

Fasting and Emergency Department Procedural Sedation and Analgesia: A Consensus-Based Clinical Practice Advisory

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Emergency physicians frequently administer procedural sedation and analgesia to nonfasted patients; however, they currently have no specific guidelines to aid them in preprocedural risk stratification. We assembled a committee of leading emergency physician sedation researchers to develop a consensus-based clinical practice advisory for this purpose. Our goal was to create a tool to permit emergency physicians to identify prudent limits of sedation depth and timing in light of fasting status and individual patient risk factors. The advisory is not intended to assert a legal standard of practice or absolute requirement. It is expected that emergency physicians will at times appropriately deviate from it according to individualized judgment and unique clinical circumstances. [Ann Emerg Med. 2007;49:454-461.]

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INTRODUCTION

Background

In an ongoing effort to optimize patient safety during procedural sedation and analgesia, emergency physicians query patients about the timing and nature of recent oral intake^{1,2} and use this information to estimate the risk of pulmonary aspiration and to plan sedation depth and timing accordingly.^{2,3} However, emergency physicians have no specific guidelines addressing this requisite task. Procedural sedation and analgesia guidelines from the American College of Emergency Physicians state: "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."² Corresponding guidelines from the American Academy of Pediatrics^{4,5} and American Society of Anesthesiologists (ASA)⁶ are no more specific.

Importance

A consequence of the inherent ambiguity in how to apply preprocedural fasting information is wide practice variation. At one end of the spectrum are emergency physicians who administer procedural sedation and analgesia "without regard to oral intake,"^{7,8} whereas at the opposite end are emergency physicians who have adopted fasting guidelines crafted for elective operative anesthesia.⁹⁻¹³ Although the former approach seems unacceptably cavalier, given that aspiration can result in significant morbidity and even mortality, the latter approach

denies a substantial number of emergency department (ED) patients the clear benefits of timely sedation. The emergency medicine community would benefit from a clearer consensus for assessment of the risks and benefits of procedural sedation and analgesia in the nonfasted ED patient.

The ideal mechanism to assist in standardizing practice would be the development and dissemination of an evidence-based clinical practice guideline. However, because aspiration is an extremely rare event (in both procedural sedation and analgesia and operative anesthesia), research evaluating its risk factors and potential preventive interventions is prohibitively difficult. Therefore, large retrospective anesthesia studies from decades ago will likely remain the primary evidence for preprocedural risk stratification into the foreseeable future, and practice guidelines will of necessity remain consensus-based.

Goals

Given the compelling need for specific recommendations to address premedication fasting in the ED, we created an emergency medicine-specific clinical practice advisory. Recognizing the limitations of the published evidence, we augmented the advisory with expert consensus, a technique that, while imperfect, represented the only feasible option for this topic.^{9,14}

MATERIALS AND METHODS

We assembled a procedural sedation and analgesia fasting clinical practice advisory committee by selecting emergency

physicians who have published substantial original procedural sedation and analgesia research. We limited our panel to emergency physicians because the ED is the exclusive focus of this advisory, because emergency physicians have a widely accepted leadership role in procedural sedation and analgesia,^{15,16} and because of the natural reluctance of emergency physicians to permit other specialists to dictate emergency medical practice.¹⁷

We searched MEDLINE from 1965 through May 2006 using the search strategy (“pneumonia, aspiration” [MeSH] OR fasting) AND (sedation OR anesthesia), manually searched the tables of contents of the leading emergency medicine and anesthesiology journals (1995 to 2006), and searched the reference lists of all identified articles for additional relevant articles. The resulting articles were reviewed by the committee and their merits debated. A draft advisory was developed using consensus whenever possible and identifying the absence of consensus when this occurred.

After completion of this initial phase, the draft advisory was circulated to 10 widely known experts selected by the committee for their related original research or for their special related expertise and perspective. These reviewers included anesthesiologists, emergency physicians, pediatricians, and intensivists. The committee analyzed and discussed this expert feedback and adjusted the recommendations according to its consensus.

BACKGROUND

Aspiration Pathophysiology

Pulmonary aspiration can be defined as “inhalation of oropharyngeal or gastric contents into the larynx and lower respiratory tract.”¹⁸ The pathophysiology of aspiration and its clinical ramifications have been detailed elsewhere^{3,19}; however, several key findings are summarized here.

It is important to recognize that the tradition of fasting before elective surgery has minimal scientific support^{3,9,19,20} and is instead based on the intuitive recognition that vomiting and aspiration requires something in the gut. There is insufficient evidence to associate fasting time, gastric volume, or gastric acidity with the probability of aspiration.^{9,14,21,22} Further, the normal glottis is an imperfect protective barrier, and silent aspiration occurs regularly during normal sleep and during general anesthesia despite endotracheal intubation.¹⁹ There is also no evidence to support the frequently repeated supposition that gastric emptying is delayed by acute stress or anxiety.^{19,23-26}

In studies of ED procedural sedation and analgesia, there is no evidence that fasting has an impact on the incidence of complications or outcome,^{8,27-29} a finding similarly noticed outside of the ED setting.³⁰⁻³² Although general anesthesia with endotracheal intubation is widely suggested as an alternative to sedation in the nonfasted patient,⁶ aspiration can still occur despite this precaution,³³ and airway manipulation is a known precipitant of aspiration.^{14,19,34}

Status of ED Procedural Sedation and Analgesia

Procedural sedation and analgesia has evolved into a core competency in emergency medicine and a daily part of ED practice.³⁵ Emergency physicians possess, by nature of their residency or fellowship training, the skills necessary to recognize and manage the most serious adverse events that occur during moderate, deep, and dissociative sedation. This training does not guarantee that aspiration can be consistently avoided with procedural sedation and analgesia, just as rigorous precautions cannot guarantee that aspiration will not occur with operative anesthesia.^{34,36}

Procedural sedation and analgesia has permitted emergency physicians to substantially upgrade their quality of care through the timely and effective relief of procedural pain and anxiety. In the past, pediatric laceration repair and fracture reduction were routinely accomplished through forcible immobilization, typically with the child crying throughout the procedure while the parents watched helplessly. Similarly, emergency physicians would reduce hip dislocations using small doses of diazepam and morphine, knowing that this inadequate sedation would result in agonized screams during the procedure and relying on the benzodiazepine to provide protective amnesia. Timely procedural sedation and analgesia administration is essential for many emergency procedures, including cardioversion and reduction of fractures with vascular compromise.

The widespread promulgation of safe and effective procedural sedation and analgesia has permitted emergency medicine to evolve to the point at which appropriate relief of procedural pain and anxiety is viewed as an ethical imperative. It is likely that hundreds of thousands (if not millions) of ED patients have benefited from sedation in the past 2 decades, and this tremendous positive impact must be respected when concerns about rare but serious complications such as pulmonary aspiration are evaluated. Only 1 case of pulmonary aspiration associated with ED sedation has been reported,³⁷ and this patient had no adverse outcome. It is, of course, possible that more cases have occurred but have not been reported. Even if ED sedation results in occasional occurrences of aspiration with morbidity or even mortality, the rarity of such an unfortunate complication must be balanced by the enormity of the benefit derived from the current standard of care.

Overview of Existing Fasting Recommendations in Various Guidelines

The American College of Emergency Physicians' sedation guidelines state: “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.”² The American Academy of Pediatrics is no more specific for children, stating: “There should be an appropriate interval of fasting before sedation,”⁴ and “When proper fasting has not been assured, the increased risks of sedation must be carefully weighted against its benefits, and the lightest effective sedation should be used.”⁵

The ASA has issued consensus-based guidelines for preoperative fasting; however, they are limited to “healthy patients” undergoing “elective procedures,”⁹ effectively excluding ED patients. These guidelines stipulate at least 2 hours of fasting for clear liquids, at least 4 hours for breast milk, and at least 6 hours for solids, cow’s milk, and infant formula.⁹

In separate guidelines for procedural sedation and analgesia,⁶ the ASA states: “The literature does not provide sufficient evidence to test the hypothesis that preprocedure fasting results in a decreased incidence of adverse outcomes in patients undergoing either moderate or deep sedation.” Given this lack of sufficient evidence, the ASA used task force consensus to conclude that: “In urgent, emergent, or other situations in which gastric emptying is impaired, the potential for pulmonary aspiration of gastric contents must be considered in determining (1) the target level of sedation, (2) whether the procedure should be delayed, or (3) whether the trachea should be protected by intubation.”⁶

EVIDENCE ADDRESSING SPECIFIC CLINICAL ISSUES

Relative Risk of Aspiration During Procedural Sedation and Analgesia Versus Operative Anesthesia

Much of the current understanding of aspiration risk is extrapolated from the general anesthesia literature, wherein the overall incidence of aspiration is low (1:3,420) and its subsequent mortality rare (1:125,109).¹⁹ There is reason to believe that aspiration risk with procedural sedation and analgesia is less likely, for reasons discussed in detail elsewhere.¹⁹ A compilation of anecdotal adverse sedation events assembled by anesthesiologists to evaluate current sedation practices by other specialists failed to identify a single case of aspiration outside of the operating room during a 27-year study period.³⁸ Thus, there is insufficient evidence to support the position that fasting guidelines crafted for operative anesthesia should be extrapolated to sedation practice.⁹

Solids Versus Liquids

Clear liquids administered up to 2 hours before surgery do not adversely affect gastric volume or pH,^{20,39-44} and regurgitated clear liquids are likely to represent little risk of aspiration morbidity.¹⁹ Accordingly, ingestion of clear liquids before procedural sedation and analgesia would appear to pose minimal risk regardless of volume. Examples of clear liquids include water, fruit juices without pulp, sodas, clear tea, and black coffee.^{9,14} Aspiration of acidic particulate matter or solid food, on the other hand, is known to result in pulmonary damage and is thus the primary focus of this advisory.^{19,34}

Sedation Depth

Nondissociative sedation exists as a continuum commonly divided into stages labeled minimal sedation, moderate sedation, deep sedation, and general anesthesia.^{1,15} Airway reflexes are reliably maintained during minimal and moderate sedation and

have been widely assumed to be consistently lost during general anesthesia, suggesting that impairment of airway reflexes occurs at an undefined threshold between these 2 points. However, this threshold concept may be too simplistic because “vigorous”⁴⁵ protective airway reflexes have been observed during both inhalational^{46,47} and propofol general anesthesia.^{45,48}

The exact point along the sedation continuum at which clinically significant airway reflex impairment might occur remains unclear. It is possible that such risk begins once deep sedation has been exceeded and increases incrementally through lighter levels of general anesthesia. On the other hand, perhaps the sedation “continuum” is not linear or continuous. Rather, multiple individual factors acting in parallel or in a discontinuous manner may affect the timing and extent of blunting of airway reflexes.

Sedation Length

Although the risk of overall complications is known to increase with the duration of operative anesthesia,^{49,50} there is insufficient evidence to implicate extended procedural sedation and analgesia as a risk factor for aspiration. There is also insufficient evidence to support any higher aspiration risk with re-sedation, ie, a second sedation procedure occurring shortly after recovery from a first one. In a recent study in children, implementation of operative fasting guidelines for sedation was associated with an increased failure rate of the initial sedation, increased total dose of sedative administered, and prolonged sedation time.⁵¹

Aspiration Risk Factors

Several large studies of operative anesthesia detail risk factors for aspiration. Predictors include airway difficulties (eg, difficult intubation, laryngospasm), advanced age (eg, >70 years), greater underlying illness (ie, higher ASA physical status classification), and conditions predisposing to gastroesophageal reflux (eg, esophageal disease, hiatal hernia, peptic ulcer disease, gastritis, bowel obstruction, ileus, elevated intracranial pressure).¹⁹

Other variables anecdotally implicated in the past—pregnancy, opioid therapy, obesity, diabetes—do not appear to be independent predictors of aspiration.⁵² Children are probably at no higher risk than adults,⁵³ although evidence is conflicting.¹⁹

Ketamine

Unlike other sedatives ketamine preserves protective airway reflexes^{54,55} and there are times where dissociative sedation is selected over other modalities largely for this specific clinical benefit. Unfortunately, the ED experience with ketamine in adults is limited.^{56,57}

Positive Pressure Ventilation

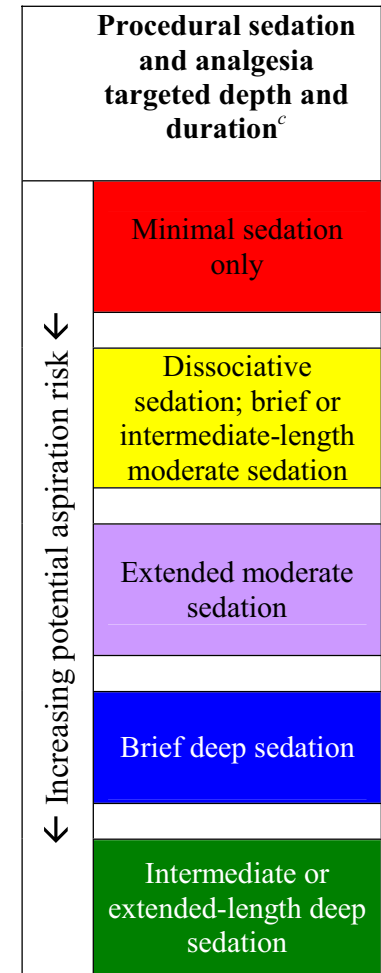
Emergency physicians should, whenever possible, avoid inducing respiratory depression to the extent where assisted

Standard-risk patient^a

Oral intake in the prior 3 hours	Procedural Urgency ^b			
	<i>Emergent Procedure</i>	<i>Urgent Procedure</i>	<i>Semi-Urgent</i>	<i>Non-Urgent</i>
<i>Nothing</i>	All levels of sedation	All levels of sedation	All levels of sedation	All levels of sedation
<i>Clear liquids only</i>	All levels of sedation	All levels of sedation	Up to and including brief deep sedation	Up to and including extended moderate sedation
<i>Light snack</i>	All levels of sedation	Up to and including brief deep sedation	Up to and including dissociative sedation; non-extended moderate sedation	Minimal sedation only
<i>Heavier snack or meal</i>	All levels of sedation	Up to and including extended moderate sedation	Minimal sedation only	Minimal sedation only

Higher-risk patient^a

Oral intake in the prior 3 hours	Procedural Urgency ^b			
	<i>Emergent Procedure</i>	<i>Urgent Procedure</i>	<i>Semi-Urgent</i>	<i>Non-Urgent</i>
<i>Nothing</i>	All levels of sedation	All levels of sedation	All levels of sedation	All levels of sedation
<i>Clear liquids only</i>	All levels of sedation	Up to and including brief deep sedation	Up to and including extended moderate sedation	Minimal sedation only
<i>Light snack</i>	All levels of sedation	Up to and including dissociative sedation; non-extended moderate sedation	Minimal sedation only	Minimal sedation only
<i>Heavier snack or meal</i>	All levels of sedation	Up to and including dissociative sedation; non-extended moderate sedation	Minimal sedation only	Minimal sedation only



Brief: <10 minutes
 Intermediate: 10-20 minutes
 Extended: >20 minutes

Figure. Prudent limits of targeted depth and length of ED procedural sedation and analgesia according to pre-sedation assessment of aspiration risk

ventilation is necessary. Assisted ventilation may insufflate the stomach and induce emesis when the likelihood of airway reflex impairment is already higher.

Pharmacologic Pretreatment

There is no evidence that therapeutic prophylaxis (eg, antacids, histamine antagonists, metoclopramide, anticholinergics) lowers aspiration risk or improves outcomes, and such interventions are not recommended preoperatively by the ASA.^{9,19}

CLINICAL PRACTICE ADVISORY

Focus

This advisory is designed to be applicable to the full spectrum of ED procedural sedation and analgesia practice, including all ages and types of patients and levels of procedural urgency observed in the ED, using the entire sedation pharmacopoeia.¹⁵ This advisory presupposes that all other aspects of sedation care are administered in accordance with standard recommendations^{2,15,16} and that a high level of vigilance is consistently maintained throughout sedation.

Limitations

The primary limitation of this advisory is the paucity of evidence on which it is based, requiring the inclusion of recommendations based largely on committee consensus.

This advisory is not a substitute for physician judgment or clinical assessment, and it is expected that there will be situations in which emergency physicians appropriately deviate

from the advisory because of unique clinical circumstances of an individual situation. The advisory is not intended to assert a legal standard of practice or absolute requirement and cannot be expected to guarantee any specific outcome. No single document can rigidly categorize appropriate practice in this setting; therefore, we offer this as a clinical guide combined with practical suggestions.

Implementation

We suggest that emergency physicians perform a 4-step assessment before each sedation. This sequence permits stratification of presedation aspiration risk and determination of prudent limits of targeted sedation. The [Figure](#) makes specific recommendations about procedural sedation and analgesia according to the 4-step assessment described in the following paragraphs.

Step 1: Assess Patient Risk

Given the lack of evidence to rank the various described aspiration risk factors relative to one another, the committee dichotomized patients as either standard risk (no risk factors present) or higher than standard risk (1 or more risk factors present to a degree individually or cumulatively judged clinically important by the treating physician).

Risk factors selected were as follows:

- Potential for difficult or prolonged assisted ventilation should an airway complication occur (eg, short neck, small mandible/micrognathia, large tongue, tracheomalacia, laryngomalacia, history of difficult intubation, congenital anomalies of the airway and neck, sleep apnea)

Figure Footnotes

- Higher-risk patients are those with one or more of the following present to a degree individually or cumulatively judged clinically important by the treating physician:
 - Potential for difficult or prolonged assisted ventilation should an airway complication occur (eg, short neck, small mandible/micrognathia, large tongue, tracheomalacia, laryngomalacia, history of difficult intubation, congenital anomalies of the airway and neck, sleep apnea)
 - Conditions predisposing to esophageal reflux (eg, elevated intracranial pressure, esophageal disease, hiatal hernia, peptic ulcer disease, gastritis, bowel obstruction, ileus, tracheo-esophageal fistula)
 - Extremes of age (eg, >70 years or <6 months)
 - Severe systemic disease with definite functional limitation (ie, ASA physical status 3 or greater)
 - Other clinical findings leading the EP to judge the patient to be at higher than standard risk (eg, altered level of consciousness, frail appearance)
- Procedural urgency:
 - Emergent (eg, cardioversion for life-threatening dysrhythmia, reduction of markedly angulated fracture or dislocation with soft tissue or vascular compromise, intractable pain or suffering).
 - Urgent (eg, care of dirty wounds and lacerations, animal and human bites, abscess incision and drainage, fracture reduction, hip reduction, lumbar puncture for suspected meningitis, arthrocentesis, neuroimaging for trauma)
 - Semi-urgent (eg, care of clean wounds and lacerations, shoulder reduction, neuroimaging for new-onset seizure, foreign body removal, sexual assault examination)
 - Non-urgent or elective (eg, non-vegetable foreign body in external auditory canal, chronic embedded soft tissue foreign body, ingrown toenail)
- Procedural sedation and analgesia terminology and definitions:
 - Minimal sedation (anxiolysis):^{1,15} A drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.
 - Moderate sedation (formerly "conscious sedation"):^{1,15} A drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation. Reflex withdrawal from a painful stimulus is not considered a purposeful response. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.
 - Dissociative Sedation:^{15,17} A trance-like cataleptic state induced by the dissociative agent ketamine characterized by profound analgesia and amnesia, with retention of protective airway reflexes, spontaneous respirations, and cardiopulmonary stability.
 - Deep sedation:^{1,15} A drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully following repeated or painful stimulation. The ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining a patent airway and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained.
 - General anesthesia:^{1,15} A drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation. The ability to independently maintain ventilatory function is often impaired. Patients often require assistance in maintaining a patent airway, and positive pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function may be impaired.

laryngomalacia, history of difficult intubation, congenital anomalies of the airway and neck, sleep apnea)

- Conditions predisposing to esophageal reflux (eg, elevated intracranial pressure, esophageal disease, hiatal hernia, peptic ulcer disease, gastritis, bowel obstruction, ileus, tracheoesophageal fistula)
- Extremes of age (eg, >70 years or <6 months)
- Severe systemic disease with definite functional limitation (ie, ASA physical status 3 or greater)
- Other clinical findings leading the emergency physician to judge the patient to be at higher than standard risk (eg, altered level of consciousness, frail appearance)

We included age less than 6 months as a risk factor, given that infants have a known predisposition to gastric regurgitation⁵⁸⁻⁶⁰ and previous authors frequently cite this specific age threshold.^{14,30,32,58}

There was complete agreement of the committee on the above classification.

Step 2: Assess the Timing and Nature of Recent Oral Intake

After debating the various options for risk-stratifying recent oral intake, the committee unanimously chose, for the sake of simplicity, to use a single time point and a graded risk based on the nature of the intake. Clinicians would assess the oral intake in the 3 hours before procedural sedation and analgesia as follows (from lowest to highest theoretical aspiration risk):

1. Nothing
2. Clear liquids only
3. Light snack
4. Heavier snack or meal

We recognize that gray zones exist between these categories, eg, do 2 potato chips constitute a light snack? Our intent is not that this classification be applied rigidly but rather be used as a general framework for individualized clinical decisionmaking.

Step 3: Assess the Urgency of the Procedure

The committee unanimously stratified procedural urgency as follows (from greatest to least harm as a consequence of deferring a procedure because of incomplete fasting):

1. Emergency (eg, cardioversion for life-threatening dysrhythmia, reduction of markedly angulated fracture or dislocation with soft-tissue or vascular compromise, intractable pain or suffering)
2. Urgent (eg, care of dirty wounds and lacerations, animal and human bites, abscess incision and drainage, fracture reduction, hip reduction, lumbar puncture for suspected meningitis, arthrocentesis, neuroimaging for trauma)
3. Semiurgent (eg, care of clean wounds and lacerations, shoulder reduction, neuroimaging for new-onset seizure, foreign body removal, sexual assault examination)
4. Nonurgent or elective (eg, nonvegetable foreign body in external auditory canal, chronic embedded soft tissue foreign body, ingrown toenail)

Again, we recognize that gray zones exist between these categories. Our intent is not that this classification be applied

rigidly but rather be used as a general framework for individualized clinical decisionmaking.

Step 4: Determine the Prudent Limit of Targeted Depth and Length of Procedural Sedation and Analgesia

The committee stratified the type and duration of procedural sedation and analgesia as follows to represent lowest to highest potential aspiration risk:

1. Minimal sedation
2. Dissociative sedation; brief or intermediate-length moderate sedation
3. Extended moderate sedation
4. Brief deep sedation
5. Intermediate or extended-length deep sedation

Again, we recognize that gray zones exist between some of these categories. Our intent is not that this classification be applied literally or rigidly but rather its general spirit be used in the context of clinical judgment.

Sedation state definitions were taken from well-established sources (Figure)^{1,15} We considered brief procedures to be those less than 10 minutes, intermediate procedures 10 to 20 minutes, and extended procedures greater than 20 minutes.

The above rankings refer to physician-targeted sedation depth rather than any absolute limit. It is well known that sedation depth can drift during a given procedure, especially if extended in length, and accordingly emergency physicians must be continually prepared to rescue patients from deeper-than-intended levels of sedation. For example, a prudent target of moderate sedation includes the implicit understanding that, despite the best titration efforts of the emergency physician, transient deep sedation may at times occur.

The committee judged extended moderate sedation to represent higher potential aspiration risk than brief or intermediate-length moderate sedation, given the difficulties of maintaining a consistent sedation depth during a prolonged period and the necessity of repeated sedative dosing. For similar reasons, intermediate- or extended-length deep sedation was thought to represent higher potential risk than brief deep sedation, the latter now commonly accomplished with a single loading dose (or titration round) of an ultrashort-acting sedative.

There was incomplete consensus in one aspect of this ranking, ie, the relative aspiration risk of extended moderate sedation versus brief deep sedation. Three members of the committee agreed with (and accordingly determined) the ranking above, with a fourth member regarding the 2 as approximately equal and a fifth believing brief deep sedation to likely represent lower potential aspiration risk than extended moderate sedation.

Emergency Procedures

Readers will notice that the advisory permits all levels of procedural sedation and analgesia for emergency procedures regardless of fasting status or underlying patient risk factors, which is not intended as a routine endorsement of such practice.

The committee believed that there were certain emergency situations in which the benefits of procedural sedation and analgesia at any sedation depth would outweigh the corresponding potential aspiration risk. For emergency procedures in particular, a risk/benefit analysis should be individualized according to the situation and available resources.

Alternatives When Desired Sedation Depth or Duration Exceeds Prudent Targeted Limits

Emergency physicians have several options when their desired sedation depth or duration exceeds the prudent limits presented in this advisory, and it is recommended that the risks and benefits of these alternatives be discussed with the patient (or the parent/guardian).

First, the procedure can be delayed for a sufficient time to be compliant with the advisory. Although this may be difficult from a logistic standpoint, given that EDs are often excessively crowded, patient safety must take precedence. Ultimately, the delay of any procedure must be balanced with the prolongation of pain and anxiety for the patient and the inconvenience for the patient and family.

Second, targeted sedation depth can be scaled back (eg, using moderate rather than deep sedation), or adjunctive regional anesthesia may be used. However, the likelihood that the patient will have increased pain or anxiety may be high: in some circumstances, unacceptably high.

Third, the emergency physician can refer the patient to the operating room for general anesthesia with endotracheal intubation, although aspiration and other anesthesia-related complications can occur despite this precaution.^{33,34}

Finally, in some circumstances the emergency physician may choose to perform the desired sedation strategy despite the advisory while documenting how the expected benefits outweigh the potential increase in aspiration risk.

SUMMARY

In this consensus-based clinical practice advisory, we propose specific recommendations for fasting before ED procedural sedation and analgesia and describe prudent limits for targeted sedation depth and length according to preprocedural risk stratification.

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REFERENCES

1. Joint Commission on Accreditation of Healthcare Organizations. *Sedation and Anesthesia Care Standards*. Oakbrook Terrace, IL: Joint Commission on Accreditation of Healthcare Organizations. Available at: <http://www.jacho.org>. Accessed July 15, 2006.
2. American College of Emergency Physicians. Clinical policy: procedural sedation and analgesia in the emergency department. *Ann Emerg Med*. 2005;45:177-196.
3. Green SM. Fasting is a consideration—not a necessity—for emergency department procedural sedation and analgesia [editorial]. *Ann Emerg Med*. 2003;42:647-650.
4. American Academy of Pediatrics Committee on Drugs. Guidelines for monitoring and management of pediatric patients during and after sedation for diagnostic and therapeutic procedures: addendum. *Pediatrics*. 2002;110:836-838.
5. American Academy of Pediatrics Committee on Drugs. Guidelines for monitoring and management of pediatric patients during and after sedation for diagnostic and therapeutic procedures. *Pediatrics*. 1992;89:1110-1115.
6. American Society of Anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. *Anesthesiology*. 2002;96:1004-1017.
7. Charles M, McGinnis HD, Wehner P. Propofol for procedural sedation in a community emergency department [abstract]. *Ann Emerg Med*. 2005;46:S64.
8. Babl FE, Puspitadewi A, Barnett P, et al. Preprocedural fasting state and adverse events in children receiving nitrous oxide for procedural sedation and analgesia. *Pediatr Emerg Care*. 2005;21:736-743.
9. American Society of Anesthesiologists. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures. *Anesthesiology*. 1999;90:896-905.
10. Bassett KE, Anderson JL, Pribble CG, et al. Propofol for procedural sedation in children in the emergency department. *Ann Emerg Med*. 2003;42:773-782.
11. Barnett P. Propofol for pediatric sedation. *Pediatr Emerg Care*. 2005;21:111-114.
12. Pitetti RD, Singh S, Pierce MC. Safe and efficacious use of procedural sedation and analgesia by nonanesthesiologists in a pediatric emergency department. *Arch Pediatr Adolesc Med*. 2003;157:1090-1096.
13. Godambe SA, Elliot V, Matheny D, et al. Comparison of propofol/fentanyl versus ketamine/midazolam for brief orthopedic procedural sedation in a pediatric emergency department. *Pediatrics*. 2003;112:116-123.
14. Soreide E, Eriksson LI, Hirlekar G, et al. Pre-operative fasting guidelines: an update. *Acta Anaesthesiol Scand*. 2005;49:1041-1047.
15. Krauss B, Green SM. Procedural sedation and analgesia in children. *Lancet*. 2006;367:766-780.
16. Krauss B, Green SM. Sedation and analgesia for procedures in children. *N Engl J Med*. 2000;342:938-945.
17. American College of Emergency Physicians. Clinical policy: procedural sedation in the emergency department. *Ann Emerg Med*. 2005;46:103-104.
18. Marik PE. Aspiration pneumonia and aspiration pneumonia. *N Engl J Med*. 2001;344:665-671.
19. Green SM, Krauss B. Pulmonary aspiration risk during ED procedural sedation: an examination of the role of fasting and sedation depth. *Acad Emerg Med*. 2002;9:35-42.
20. Ljungqvist O, Soreide E. Preoperative fasting. *Br J Surg*. 2003;90:400-406.

21. Brady M, Kinn S, Stuart P. Preoperative fasting for adults to prevent perioperative complications. *Cochrane Database Syst Rev.* 2003;(4):CD004423.
22. Brady M, Kinn S, O'Rourke K, et al. Preoperative fasting for preventing perioperative complications in children. *Cochrane Database Syst Rev.* 2005;(2):CD005285.
23. Kallar SK, Everett LL. Potential risks and preventive measures for pulmonary aspiration: new concepts in preoperative fasting guidelines. *Anesth Analg.* 1993;77:171-182.
24. Simini B. Preoperative fasting [letter]. *Lancet.* 1999;353:862.
25. Lydon A, McGinley J, Cooke T, et al. Effect of anxiety on the rate of gastric emptying of liquids. *Br J Anaesth.* 1998;81:522-525.
26. Nygren J, Thorell A, Jacobsson H, et al. Preoperative gastric emptying: effects of anxiety and oral carbohydrate administration. *Ann Surg.* 1995;222:728-734.
27. Agrawal D, Manzi SF, Gupta R, et al. Preprocedural fasting state and adverse events in children undergoing procedural sedation and analgesia in a pediatric emergency department. *Ann Emerg Med.* 2003;42:636-646.
28. Roback MG, Bajaj L, Wathen JE, et al. Preprocedural fasting and adverse events in procedural sedation and analgesia in a pediatric emergency department: are they related? *Ann Emerg Med.* 2004;44:454-459.
29. Treston G. Prolonged pre-procedure fasting time is unnecessary when using titrated intravenous ketamine for paediatric procedural sedation. *Emerg Med Australas.* 2004;16:145-150.
30. Heistein LC, Ramaciotti C, Scott WA, et al. Chloral hydrate sedation for pediatric echocardiography: physiologic responses, adverse events, and risk factors. *Pediatrics.* 2006;117:e434-e441.
31. Hoffman GM, Nowakowski R, Troshynski TJ, et al. Risk reduction in pediatric procedural sedation by application of an AAP/ASA process mode. *Pediatrics.* 2002;109:236-243.
32. Beach ML, Chapman JJ, Cohen D, et al. Nil per os times and pulmonary complication rates in pediatric sedation: results from the pediatric sedation research consortium [abstract]. Pediatric Academic Societies national meeting, San Francisco, CA; April 30, 2006. E-PAS2006:59:3130.4
33. Engelhardt T, Webster NR. Pulmonary aspiration of gastric contents in anaesthesia. *Br J Anaesth.* 1999;83:453-460.
34. Olsson GL, Hallen B, Hambraeus-Jonzon K. Aspiration during anaesthesia: a computer-aided study in 185,358 anaesthetics. *Acta Anaesthesiol Scand.* 1986;30:84-92.
35. Content Task Force Core II. The model of the clinical practice of emergency medicine. *Ann Emerg Med.* 2001;37:745-660.
36. Cook-Sather SD, Nicolson SC, Schreiner MS, et al. Proponents of liberalized fasting guidelines [letter]. *Anesthesiology.* 2005;102:236-237.
37. Cheung KW, Watson M-L, Field SG, et al. Aspiration pneumonia requiring intubation after procedural sedation and analgesia: a case report. *Ann Emerg Med.* 2007;49:462-464.
38. Coté CJ, Notterman DA, Karl HW, et al. Adverse sedation events in pediatrics: a critical incident analysis of contributing factors. *Pediatrics.* 2000;105:805-814.
39. Ingebo KR, Rayhorn NJ, Hecht RM, et al. Sedation in children: adequacy of two-hour fasting. *J Pediatr.* 1997;131:155-158.
40. Sandhar BK, Goresky GV, Maltby JR, et al. Effect of oral liquids and ranitidine on gastric fluid volume and pH in children undergoing outpatient surgery. *Anesthesiology.* 1989;71:327-330.
41. Splinter WM, Stewart JA, Muir JG. The effect of preoperative apple juice on gastric contents, thirst, and hunger in children. *Can J Anaesth.* 1989;36:55-58.
42. Splinter WM, Stewart JA, Muir JG. Large volumes of apple juice preoperatively do not affect gastric fluid pH and volume in children. *Can J Anaesth.* 1990;37:36-39.
43. Schwartz DA, Connelly NR, Theroux CA, et al. Gastric contents in children presenting for upper endoscopy. *Anesth Analg.* 1998;87:757-760.
44. Nicolson SC, Dorsey AT, Schreiner MS. Shortened preanesthetic fasting interval in pediatric cardiac surgical patients. *Anesth Analg.* 1992;74:694-697.
45. Tagaito Y, Isono S, Nishino T. Upper airway reflexes during a combination of propofol and fentanyl anesthesia. *Anesthesiology.* 1998;88:1459-1466.
46. Nishino T, Honda Y. Respiratory reflex responses to stimulation of tracheal mucosa in enflurane-anesthetized humans. *J Appl Physiol.* 1988;65:1069-1074.
47. Nishino T, Kochi T, Ishii M. Differences in respiratory reflex responses from the larynx, trachea, and bronchi in anesthetized female subjects. *Anesthesiology.* 1996;84:70-74.
48. Warner DO. Laryngeal reflexes: exploring terra incognita [editorial]. *Anesthesiology.* 1998;88:1433-1444.
49. Asai T. Who is at increased risk of pulmonary aspiration? *Br J Anaesth.* 2004;93:497-500.
50. Tiret L, Desmots JM, Hatton F, et al. Complications associated with anaesthesia: a prospective survey in France. *Can Anaesth Soc J.* 1986;33:336-344.
51. Keidan I, Gozal D, Minuskin T, et al. The effect of fasting practice on sedation with chloral hydrate. *Pediatr Emerg Care.* 2004;20:805-807.
52. Warner MA, Warner ME, Weber JG. Clinical significance of pulmonary aspiration during the perioperative period. *Anesthesiology.* 1993;78:56-62.
53. Warner MA, Warner ME, Warner DO, et al. Perioperative pulmonary aspiration in infants and children. *Anesthesiology.* 1999;90:66-71.
54. Green SM, Krauss B. Clinical practice guideline for emergency department ketamine dissociative sedation in children. *Ann Emerg Med.* 2004;44:460-471.
55. Green SM, Johnson NE. Ketamine sedation for pediatric procedures: part 2, review and implications. *Ann Emerg Med.* 1990;19:1033-1046.
56. Chudnofsky CR, Weber JE, Stoyanoff PJ, et al. A combination of midazolam and ketamine for procedural sedation and analgesia in adult emergency department patients. *Acad Emerg Med.* 2000;7:228-235.
57. Green SM, Li J. Ketamine in adults: what emergency physicians need to know about patient selection and emergence reactions [editorial]. *Acad Emerg Med.* 2000;7:278-281.
58. Phillips S, Daborn AK, Hatch DJ. Preoperative fasting for paediatric anaesthesia. *Br J Anaesth.* 1994;73:529-536.
59. Kawabata T, Tokumine J, Nakamura S, et al. Unanticipated vomiting and pulmonary aspiration at anesthesia induction in a formula-fed 4-month old infant [letter]. *Anesthesiology.* 2004;100:1330-1331.
60. Kawabata T, Tokumine J, Sugahara K, et al. Proponents of liberalized fasting guidelines [letter]. *Anesthesiology.* 2005;102:238.