Clinical Policy for Procedural Sedation and Analgesia in the Emergency Department

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PREFACE

Procedural sedation has received a great amount of attention in recent years. Several groups have produced documents covering its use, including the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), which has made it an area of intense review. Unfortunately, most of these promulgated advisory materials are not truly evidence-based. The following clinical policy, developed by the Clinical Policies Committee of ACEP, attempts to remove the bias from recommendations for procedural sedation by creating a document that is, to the degree possible, evidence-based. There is a relative lack of high-quality data in the area of procedural sedation. **It must be carefully noted, however, that in spite of the statements made in this policy, individual institutions will still be accredited on the basis of the criteria of the respective accrediting organization, such as the JCAHO.**

It is hoped that this policy will assist in the development of improved review criteria for procedural sedation.

INTRODUCTION

The appropriate management of anxiety and pain is an important component of comprehensive emergency medical care for patients of all ages. Pain control often is not adequately provided for a variety of reasons, which include fear of oversedation, concern of altering physical findings, or underestimation of patient needs.[1] However, proactively addressing pain and anxiety may improve quality of care and patient satisfaction by facilitating interventional procedures and minimizing patient suffering. Many of the drugs used for sedation and analgesia have the potential to cause central nervous system, respiratory, or cardiac depression. To minimize complications, the appropriate drug(s) and

dosages must be chosen, they must be administered in the proper setting, and a patient evaluation should be performed before, during, and after their use.

This policy should never supersede individual physician judgment in individual clinical circumstances.

DEFINITION

"Procedural sedation" refers to a technique of administering sedatives or dissociative agents with or without analgesics to induce a state that allows the patient to tolerate unpleasant procedures while maintaining cardiorespiratory function. Procedural sedation and analgesia is intended to result in a depressed level of consciousness but one that allows the patient to maintain airway control independently and continuously. Specifically, the drugs, doses, and techniques used are not likely to produce a loss of protective airway reflexes.[2]

RATIONALE AND GUIDELINE OBJECTIVES

Emergency physicians are trained in resuscitation and stabilization of critically ill patients, and in all aspects of patient management including airway assessment and interventions including rapid sequence intubation.[3] The emergency department is a unique environment where a variety of patients with emergent and urgent conditions are managed; many of these conditions result in significant pain and are associated with varying degrees of anxiety, making the management of analgesia and sedation a primary concern for the emergency physician. Many of the procedures performed by emergency physicians are time sensitive, such as the reduction of an extremity dislocation associated with, or at risk for, neurovascular compromise, and are facilitated by a cooperative patient, thus making it necessary for the emergency physician to be facile in the use of procedural sedation and analgesia.

This clinical policy provides an evidence-based approach to the application of procedural sedation and analgesia. It is based on a critical review of the literature available on patient evaluation and monitoring before, during, and after procedural sedation and analgesia, and makes recommendations based on strength of evidence. The intent is to help in the development of operating procedures with respect to procedural sedation and analgesia that ensure patients a comfortable and safe environment and that use available technologies appropriately. A wide variety of drugs and routes of administration are in use, and this policy is not designed to specifically assess these issues, since available agents vary from institution to institution, and selection of agents is dependent on clinician experience and patient characteristics. Many drug and dosing regimens used in procedural sedation and analgesia have been discussed in depth in other publications.[2,4,5]

According to the 1998 Comprehensive Accreditation Manual for Hospitals, the standards for anesthesia care apply when patients receive, "sedation (with or without analgesia) which, in the manner used, may be reasonably expected to result in the loss of protective reflexes."[6] Procedural sedation and analgesia in the ED is not reasonably expected to result in the loss of protective reflexes. When procedural sedation and analgesia is properly administered by experienced emergency physicians, loss of protective reflexes or clinically significant respiratory depression are extremely rare.[7-9]

INCLUSION AND EXCLUSION CRITERIA

This clinical policy is intended for hospital ED patients of all ages who have emergent or urgent conditions that require pain and/or anxiety management to successfully accomplish an interventional or diagnostic procedure. Patients with underlying cardiopulmonary disorders, multiple trauma, head trauma, or who have ingested a central nervous system depressant such as alcohol are included in this guideline. However, these patients are at increased risk of complications from procedural sedation and analgesia and require a high level of vigilance.[8,10]

Excluded from this guideline are: (1) patients receiving inhalational anesthetics, (2) patients who receive analgesia for pain control without sedatives, (3) patients who receive sedation solely for the purpose of managing altered mental status, and (4) patients who are intubated.

DESCRIPTION OF THE PROCESS

A MEDLINE search for articles published between January 1992 and August 1996 was performed using combinations of the key words conscious sedation, analgesia, sedation, standards, guidelines, and emergency department. A manual search was performed in the peer-reviewed emergency medicine literature from August 1996 through January 1997. Terms were exploded as appropriate. There were 124 references dealing with procedural sedation and analgesia in the primary care setting or in the ED that were identified for review. A secondary search of the bibliographies of these articles was performed to identify articles published before 1992 or those not identified in the first assessment, which resulted in an additional 28 articles for review. Of the total 152 articles, 44 articles were selected for analysis

by at least two subcommittee members and scored for "strength of evidence" according to the following criteria.

***Strength of evidence A*—**Unbiased interventional studies including clinical trials; observational studies including prospective cohort studies; aggregate studies including meta-analyses of randomized clinical trials only.

***Strength of evidence B*—**Unbiased observational studies including retrospective cohort studies, case-control studies, cross-sectional studies; aggregate studies including other metaanalyses.

***Strength of evidence C*—**Unbiased observational reports including case series, case reports; consensual studies including published panel consensus by acknowledged groups of experts.

Articles with significant flaws or design bias were downgraded in their strength of evidence (Table).

Strength of recommendations were then made according to the following criteria:

Standard: Generally accepted principles for patient management that reflect a high degree of clinical certainty (ie, based on "strength of evidence A" or overwhelming evidence from "strength of evidence B" studies that directly address the question at hand or from decision analysis that directly addresses all the issues).

Guideline: Recommendations for patient management that may identify a particular strategy or range of management strategies and that reflect moderate clinical certainty (ie, based on "strength of evidence B" that directly addresses the issue, decision analysis that directly addresses the issue, or strong consensus of "strength of evidence C").

Option: Other strategies for patient management for which the clinical utility is uncertain (ie, based on inconclusive or conflicting evidence or opinion).

There are many clinical questions that remain unanswered. Evidence-based medicine versus consensus-based medicine supports few standards of care. There was consensus that physicians should have an understanding of drugs administered, and someone should be available to provide airway management.

SCOPE OF APPLICATION

This guideline is intended for emergency physicians working in hospital-based EDs. Procedural sedation is a fundamental skill expected of a specialist in emergency medicine. It is expected that any emergency physician working in an ED will have procedural sedation within their scope of practice. Procedural sedation and analgesia is an identified core content area in emergency medicine training.[11] All physicians who are working or consulting in the ED should coordinate all procedures requiring procedural sedation and analgesia in the ED with the ED staff.

PERSONNEL

Procedural sedation and analgesia requires personnel who have *an understanding* and experience with the drugs used; *the ability* to monitor the patient's condition and recognize changes in clinical status; and *the skills* necessary to manage a compromised airway and to perform CPR.

The literature does not provide clear evidence on the number of personnel necessary to safely provide procedural sedation and analgesia. The presence of a support person assumes increased importance when the physician is involved in a procedure that precludes the ability to continually assess the patient's clinical status. However, there are situations where exceptions are permissible, such as when low doses of pharmacologic agents are used and the physician is able to maintain visual or verbal communication with the patient. During procedural sedation and analgesia there must be an individual available who is capable of recognizing and managing airway emergencies.

Personnel Recommendations

Evidence-Based Standards: None

Guidelines: (1) Personnel providing procedural sedation and analgesia must have an understanding of the drugs administered, the ability to monitor the patient's response to the medications given, and the skills necessary to intervene in managing all potential complications.

(2) If the provider is unable to adequately monitor the patient, an additional support person should be present.

Options: Have one support person present in addition to the individual performing the procedure.

PATIENT ASSESSMENT

Key components of the patient assessment include indications for procedural sedation and analgesia, past medical history, anesthetic history, medications, allergies, and drug reactions. The combination of vomiting and loss of airway protective reflexes is an extremely rare occurrence with procedural sedation and analgesia, making aspiration an unlikely event; however, potential for aspiration must always be considered in the timing and degree of procedural sedation and analgesia. There is lack of evidence that gastric emptying has any impact on the incidence of complications or on outcome in procedural sedation and analgesia.

There is a lack of literature to guide the extent of the physical examination before procedural sedation and anal-

gesia. In general, vital signs, mental status, and a cardiopulmonary assessment are sufficient. A general assessment of the patient's airway should be performed; however, further airway assessment may be indicated in select groups of patients such as those with difficult facial or neck anatomy, in patients who are very old, or patients with underlying cardiopulmonary disease.

There is no literature to support the need for specific laboratory testing before procedural sedation and analgesia; instead laboratory testing is driven by the patient's comorbid status.

Patient Assessment Recommendations

Evidence-Based Standards: None

Guidelines: (1) A past medical history should be obtained to identify comorbid medical disorders, medications, and allergies or prior drug reactions that may influence the administration of procedural sedation and analgesia agents. Physical examination including assessment of vital signs, airway, and cardiopulmonary status should be performed.

(2) Recent food intake is not a contraindication for administering procedural sedation and analgesia, but should be considered in choosing the depth and target level of sedation.

Options: None specified

CONSENT

It is good medical practice to discuss with patients all medications and interventions that will be provided. The discussion should include the risks, benefits, potential side effects, and alternatives. There is no literature to support that the use of an informed/consent form separate from the general informed/ consent obtained at registration in the ED has an effect on patient satisfaction or on clinical outcome. In some cases, procedural sedation and analgesia is provided in situations when the patient is in severe pain or extremely anxious because of the circumstances surrounding the ED visit; such situations limit the patient's ability to comprehend issues presented in the informed/consent process. In other circumstances, the informed/consent process is limited by an altered mental status, which affects the patient's capacity to understand risk and benefit. Procedural sedation and analgesia under implied consent may be appropriate in these circumstances.

Consent Recommendations

Evidence-Based Standards: None

Guidelines: None

Options: Obtain an informed/consent form separate from the consent obtained in the ED registration. Document that the patient was informed of risks and benefits on the patient's medical record.

EQUIPMENT AND SUPPLIES

Although rare, procedural sedation and analgesia may result in an allergic reaction, respiratory arrest, or cardiopulmonary arrest. The incidence of complications is dependent on the drugs used, rate and dose of administration, and patient sensitivities. Consequently, the appropriate protocols and equipment to monitor the patient's condition, and to manage airways, allergic reactions, drug overdoses, and to treat respiratory and cardiorespiratory arrest should be readily available; use of specific monitoring equipment is discussed in the following sections.

Equipment necessary for procedural sedation and analgesia includes oxygen, suction, and advanced life support equipment that includes medications, bag-valve–mask device, and intubation equipment. The need for intravenous access is dependent on the medications, the dose, and the route used.[9,10] When opioids or benzodiazepines are used, the opioid antagonist naloxone and the benzodiazepine antagonist flumazenil should be available. Both antagonists have been used in various protocols at the end of procedures to reverse the effects of the drugs[12-14]; however, there is no evidence to recommend this on a routine basis. In one case of respiratory arrest, naloxone completely reversed the respiratory depression.[15] In a study of 842 patients receiving fentanyl, four developed apnea, and all responded to naloxone.[8]

Equipment and Supplies Recommendations

Evidence-Based Standards: None

Guidelines: (1) Oxygen, suction, reversal agents, and advanced life support equipment should be available when procedural sedation and analgesia is used.

(2) Intravenous access should be established and maintained when intravenous procedural sedation and analgesia is provided; the need for intravenous access when procedural sedation and analgesia is provided by intramuscular, oral, nasal, or rectal drug administration is dependent on the dose used and patient comorbidity.

Options: None

PATIENT MONITORING AND DOCUMENTATION—GENERAL

Monitoring the patient's condition involves visual observation and assessment of the level of consciousness and phys-

iologic changes. The monitoring process should be documented (see Figure 1 for example). The components of monitoring may include level of consciousness, respiratory rate, blood pressure, oxygen saturation, percent of exhaled carbon dioxide, heart rate, blood pressure, and ECG rhythm. The patient's ability to follow commands is a method of monitoring level of consciousness. Except for those patients who have received dissociative agents, patients who are unable to follow commands are potentially at risk for airway compromise, need higher levels of monitoring, and may be candidates for drug reversal agents.

There are times when patients receive procedural sedation and analgesia and then must be transported outside the ED. In such cases, every attempt must be made to provide the same level of monitoring during the transport that was used inside the ED.

In general, documentation of the patient's preprocedure status and clinical status during and after the procedure are recommended. The available literature provides little guidance as to the minimum frequency at which vital signs should be recorded.

Vital sign monitoring includes assessment of blood pressure, pulse, and respiratory rate. Patients are at highest risk of complications within 5 to 20 minutes of receiving intravenous medications and during the postprocedure period when external stimuli are removed. In one study using midazolam and fentanyl, all cases of apnea occurred within 5 minutes of receipt of the drugs.[16] In another study, using diazepam and fentanyl, all episodes of desaturation occurred within 20 minutes of drug administration.[17]

There is no evidence that cardiac monitoring during procedural sedation and analgesia is of benefit, especially if the patient has no underlying cardiopulmonary disease.

General Recommendations

Evidence-Based Standards: None

Guidelines: (1) Obtain and document vital signs before, during, and after procedural sedation and analgesia.

(2) Monitor the patient's appearance and ability to respond to verbal stimuli during and after procedural sedation and analgesia.

Options: Use cardiac monitoring during procedural sedation and analgesia.

PATIENT MONITORING AND DOCUMENTATION—PULSE OXIMETRY

The use of pulse oximetry in procedural sedation and analgesia has been extensively reviewed in the recent literature.[18] Pulse oximetry provides continuous noninvasive estimates of arterial oxygen saturation and is a reliable tool in detecting early decreases in oxygen saturation and changes in the patient's heart rate. Under most circumstances, there is excellent correlation between the pulse oximeter saturation, measured by spectrophotometry, and arterial hemoglobin oxygen saturation measured by oximetry; however, when the hemoglobin saturation drops below 80%, accuracy may be affected.[18,19] The limitations of oximetry include its inability to detect early decreases in the adequacy of ventilation and thus the detection of the onset of hypercarbia that may occur before the development of apnea. Pulse oximetry's inability to detect early hypoventilation may be related to the administration of oxygen during procedural sedation and analgesia, which will delay the onset of hypoxemia.

Many studies have demonstrated the utility of pulse oximetry in detecting decreases in oxygen saturation; most of these studies define hypoxemia as a saturation of less than 90%.[10,16,17,20] It has been clearly demonstrated that many of the drugs used in procedural sedation and analgesia predispose the patient to the development of hypoxemia, and that drug combinations, especially benzodiazepines and opioids, have a potentiating effect in suppressing respirations. Despite the evidence that desaturation may occur during procedural sedation and analgesia, there is little information regarding the clinical significance of desaturation. Studies have demonstrated that decreases in oxygen saturation occur without clinical consequence, and in fact, transient decreases in oxygen saturation have been reported during sleep in healthy volunteers. In one series, 43% of asymptomatic men had desaturation to below 90% during sleep, with 13% below 75% including 1 case of apnea lasting 54 seconds.[21] Two studies have found that the only consistent predictor of desaturation during procedural sedation and analgesia is age greater than 60. These studies have not demonstrated clinical correlation between desaturation and increased tidal volume or respiratory rate.[22]

It has been hypothesized that failure to properly monitor oxygenation has led to drug-related deaths in procedural sedation and analgesia.[16] There are no studies showing that detection of a decrease in oxygen saturation alone during procedural sedation and analgesia, in the absence of other clinical findings such as inability to respond to verbal or tactile stimuli, has an impact on patient outcome. Claims that use of pulse oximetry could decrease adverse outcomes associated with procedural sedation and analgesia are speculative at this time and are based on reports that fail to mention medication dosing, rates of administration, monitoring procedures, or patient comorbidity. When the patient's level of consciousness or respiratory efforts can be adequately

assessed, procedural sedation and analgesia has an extremely low risk of morbid complications and mortality.[7-9,23,24] Without devaluing its utility as a monitoring adjunct, pulse oximetry should not substitute for comprehensive clinical assessments during procedural sedation and analgesia.

Pulse Oximetry Recommendations

Evidence-Based Standards: Pulse oximetry reduces the risk of unrecognized hypoxemia. 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.

Guidelines: When the patient's level of consciousness is minimally depressed and verbal communication can be continually monitored, pulse oximetry may not be necessary.

Options: None

PATIENT MONITORING AND DOCUMENTATION—CAPNOMETRY

Capnometry is a technique used to monitor end-tidal CO_2 ($PETCO_2$) and thus may detect early cases of inadequate ventilation before oxygen desaturation takes place.[18] There is an excellent correlation between $PaCO_2$ and $PETCO_2$ even when the $PETCO_2$ is measured through a nasal cannula while the patient is receiving oxygen.[25] It has been found that the combination of opioids and benzodiazepines results in decreased hypoxic ventilatory drive, and that hypoventilation may be detected by rising levels of CO_2.[16] Theoretically therefore, early detection with capnometry may be beneficial; however, there is no evidence that this benefit has an impact on patient outcome when used in procedural sedation and analgesia.[25] In one study of 27 ED patients receiving procedural sedation and analgesia with a benzodiazepine and/or opioids, the average $PETCO_2$ increased from 36 to 42 mm Hg while the oxygen saturation decreased from 98% to 94%. However, these changes were without clinical consequence.[25] One patient in this study had a desaturation level of 83%, but responded to verbal and tactile stimuli.

Capnometry Recommendations

Evidence-Based Standards: None

Guidelines: None

Options: Use of capnometry may be helpful when managing cases where the patient's ventilatory efforts cannot be visualized.[26]

DRUG ADMINISTRATION

A key to minimizing complications in procedural sedation and analgesia is the slow titration of drugs to the desired effect. Rapid administration of drugs may be associated with hypotension or respiratory depression. In addition, the combination of drugs may accentuate the potential side affects associated with each drug individually. In one study, use of benzodiazepines alone resulted in no significant respiratory depression, whereas use of an opioid alone caused hypoxemia in 50% of volunteers and caused a decrease in ventilatory response to carbon dioxide, but did not cause apnea. When the benzodiazepine and opioid were used together, hypoxemia occurred in 92% of subjects, apnea in 50%.[16] Although there was no clinical correlation of these findings to patient outcome, this study does suggest that the combined use of benzodiazepines and opioids increases the risk of respiratory compromise. Pohlgeers et al[17] also reported no association of benzodiazepine dose with desaturation. High doses of opioids without careful and slow titration also increase the risk of respiratory compromise; in a case report, Yaster et al[15] present a child who had a respiratory arrest after 10 μg/kg of fentanyl was given over approximately 4 minutes.

It has been recommended that when both a benzodiazepine and an opioid are used, the opioid, which poses the greater risk of respiratory depression, should be given first and the benzodiazepine dose titrated.[27]

Agents such as ketamine result in a dissociative state where a patient may not speak or respond purposefully to verbal commands. Use of ketamine in the doses recommended for procedural sedation and analgesia does not result in a loss of protective reflexes. The medical literature documents the safety of its use for procedural sedation and analgesia in pediatric populations.[9,28]

Drug Administration Recommendations

Evidence-Based Standards: None

Guidelines: Titrate drugs to clinical effect while monitoring respiratory rate and mental status.

Options: None specified.

POSTPROCEDURE AND DISCHARGE

The condition of all patients should be monitored in the immediate postprocedure period. It is during this period that all stimulation is removed, and pain and anxiety have been controlled, thus putting the patient at risk of complications from the medications used. In one study, the one

case of apnea occurred after a shoulder was relocated.[14] The duration of actions of all agents used, including reversal agents, must be taken into consideration before discharging the patient.

Discharge criteria should include the following information: (1) the patient is conscious and responds appropriately, (2) vital signs are within normal limits for that patient, (3) the respiratory status is not compromised, (4) pain and discomfort have been addressed, (5) there are no new signs, symptoms, or problems, and (6) there is minimal nausea. Patients who have not returned to their preprocedure baseline status may be discharged under the care of a responsible third party.

Postprocedure and Discharge Recommendations

Evidence-Based Standards: None

Guidelines: (1) The condition of all patients should be monitored in the immediate postprocedure period.

(2) Patients should return to preprocedure baseline before discharge or be discharged under the care of a responsible third party after meeting discharge criteria.

(3) Discharge instructions should be given (see Figure 2 for example).

Options: None

QUALITY ASSURANCE

A quality management program is a useful tool for monitoring the safety of procedural sedation and analgesia in the ED. Suggested indications for a quality management review include death, cardiopulmonary arrest, airway compromise, prolonged sedation, new neurologic deficit, significant hypoxemia, aspiration, significant hypotension, and significant bradycardia or tachycardia.

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Table

Reference	Grade	Minor Complications	Major Complications	Comments
Wilson and Pendleton[1]	C			Retrospective chart review of 198 patients with painful conditions; 56% received no analgesics while in the ED; patients who received analgesia were in the ED, 69% more than 1 hour, 42% more than 2 hours
Holzman et al[2]	C			Practice guideline Medication list Summary of literature Sample monitoring record
ACEP[3]	C			ACEP policy statement
Rose and Koenig[4]	C			Review
Sacchetti et al[5]	C			Review of pediatric literature Drug dosing recommendations
JCAHO[6]	C			Standards document
Barsan et al [7]	A	3 Nausea 6 Vomiting 1 Hypotension	None	Prospective, multicenter clinical trial; 72 patients receiving 1.5 to 3 mg/kg meperidine
Chudnofsky et al[8]	B	1 Nausea 2 Emesis 1 Urticaria 2 Pruritus	6 (.7%) respiratory compromise 3 (.4%) hypotension No sequelae, associated with comorbid factors, ie, alcohol, head trauma	Retrospective chart review, 841 patients receiving fentanyl; average dose 180 μg (range 25 to 1400 μg)
Green et al[9]	B	6 Emesis during recovery	1 case of emesis and laryngospasm with transient cyanosis with no adverse sequelae	Prospective uncontrolled trial of 108 children (14 months to 13 years) using intramuscular ketamine 4 mg/kg
Terndrup et al[10]	B	Not reported	3 patients (.6%) significant respiratory depression requiring intravenous naloxone	Descriptive retrospective chart review over 2 years (487 patients)
Task Force on Core Content for EM Revision[11]	C			ACEP policy statement

Table—*continued*

Reference	Grade	Minor Complications	Major Complications	Comments
Bartelsman et al[12]	A	None	None	Double-blind, placebo-controlled randomized, 69 outpatients. Flumazenil given after procedure reduced sedation time without rebound.
Keeffe and O'Connor[13]	C		During an average of 12 years using procedural sedation and analgesia, endoscopists reported on the average: 1 respiratory arrest, 4 cases of hypoventilation, .1 death	Questionnaire to 509 endoscopists; 290 responses
Wright et al[14]	B	1 Phlebitis 5 Nausea 1 Vomiting 1 Eyelid swelling	None	Prospective, double-blind, randomized multicenter trial; 69 patients (18 to 60 years old); not controlled for fentanyl
Yaster et al[15]	C		Respiratory arrest, "instantaneous resolution" with naloxone	Case report; large incremental doses of both drugs; over 4 minutes received 10 μg of fentanyl; no supplemental oxygen available
Bailey et al[16]	A	Midazolam alone caused no hypoxemia. Fentanyl alone caused hypoxemia in 50% without clinical correlate. Midazolam plus fentanyl caused hypoxemia in 92% without clinical correlate and apnea in 50%.	None. Apnea was defined as no respirations for 15 seconds and was observed in 50% of volunteers receiving both drugs; no complications	Randomized, double-blind crossover study in 12 volunteers
Pohlgeers et al[17]	B	11% Desaturation <90% .7% Vomited .7% Pruritus	None	Retrospective chart review of a standardized protocol in 133 consecutive patients

Table—*continued*

Reference	Grade	Minor Complications	Major Complications	Comments
AMA, Council on Scientific Affairs[18]	C			Review of the literature; no evidence that pulse oximetry affects outcome
Aughey et al[19]	B			Prospective, cross-sectional paired measurement of pulse oximetry versus hemoglobin saturation; strong correlation was found.
O'Connor and Jones[20]	C	None	None	260 consecutive patients undergoing elective endoscopy using benzodiazepine plus meperidine: 45% had desaturation <90%; 18% had desaturation <86%; none showed clinical signs of distress.
Block et al[21]	A	None	None	Desaturation in 43% of asymptomatic males documented during sleep
Bilotta et al[22]	C	41% desaturation without clinical correlate	None	103 consecutive patients, 22 to 96 years old; diazepam plus meperidine
Arrowsmith et al[23]	C	Study limited by retrospective design and lack of information on indications for procedures and on patient clinical status	.3 deaths/1000 procedures 5.4 serious cardiopulmonary events/1000 (not defined) See comment under "Minor Complications"	Aggregate study using computer-based data collection system: 19,363 procedures using midazolam, diazepam with or without narcotics: 17 sites, one site reported 54% of the midazolam-associated cardiorespiratory events, another center reported 54% of the diazepam-related events.
Ceravolo et al[24]	C	4.1% Phlebitis; .37% with nausea; 0 cases of vomiting	None	10,000 cases over 11 years using intravenous meperidine, diazepam, and methohexital in 7443 patients; diazepam plus methohexital in 2557 patients (ages 9 to 78 years)

Table—*continued*

Reference	Grade	Minor Complications	Major Complications	Comments
Wright[25]	B	Average $PETCO_2$ increased from 36 to 42 mm Hg; oxygen saturation dropped from 98% to 94%; no clinical correlation	1 episode of apnea lasting 30 seconds responded to verbal stimuli	Prospective, nonblinded, nonrandomized, noncontrolled observational trial. 27 patients treated with benzodiazepine and/or narcotic
ACEP[26]	C			ACEP policy statement
Bell et al[27]	C			British Society of Gastroenterology, Endoscopy guidelines
Pruitt et al[28]	C	None No desaturation 2 children vomited after procedure; 30% mild to moderate agitation postprocedure	None	37 children, case series
AHCPR[29]	C			Practice guideline
AAP[30]	C			Practice guideline
ASA[31]	C			Practice guideline
Barton and Wang[32]	B			Prospective cross-sectional analysis. $PETCO_2$ correlates well with $PaCO_2$.
Connors and Terndrup[33]	A	3 Inconsolable postprocedure	None	Double-blind, double-placebo, randomized trial, 58 children (1 to 10 years)
Doyle and Perrin[34]	C	1 Emergence delirium treated with morphine		1 case of emergence delirium that resolved without sequelae
Hovagim et al[35]	C	Hypoxemia without clinical correlation	None	Observational case series; 46 patients undergoing dental procedures
Lavies et al[36]	B	None mentioned	None mentioned	Single-blind, placebo-controlled study of 120 endoscopy patients who received midazolam, diazepam, or placebo. No significant hypoxemia noted.

Table—*continued*

Reference	Grade	Minor Complications	Major Complications	Comments
Mitchell et al[37]	C			45-second apnea 10 minutes after ketamine 4 mg/kg; responded to 6 ventilations with bag-valve–mask device
Shane et al[38]	A	2 Patients had inconsolable agitation postprocedure	None .	Randomized, double-blind, placebo-controlled, 34 children (14 to 51 months), .45 mg/kg rectal midazolam
Sievers et al[39]	B	No cases of emesis 13% desaturation below 90%; 1 below 80%; all within 10 minutes of medication; 3% required supplemental oxygen for hypoxemia not responsive to verbal stimulation	None	Prospective cohort: 24 children, 70 procedures. 14% required verbal stimulation to take deeper breaths. Higher doses of midazolam associated with hypoxemia
Singer and Thomas[40]	C	39% no hypoxemia, 32% mild, 28% moderate, 1% severe	1 case of hypoxemia <75% treated with oral airway; naloxone or oxygen not needed	100 consecutive patients (office-based surgery). Various medicines used—not controlled (fentanyl, droperidol, methohexital) No correlation between saturation and heart rate, ECG, blood pressure
Smith and Santer[41]	C		Apnea for 40 seconds following intramuscular ketamine, 4 mg/kg. Responded to bag-valve–mask ventilation.	Case report
Swanson et al[42]	C	3 had pain on injection 1 hypotension < 1 minute 1 had apnea < 30 seconds, responded to stimulation	1 apnea with desaturation to 86% requiring "brief" bag-valve–mask ventilation	Convenience sample, 20 patients received 2 µg/kg fentanyl and propofol .21 mg/kg/minute
Walsh et al[43]	C			Case report

Figure 1.

Sample Procedural Sedation and Analgesia Form

EQUIPMENT:

Oxygen ❒
Wall Suction ❒
Crash Cart ❒
Intubation Equipment ❒
❒ flumazenil
❒ naloxone
❒ diphenhydramine

PATIENT INFORMATION:

Name:
DOB:
ID#:
Address:
Phone:

PERSONNEL:

_____

_____

PRESEDATION PATIENT ASSESSMENT:

Indication:
Past Medical History:
Medications:
Allergies:
Last meal:
Other:

Vital Signs: P: BP: RR: T:
Mental Status:
Heart:
Lungs:
Pulses:
Monitor: Pulse oximetry:
$PETco_2$:
ECG:

Patient informed of risks/benefits: Yes: ❒ No: ❒

Procedural sedation and analgesia:
IV Access: Yes: ❒ No: ❒

Time:				
Medication:				
Skin color:				
LOC:				
P:				
RR:				
BP:				
O_2 in use:				
Po_2 sat%:				
$PETco_2$:				
Other intervention:				
Other comments:				
DISCHARGE:				

Level of Consciousness (LOC):
Vital Signs:
Neurovascular Status:
Pain Scale:

Dressing/Splint in place:
Patient tolerates POs:
Responsible Party:

RN Signature: _____
MD Signature: _____

DOB, Date of birth; **P,** pulse; **BP,** blood pressure; **RR,** respiratory rate; **T,** temperature; **LOC,** level of consciousness; **sat,** saturation; **POs,** by mouth.

Figure 2.

Sample Discharge Instructions After Sedation/Analgesia

The medicines you have received in the emergency department can sometimes cause confusion, sleepiness, or clumsiness; therefore, you need to be extra careful for the next 24 hours. If you have any questions, please do not hesitate to call the emergency department.

For Children:

1. Do not leave the child unattended at any time in a car seat; if the child falls asleep in the car seat, watch the child continuously to make sure that he or she does not have any difficulty breathing.
2. No eating or drinking for at least the next 2 hours, and the child is completely awake and alert, and has no nausea. If the child is an infant, half a normal feeding may be given 1 hour after discharge.
3. If sleepy, the child should not be left alone, and should be awakened from sleep every hour for the next 4 hours. If the child's breathing does not appear normal to you or if you are unable to wake the child up, call 911, or return to the hospital, *immediately*.
4. No playing that requires coordination (bikes, skating, swing sets, climbing, monkey bars, etc) for the next 24 hours since these activities might result in the child injuring himself or herself.
5. No swimming or using machines that might result in injury for the next 24 hours without adult supervision.
6. Supervise all playing or bathing for the next 8 hours.
7. Return immediately to the emergency department for vomiting more than once, strange or unusual behavior, or any other symptom that does not seem normal for the child.

For Adults:

1. Do not engage in any activity that requires alertness or coordination for the next 24 hours. This includes: No driving, operating heavy machinery, using power tools, cooking, climbing, or riding a bicycle.
2. No swimming, hot tubs, or baths for the next 24 hours.
3. Remain in the company of a family member, friend, or attendant for the next 24 hours.
4. Do not make any important decisions in the next 24 hours, such as signing contracts, expensive purchases, important commitments, and so on.
5. No alcohol for 24 hours.
6. Do not eat or drink if you have any nausea.
7. Take only medications prescribed by your physician, in the dose prescribed.
8. Return to the emergency department for vomiting more than once, strange or unusual behavior, confusion, or any other worrisome symptoms.