parameters. Literature from 1958 to 2001 was gathered by manual and electronic searches as they pertained to the 15 subjects reviewed in the guidelines. In addition to the standard guideline creation methodology, the authors performed a meta-analysis of 357 included articles and then supplemented the analysis with opinions from a panel of consultants from specialties where sedation and analgesia are commonly performed, including ED physicians.

The intended audience for these guidelines is practitioners who are not specialists in anesthesiology but administer sedation for diagnostic or therapeutic procedures in any medical or dental setting. Excluded from consideration are patients receiving minimal sedation or those receiving a single analgesic or sedative drug orally for insomnia, anxiety, or pain. The terms "supportive," "suggestive," and "equivocal" are used to describe the strength of scientific evidence. The lack of available scientific evidence is described as "inconclusive," "insufficient," or "silent." Recommendations are graded according to a panel survey consensus scale (strongly agree, agree, equivocal, disagree, strongly disagree); however, grading of recommendations is inconsistently reported and were omitted in this summary. The following summary abstracts the 15 subjects reviewed. The full practice guidelines can be viewed at: <http://www.asahq.org/publicationsAndServices/sedation1017.pdf>

1. Preprocedure Evaluation

The practitioner should obtain a medical history on the patient (including major organ systems, anesthesia and sedation, medications, allergies, and most recent oral intake); a focused physical examination, including heart, lungs, and airway; and laboratory testing based on underlying conditions and their possible effect on management of the patient.

2. Patient Counseling

Patients should be counseled on the risks, benefits, limitations, and alternatives of the procedural sedation and analgesia.

3. Preprocedure Fasting

For elective procedures, there should be sufficient time allowed for gastric emptying. For urgent or emergent situations, the potential for pulmonary aspiration should be considered when determining target level of sedation, delay of procedure, or protection of the trachea by intubation.

4. Monitoring

The following data should be recorded at appropriate intervals before, during, and after the procedure:

- Pulse oximetry
- Response to verbal commands (when practical)
- Pulmonary ventilation (observation, auscultation)
- Exhaled CO₂ monitoring (when patient is separated from the caregiver)
- Blood pressure and heart rate at 5-minute intervals unless contraindicated
- ECG for patients with significant cardiovascular disease

Deep sedation: Deep sedation requires monitoring of response to verbal commands or more profound stimuli unless contraindicated. Exhaled CO₂ monitoring should be considered for all patients and ECG monitoring should be used for all patients

5. Personnel

An individual responsible for patient monitoring throughout the procedure should be designated. This individual may assist with minor interruptible tasks once the patient is stable. **Deep sedation:** The individual monitoring the patient may not assist with other tasks.

6. Training

The practitioner should know the pharmacology of sedative and analgesic agents and the pharmacology of available antagonists. Providers with basic life-support skills should always be present and providers with advanced life-support skills should be available within 5 minutes. **Deep sedation:** Providers with advanced life support skills should be available in the procedure room.

7. Emergency Equipment

The following should always be available: suction, airway equipment of appropriate size, means of positive-pressure ventilation, intravenous equipment, pharmacologic antagonists, and basic resuscitative medications. For patients with cardiovascular disease, a defibrillator should be immediately available. **Deep sedation:** A defibrillator should be immediately available for all patients.

8. Supplemental Oxygen

Oxygen delivery equipment should be available and oxygen should be administered if hypoxemia occurs. **Deep sedation:** Oxygen should be administered to all patients unless contraindicated.

9. Choice Of Agents

There should be a distinction between sedatives that decrease anxiety and promote somnolence and analgesics that relieve pain.

10. Dose Titration

Medications should be administered incrementally, allowing sufficient time between doses to assess their effect. If both sedatives and analgesics are used, dose reduction should be considered. Repeat doses of oral medications are not recommended.

11. Use Of Anesthetic Induction Agents (Methohexital, Propofol, Ketamine)

When using these drugs, patients should receive care consistent with deep sedation, regardless of the route of administration and intended level of sedation. The practitioner should have the ability to rescue the patient from unintended general anesthesia.

12. Intravenous Access

Intravenous access must be maintained if sedatives are administered intravenously. If sedatives are administered by other routes, an IV can be maintained on a case-by-case decision basis. An individual with IV skills should be immediately available.

13. Reversal Agents

Naloxone and flumazenil should be available whenever opioids or benzodiazepines are administered.

14. Recovery

Patients should be observed until they are no longer at risk for cardiorespiratory depression. The institution should establish appropriate discharge criteria to minimize risk of respiratory or cardiovascular depression after discharge.

15. Special Situations

For patients with significant underlying medical problems, obtain a consult with an appropriate specialist, if possible. For patients at high risk of severe cardiovascular or respiratory compromise or when complete unresponsiveness is needed to obtain adequate conditions for the procedure, practitioners who are not trained in the administration of general anesthesia should consult an anesthesiologist. ■

Clinical Policy: Procedural Sedation And Analgesia In The Emergency Department²

Annals of Emergency Medicine. 2005;45(2):177-196.

Link: <http://www.acep.org/WorkArea/DownloadAsset.aspx?id=8818>

This document was developed by a committee and subcommittee organized and funded by the American College of Emergency Physicians (ACEP). Panel members are listed; their affiliations/qualifications are not. After a review of Medline (<http://pubmed.gov>) searches between January 1992 and 2004 using key words, a search of the found articles' references, and consultation with experts in the field, relevant articles addressing the 7 questions considered in the clinical policy document were chosen.

Evidence was evaluated for quality according to predefined criteria and sorted into 4 classes (I, II, III, or X-fatally flawed). Recommendations were graded based on the strength of evidence for each question. Level A: high degree of certainty; Level B: moderate degree of certainty; Level C: based on preliminary, inconclusive, conflicting evidence or panel consensus. Disclosures were not reported for the subcommittee for this policy.

The policy targets clinicians working in hospital-based EDs. The guidelines presented in the policy apply to adult and pediatric patients presenting to the ED with urgent or emergent conditions who require pain and/or anxiety management in order for a clinician to perform an interventional or diagnostic procedure. Included are high-risk patients (those with cardiopulmonary disorders, multiple trauma, head trauma, or who have ingested a central nervous system depressant such as alcohol) with the acknowledgement that these high-risk patients are at increased risk for complications from procedural sedation and analgesia. Excluded are patients who receive inhalational anesthetics, patients who receive analgesia for pain control without sedatives, intubated patients, and patients who receive sedation solely for the purpose of handling behavioral emergencies.

Critical Question I. What are the personnel requirements needed to provide procedural sedation and analgesia in the ED?

Level C Recommendations:

- During moderate and deep sedation, a qualified support person should be present for continuous monitoring of the patient.
- Procedural sedation and analgesia in the ED must be supervised by an emergency physician or other appropriately trained and credentialed specialist.

Critical Question II. What are the key components of the patient assessment before initiating procedural sedation?

Level C Recommendations:

- Obtain a history and perform a physical examination to identify medical illnesses, medications, allergies, and anatomic features that may affect procedural sedation and analgesia and airway management.
- No routine diagnostic testing is required before procedural sedation.

Critical Question III. Is preprocedural fasting necessary before initiating procedural sedation?

Level C Recommendations: Recent food intake is not a contraindication for administering procedural sedation and analgesia, but should be considered in choosing the timing and target level of sedation.

Critical Question IV. What equipment and supplies are required to provide procedural sedation and analgesia?

Level C Recommendations:

- Oxygen, suction, reversal agents, and advanced life support medications and equipment should be available when procedural sedation and analgesia is used.

- Intravenous access should be maintained when intravenous procedural sedation and analgesia is provided. Intravenous access may not be necessary when procedural sedation and analgesia is provided by other routes.

Critical Question V. What assessment and monitoring are required to provide procedural sedation in the ED?

Level C Recommendations: Obtain and document vital signs before, during, and after procedural sedation and analgesia. Monitor the patient’s appearance and ability to respond to verbal stimuli during and after procedural sedation and analgesia.

Critical Question VI. How should respiratory status be assessed?

Level B Recommendations: Pulse oximetry should be used in patients at increased risk of developing hypoxemia, such as when high doses of drugs or multiple drugs are used, or when treating patients with significant comorbidity.

Level C Recommendations:

- When the patient’s level of consciousness is minimally depressed and verbal communication can be continually monitored, pulse oximetry may not be necessary.
- Consider capnometry to provide additional information regarding early identification of hypoventilation.

Critical Question VII. Can ketamine, midazolam, fentanyl, propofol, and etomidate be safely administered for procedural sedation and analgesia in the ED?

Level A Recommendations: Ketamine can be safely administered to children for procedural sedation and analgesia in the ED.

Level B Recommendations:

- Propofol can be safely administered for procedural sedation and analgesia in the ED.
- Nondissociative sedation agents should be titrated to clinical effect to maximize safety during procedural sedation in the ED.
- The combination of fentanyl and midazolam is effective for procedural sedation and analgesia in the ED.

Level C Recommendations: Etomidate can be safely administered for procedural sedation and analgesia in the ED. ■

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Editorial Comment

A properly administered procedural sedation can be elegant and satisfying; one administered improperly can be life-threatening. To avoid the latter, these guidelines appropriately stress the 4 defined states of non-dissociative sedation:

1. Minimal sedation/analgesia is essentially mild anxiolysis or pain control.
2. Moderate sedation (formerly known as conscious sedation) is defined by a patient who may be sleepy but is aroused to voice or light touch.
3. Deep sedation is defined by a patient who requires painful stimuli to evoke a purposeful response.
4. General anesthesia is defined by a patient with no purposeful response to even repeated painful stimuli.

To put this into the context of the ED, minimal sedation could be 1-2 mg of midazolam given prior to a lumbar puncture or 6-8 mg of morphine prior to tapping a knee. This level of sedation requires only the routine ED monitoring.

Moderate sedation could be used to take the edge off the pain of abscess drainage. This level requires the more extensive monitoring, documentation, quality assurance, and diligence to which we have all become accustomed. Despite this, patients undergoing moderate sedation will not be pain-free or unaware of their procedure. A moderately sedated patient is arouseable to voice or light touch and, therefore, fully aroused and upset by any stimulation greater than light touch (such as attempting to lever a hip back into place). Moderate sedation is therefore suited only to procedures that might be done with no sedation at all, if you were a less-caring physician. This level of sedation is inappropriate if the procedure requires a pain-free, relaxed patient.

For these procedures, we need deep sedation. Even this level of sedation requires that the patient be responsive to painful stimuli, which is difficult to reconcile with the fact that the reason we are performing the sedation is so that the patient does not respond to the painful stimuli of the procedure. In most US hospitals, however, emergency physicians are not allowed to provide general anesthesia, so deep sedation is often the only option.

The most important thing to understand about these levels of sedation is that the process is *dynamic*. While the patient is receiving the stimuli of a joint reduction, he may be only at a plane of minimal sedation; but when the orthopedist releases the leg, the patient can easily slip into general anesthesia. This leads to the first rule of safe deep procedural sedation: Match the duration of action of your medications with the length of the procedural stimulation.

In some EDs, the combination of midazolam and fentanyl is an almost reflexive choice for all procedural sedation. This combination works well for moderate sedation, but can be dangerous for the deep sedation most of our painful procedures require. With the example of the hip reduction, either the patient will be under-sedated if left at the moderate level, or more midazolam/fentanyl can be administered to bring the patient to a deep plane of sedation. If the latter course is taken, in 3 minutes when the reduction is completed, the patient may be at the level of general anesthesia for 30-40 minutes.

One way to make this medication combination work for deep sedation is to reverse the patient after the procedure is completed. The opioid portion of the package causes the majority of the respiratory depression, so it makes sense and is probably safest to reverse the fentanyl with naloxone. Remember that the duration of action of the reversal agent may be less than the agent it is intended to reverse; patients who have received a reversal agent should be monitored for re-sedation. If used in small, titrated doses (0.04 mg every 30 seconds), it is easy to bring the patient to an awake, but still pain-controlled state. However, ASA guidelines (and therefore most hospital sedation committees) consider the use of any reversal agent to be an adverse event.

If available, it makes more sense to choose a drug combination that will leave your patient deeply sedated only for the length of the procedure. Propofol, etomidate, or methohexital when combined with fentanyl provide brief, titratable, deep sedation. Of interest, while the ASA guideline states that propofol can be used by practitioners who can rescue patients who progress to general anesthesia (such as an emergency physician), a separate statement from ASA states that propofol should only be administered by anesthesia personnel.³ Alternatively, sedation and its baggage of respiratory depression and loss of airway reflexes can

be avoided entirely by going the dissociative route with ketamine.⁴ When utilizing these more-potent agents, careful attention must be paid to the patient's ventilatory status. This can be done in 2 ways: 1) have the patient breathe room air; or 2) combine supplemental oxygen with continuous ETCO₂ monitoring. When breathing room air, the patient's oxygen saturation will progressively decline as alveolar ventilation decreases and CO₂ rises.⁵ This will rapidly result in a decreased SpO₂, which allows ample time for correction by repositioning or giving additional stimuli. If the patient is placed on even a small amount of supplemental oxygen, he will continue to saturate well even as alveolar ventilation is almost nil and CO₂ rises to dangerous levels.

Deep sedation can cause apnea, and having the safety buffer of pre-oxygenation may be desirable. The ASA guidelines recommend considering oxygen for moderate sedations and strongly recommend it for deep sedations. To benefit from preoxygenation and accurate ventilatory monitoring, place the patient on high-flow oxygen by face mask and use quantitative waveform ETCO₂, which provides information on respiratory rate, airway patency, and the adequacy of ventilation; this may prevent adverse events.^{6,7}

Preparation is key to preventing adverse events that can be catastrophic in a poorly managed procedural sedation. In addition to equipment and reversal agents mentioned in the guidelines, having ready a few additional items will further the clinician's ability to manage and prevent adverse events. Placing a laryngeal mask airway may be preferable to continued bag-valve-mask (BVM) ventilation if the patient was inadvertently over-sedated or over-analgesed using nonreversible medications. It can be easily placed and then removed when the patient emerges, without the downsides of endotracheal intubation. If hypotension is persistent during deep sedation, it can be easily and safely reversed with small aliquots of peripherally administered vasopressor agents such as phenylephrine.⁸

Finally, consider the patient's comorbidities when planning a sedation. Patients with coexistent disease, extreme age, morbid obesity, or sleep apnea can develop life-threatening problems during even a well-planned and orchestrated sedation. Choosing alternatives such as nerve blocks, regional anesthesia, or operating room sedation may be a safer path. ■

Clinical Policy: Critical Issues In The Sedation Of Pediatric Patients In The Emergency Department⁹

Annals of Emergency Medicine. 2008;51(4):378-399, e1-e57.

Link: <http://www.acep.org/WorkArea/DownloadAsset.aspx?id=33726>

This guideline was created by a multidisciplinary panel under the leadership of ACEP and funded by the Emergency Medical Services for Children Program within the U.S. Department of Health and Human Services. Multiple searches of Medline and the Cochrane database encompassed articles from 1976 to 2006 and those addressing the questions considered were chosen for grading. It is intended for physicians administering procedural sedation and analgesia to pediatric patients 18 years of age or younger who are in a hospital ED and have conditions necessitating the alleviation of anxiety, pain, or both. It excludes patients older than 18 years of age.

Evidence was evaluated for quality according to the predefined criteria and sorted into 4 classes (I, II, III, or X-fatally flawed). Recommendations were graded based on the strength of evidence for each question. Level A: high degree of certainty; Level B: moderate degree of certainty; Level C: based on preliminary, inconclusive, conflicting evidence or panel consensus.

The authors note that nitrous oxide and chloral hydrate are addressed in this clinical policy because of their use in some practice settings. A previous clinical policy focused on the efficacy and safety of etomidate, fentanyl/midazolam, ketamine, methohexital, pentobarbital, and propofol for achieving sedation and analgesia in pediatric patients in the ED.¹⁰ These recommendations about the safety and efficacy of nitrous oxide and chloral hydrate do not imply superiority to the pharmacologic agents addressed in the previous clinical policy.

Critical Question 1. Should pediatric patients undergo a period of preprocedural fasting to decrease the incidence of clinically important complications during procedural sedation in the ED?

Level B Recommendations: Procedural sedation may be safely administered to pediatric patients in the ED who have had recent oral intake.

Critical Question 2. Is nitrous oxide effective and safe for providing pediatric procedural sedation in the ED?

Level A Recommendations: Nitrous oxide at 50% concentration can be used with concurrent local anesthesia for safe and effective procedural sedation in healthy children undergoing painful procedures.

Level B Recommendations: A gas scavenging system should be used for protection of health care providers when administering nitrous oxide.

Level C Recommendations:

1. Nitrous oxide at 60% to 70% concentration may be used with concurrent local anesthesia for safe and effective procedural sedation in healthy children undergoing painful procedures.
2. Nitrous oxide may be combined with other sedative analgesic agents to augment sedation, but patients receiving these combinations should be carefully monitored for deepening sedation, respiratory depression, and other adverse events.
3. Nitrous oxide may be less effective in reducing procedure-related distress in younger children compared with older children.
4. Nurses trained in principles of nitrous oxide sedation, including the specific nitrous oxide administration device, may safely administer nitrous oxide to healthy children while under the supervision of an emergency physician or other appropriately trained and credentialed specialist in the ED.

Critical Question 3. Can oral sucrose be used to reduce infant distress due to minor, painful procedures in the ED?

Level A Recommendations: Oral sucrose can be used to reduce signs of distress due to minor, painful procedures in preterm and term neonates (less than 28 days old).

Level B Recommendations:

1. Effective doses for neonates range from 0.1 mL of 24% to 2 mL of 50% sucrose (with the most commonly studied dose being 2 mL of 24% sucrose).

2. Oral sucrose can be used in combination with sucking (ie, a pacifier) to improve its efficacy.
3. Oral sucrose may be safely administered to full-term neonates and infants.

Level C Recommendations:

1. Sucrose appears to be less effective in infants between 1 month and 6 months of age.
2. Effective doses for infants between 1 month and 6 months of age may range from 0.75 mL of 50% to 2 mL of 75% sucrose.
3. Effective doses for very-low-birth-weight, preterm infants may be as low as 0.05 mL of 24% sucrose.
4. Oral sucrose should be given approximately 2 minutes before an invasive procedure.
5. Oral sucrose may be safely given to low-birth-weight, preterm neonates.

Critical Question 4. Is chloral hydrate effective and safe for providing procedural sedation in children in the ED?

Level A Recommendations:

1. Chloral hydrate may be used to provide effective procedural sedation in pediatric patients undergoing painless diagnostic studies. However, children receiving chloral hydrate should be properly monitored and managed by appropriately trained personnel due to the risk of respiratory depression and hypoxia.
2. Chloral hydrate should not be considered a first-line agent in children older than 48 months because of decreased efficacy as compared with younger children.

Level C Recommendations:

1. Chloral hydrate has the potential for resedation and may produce residual effects up to 24 hours after administration.
2. Chloral hydrate may be used safely and effectively in properly monitored children who have congenital cardiac anomalies and are undergoing painless diagnostic procedures.
3. Chloral hydrate should not be used in children with neurodevelopmental disorders due to an increased incidence of adverse effects and decreased efficacy as compared with healthy children.
4. Pediatric patients receiving chloral hydrate should not be intentionally fasted because of increased procedural sedation failure rates.

Critical Question 5. What clinical indicators support safe discharge after pediatric procedural sedation in the ED?

Level C Recommendations: No universally applicable, evidence-based set of clinical indicators has been established. Emergency physicians, in conjunction with their institutions, should develop criteria for safe discharge. ■

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Editorial Comment

This guideline builds on the ACEP policy discussed previously and addresses issues specific to pediatric emergency medicine. This guideline does not discuss intravenous sedation agents, but does refer to the Emergency Medical Services for Children (EMSC) 2004 clinical policy focusing on safe use of the intravenous agents such as etomidate, fentanyl/midazolam, ketamine, methohexital, pentobarbital, and propofol.¹⁰

Children may not be able to verbalize or effectively rationalize their fear and pain, so it is even more crucial that they are optimally sedated and analgesed. Subsequent behavior problems can be expressed long after a procedure is performed with inadequate symptom control. Furthermore, painful and frequent procedures in neonates may cause behavior problems and alterations in pain perception later in childhood.¹¹

Preparation for sedation and analgesia is even more important in pediatric sedations due to a greater range in equipment sizes and availability. The American Academy of Pediatrics offers a mnemonic that is applicable to all ages and types of sedation. The mnemonic "SOAPME" stands for Suction (both Yankauer and suction tubing), Oxygen (as well as the optimal means of providing it), Airway (available, properly sized, but not necessarily opened devices for positive pressure ventilation, oral and nasal airways, laryngoscope blades, tubes, stylets, and laryngeal mask airway [LMA] devices), Pharmacy (the drugs for sedation and analgesia and their antagonists, as well as basic emergency drugs like atropine and epinephrine), Monitors (preferably including ETCO₂), and Equipment (eg, defibrillator).¹²

The ACEP guidelines suggest the use of sucrose, which is efficacious for both pain and comfort in neonates. The appropriate sucrose solution can be placed on a gauze and then into a baby's bottle nipple to avoid overdosing and hyperglycemia. Facilitative holding (swaddling the child with extremities flexed), kangaroo care (patient held tight to the parent's chest), or breastfeeding are ways to comfort a neonate during an invasive procedure.

For the most part, the sedation methods for a child are similar to adult methods, with a few notable differences. Infants and young children are more likely to have airway obstruction during sedation due to a relatively larger tongue, epiglottis, and occiput. Patients should also be evaluated for tonsillar hypertrophy and its resultant obstructive sleep apnea, because patients with these problems are more likely to obstruct with milder forms of sedation and should receive less sedation/analgesia. Loose teeth may also pose a problem with the pediatric patient.

Due to their higher metabolic rates, compliant chest walls and tendency towards early fatigue, children desaturate more quickly after apnea than even moderately ill adults.¹³ The most common complication of ED sedation in children is hypoxia.¹⁴ Children, especially when anxious, may not tolerate a mask or the nasal cannula, but with blow-by oxygen at high flows (6-8 L/minute in patients less than 2 years of age, and 8-10 L/minute for those 2 years of age and older), a comfortable increase in FiO₂ can be achieved.¹⁵

Fortunately, most hypoxic episodes can be treated with nothing more than repositioning of the head. A shoulder roll for the small child, a chin lift, manually opening the mouth, and the use of the oral/nasal airway all will help to reestablish airway patency. Still, the practitioner should have a familiarity with the sizing of airway adjuncts and the appropriate dosing of reversal agents prior to the sedation. The BVM and LMAs are excellent rescue devices for the pediatric patient just as they are for the adult.

While ACEP's guidelines do not address it, the ASA guidelines as well as separate American Association of Pediatrics guidelines¹²

recommend consideration of the administration of supplemental oxygen for moderate and deep sedation. As mentioned in the previous guideline, continuous quantitative end-tidal CO₂ monitoring should be used to avoid unrecognized apnea and hypoventilation. In one study, clinical assessment identified hypoventilation much less frequently than capnography and it did not identify any patients with apnea.¹⁶ If capnography is not available, it is critical to maintain vigilant assessment of frequency and depth of respirations by a practitioner whose sole role is to monitor the sedation.

Dissociative sedation with ketamine may be the easiest and most efficacious means of sedation and analgesia in the pediatric ED. The patient does not have to be premedicated with midazolam to prevent emergence delirium.¹⁷ Ketamine is safe to use without anti-sialogogues such as atropine for the sedation of older children and those not having oropharyngeal procedures.¹⁸ If premedication is used, the best candidate is probably ondansetron, which may be added to ketamine to decrease the incidence of vomiting.¹⁹

Etomidate or propofol, when combined with an analgesic such as fentanyl, can provide deep, brief sedation. Myoclonus is a dose-dependent side effect of etomidate that can be ameliorated with a pretreatment dose of .05 mg/kg etomidate²⁰ or with either a pre- or post-etomidate dose of 0.015 mg/kg midazolam.²¹ Pain at the injection site with both etomidate and propofol can be avoided by applying an IV tourniquet proximal to the IV site, administering 1 mg/kg of lidocaine, and then keeping the tourniquet on for 3 minutes.

There is a wide range of practice when it comes to fasting guidelines. In the general anesthesia literature, the reported incidence and mortality from aspiration is low. The likelihood of aspiration is probably even less in the emergency room. Patients are not exposed to the emetogenic inhalational anesthetics and airway manipulation of general anesthesia. However, pain can increase the incidence of aspiration. A comprehensive practice advisory was recently published outlining evidence-based recommendations for fasting in both adult and pediatric patients.²² ■

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