Gastrointestinal endoscopy in adults: Procedural sedation administered by endoscopists

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INTRODUCTION

Research and development in the field of gastrointestinal (GI) endoscopy has greatly expanded the diagnostic and therapeutic capabilities of these procedures. Adequate patient tolerance is essential for the successful completion of a safe examination and compliance with subsequent follow-up. As a result, endoscopists have developed skills in administering procedural sedation to facilitate procedures and enhance patient comfort.

This topic will discuss the endoscopist's approach to procedural sedation for GI endoscopy in adults. Anesthetic management for GI endoscopy delivered by anesthesia clinicians, including the use of propofol, deep sedation, and general anesthesia, is discussed separately. (See "Anesthesia for gastrointestinal endoscopy in adults".)

Adverse events related to sedation for GI endoscopy are discussed separately. (See "Adverse events related to procedural sedation for gastrointestinal endoscopy in adults".)

Some patients may not require or may not want to have intravenous sedation. The approach to performing GI endoscopy without sedation is discussed separately. (See "Sedation-free gastrointestinal endoscopy".)

Our approach to procedural sedation for patients undergoing GI endoscopy is generally consistent with guidelines from the American Society of Gastrointestinal Endoscopy (ASGE) [1].

GENERAL PRINCIPLES

Levels of sedation — A sedation continuum has been described, ranging from minimal sedation (anxiolysis) to general anesthesia (table 1). (See "Monitored anesthesia care in adults", section on 'Clinical assessment of sedation'.)

Moderate sedation (previously referred to as conscious sedation) is defined as a drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation [2]. No interventions are required to maintain a patent airway when spontaneous ventilation is maintained. In contrast, a deeply sedated patient may respond to a painful stimulus but otherwise cannot be aroused easily.

Minimal sedation (anxiolysis) or moderate sedation is appropriate for most nonadvanced endoscopic procedures (eg, diagnostic upper endoscopy, screening colonoscopy). However, it is not always possible to predict how a patient will respond to sedation, and continuous monitoring is required to detect and address hemodynamic changes before a significant cardiorespiratory event occurs. (See 'Monitoring' below.)

Goals — Goals of procedural sedation for GI endoscopy are to relieve patient anxiety and pain, improve the outcome of the examination, and diminish the patient's memory of the event [1].

Clinical use and requirements — Minimal or moderate sedation is commonly administered by endoscopists during nonadvanced endoscopic procedures (eg, upper endoscopy, colonoscopy) for patients who are American Society of Anesthesiologists (ASA) physical status ≤III. The ASA physical status classification system is a system for stratifying periprocedural risk of morbidity and mortality for patient-specific risk factors. (See 'American Society of Anesthesiologists physical status' below.)

Endoscopic procedures may be performed in several settings (free standing endoscopy unit, in-hospital endoscopy unit, other in-hospital locations outside of the endoscopy unit [eg, intensive care unit, operating room]). Basic and emergency equipment (eg, oral suction devices, oral airways, ventilatory devices such as Ambu bag), medications (including reversal agents), and personnel (including those trained in resuscitating a sedated patient) should be the same, regardless of the location. (See "Office-based anesthesia".)

Anesthesiology consultation — For patients who will have GI endoscopy with sedation, consultation with an anesthesia clinician to administer sedation is generally obtained for the following (see 'Presedation evaluation' below):

- Patient characteristics:
  - ASA physical status classification ≥IV (ie, severe comorbid illness) (table 2). (See 'American Society of Anesthesiologists physical status' below.)
  - History of difficult intubation.
  - Potential difficult airway based on airway examination. (See 'Focused physical examination' below.)
  - History of a hemodynamically significant adverse reaction to moderate sedation (eg, respiratory depression, hypoxemia).
  - History of intolerance to procedures performed with moderate level of sedation.
  - History of or active alcohol or substance use disorder.
  - Class III obesity (ie, body mass index [BMI] ≥40 kg/m^2).
  - Increased risk for airway obstruction (eg, anatomic variant, such as macroglossia, tonsillar hypertrophy, or nonvisible uvula; severe obstructive sleep apnea) [2]. Patients who meet criteria for sleep apnea are traditionally classified based on symptoms and the apnea-hypopnea index, and this is discussed separately. (See "Clinical presentation and diagnosis of obstructive sleep apnea in adults", section on 'Classification of severity'.)
  - Indication for urgent endoscopy (eg, patients with active GI bleeding and increased risk for aspiration).
- Procedure-related characteristics:
  - Advanced and/or therapeutic procedure (eg, endoscopic retrograde cholangiopancreatography, endoscopic ultrasound). (See "Anesthesia for gastrointestinal endoscopy in adults", section on 'Advanced endoscopic procedures'.)

PRESEDATION EVALUATION

Goals — A medical history is obtained and a focused physical examination is performed for all patients who receive sedation for endoscopy. The goals for presedation evaluation are to identify underlying conditions that may increase risk and to create a plan for procedural sedation that minimizes risk, while managing coexisting medical conditions.

Risk factors for adverse events — Patient characteristics that may increase risk for intolerance to sedative and anesthetic medications or for adverse events include [1]:

- Risk factors for intolerance to moderate sedation [3]:
  - History of or active substance use disorder (eg, alcohol, opioids)
  - History of anxiety disorder
  - Chronic benzodiazepine use
  - Chronic opioid use
  - Use of an opioid agonist (eg, buprenorphine)
  - History of intolerance to procedures performed with moderate sedation
- Risk factors for difficult airway management:
  - Established or suspected obstructive sleep apnea (eg, periods of silence followed by loud snoring) (see "Clinical presentation and diagnosis of obstructive sleep apnea in adults")
  - Dysmorphic facial features (eg, trisomy 21)
  - Oral abnormalities (eg, small oral aperture [<3 cm in adults], macroglossia, nonvisible uvula, edentulous mouth)
  - Neck abnormalities (eg, decreased hyoid-mental distance [<3 cm in adults], neck mass, rheumatoid arthritis)
  - Class III obesity (ie, body mass index [BMI] ≥40 kg/m^2)
- Risk factors for aspiration:
  - History of gastroparesis
  - Class III obesity (ie, BMI ≥40 kg/m^2)
  - Ingestion of solid food <6 hours prior to procedure
  - Ingestion of liquids <2 hours prior to procedure
  - Suspected bowel obstruction (eg, vomiting, abdominal pain, abdominal distension) (see "Etiologies, clinical manifestations, and diagnosis of mechanical small bowel

obstruction in adults", section on 'Clinical presentations')

- Inability to swallow solids and/or liquids, including secretions (see "Approach to the evaluation of dysphagia in adults", section on 'Acute dysphagia')
- Acute upper GI bleeding (see "Approach to acute upper gastrointestinal bleeding in adults")
- Large or tense ascites with abdominal distension (see "Evaluation of adults with ascites", section on 'Diagnosis')

- Other risk factors for adverse events:
  - Comorbid conditions (chronic lung, liver or kidney disease, coronary artery disease) [4,5] (see "Anesthesia for the patient with liver disease")
  - Older adults (≥65 years of age) (see "Anesthesia for the older adult")
  - History of adverse reaction to sedatives

Anesthetic management options for patients with one or more risk factors for adverse events with intravenous sedation depends on the specific risk factor(s), clinician preferences, patient preferences, and the available resources. Management options for at-risk patients may include a sedation level goal of minimal sedation (rather than moderate), adjusting the sedative/analgesic regimen and/or dosing (eg, using midazolam alone, using longer time intervals between doses), or consulting an anesthesia clinician. (See 'Anesthesiology consultation' above and 'Sedation management' below.)

For some patients undergoing nonadvanced procedures (eg, diagnostic upper endoscopy), unsedated endoscopy is a reasonable alternative to intravenous sedation, and this is discussed separately. (See "Sedation-free gastrointestinal endoscopy".)

Airway management for patients at risk for respiratory depression or obstruction, including the use of airway devices, is presented separately. (See "Anesthesia for gastrointestinal endoscopy in adults", section on 'Airway management'.)

Focused physical examination — Presedation focused physical examination includes:

- Baseline level of consciousness
- Vital signs, weight, height
- Heart and lung auscultation

- Abdominal exam (ie, assess for distension, tenderness)
- Airway assessment, including determination of the Mallampati classification (figure 1), mouth opening >3 fingerbreadths, neck mobility

The Mallampati classification identifies patients at increased risk for difficult endotracheal intubation or sleep apnea, and it is a scoring system that relates the amount of mouth opening to the size of the tongue [1]. Other physical features that could make positive pressure ventilation or endotracheal intubation difficult include obesity, decreased distance between the mentum and the neck/mandible junction (<3 cm in adults), cervical spine disease (eg, rheumatoid arthritis), structural abnormalities of the mouth, and jaw or oral cavity (picture 1). Clinical features predicting a difficult airway are discussed in more detail separately. (See "Approach to the difficult airway in adults for emergency medicine and critical care", section on 'Identifying the anatomically difficult airway'.)

No published data have shown that determining the Mallampati classification prior to endoscopy leads to reduced risk of cardiorespiratory adverse events. However, assigning Mallampati class may identify patients at increased risk for difficult airway management if they progress from moderate to deep sedation in which airway reflexes might be lost. (See 'Anesthesiology consultation' above and 'Risk factors for adverse events' above.)

American Society of Anesthesiologists physical status — Patients are classified using the American Society of Anesthesiologists (ASA) physical status classification to identify patients who are at increased risk for periprocedural adverse events (table 2). For patients with increased risk of adverse events because of severe comorbid illness (ASA classification ≥IV), an anesthesia clinician is consulted to provide sedation. (See 'Anesthesiology consultation' above.)

Pregnancy — For women of childbearing age who are uncertain of pregnancy status and are undergoing endoscopy with mild to moderate sedation, a preprocedure urine or serum pregnancy test is performed, unless the patient refuses and waives the testing in writing. For women who are pregnant, the approach to intravenous sedation is discussed below. (See 'Special populations' below.)

PREPROCEDURE PREPARATION

Preprocedure preparation includes:

- **Preoperative fasting** – Patients should follow preoperative fasting guidelines as they would for any type of anesthetic (table 3). (See "Preoperative fasting in adults".)

Specifically, the American Society of Anesthesiologists (ASA) guidelines state that patients should fast for a minimum of two hours after ingestion of clear liquids and six hours after ingestion of light meals before sedation is administered.

- **Informed consent** – Informed consent is obtained prior to all GI endoscopic procedures. Informed consent is a process that involves discussing the procedure (including administration of sedation) and the associated risks, benefits, alternatives, and limitations. (See "Informed procedural consent".)

SEDATION MANAGEMENT

Monitoring — The goal of intraprocedural monitoring for patients undergoing endoscopic procedures is to detect changes in pulse, blood pressure, ventilatory status, cardiac electrical activity, and level of sedation so that they can be addressed before a significant cardiorespiratory adverse event occurs [1]. During endoscopic procedures with mild to moderate sedation, the personnel responsible for patient monitoring can perform brief, interruptible tasks [6]. (See 'Levels of sedation' above.)

Monitoring is performed using a combination of visual assessment and monitoring devices:

- At a minimum, assessing level of consciousness and vital signs occurs [1]:
  - Before the procedure is started
  - After administration of sedative-analgesic medications
  - At least every five minutes during the procedure
  - During initial recovery
  - Immediately prior to discharge
- The approach to intraprocedural monitoring of hemodynamic and ventilatory status includes [1,2,6,7]:
  - Hemodynamic monitoring – Heart rate is monitored continuously, and blood pressure is checked at baseline and then at three- to five-minute intervals.
  - Electrocardiography – We use continuous electrocardiographic monitoring for all patients. Society guidelines state that electrocardiographic monitoring is required for patients with a history of cardiovascular disease or cardiac dysrhythmia.

- Pulse oximetry – Continuous pulse oximetry is required for all patients [8]. However, it is relatively insensitive for detecting early hypoventilation and is not a replacement for direct observation of the patient.

- Capnography – Ventilation is often monitored noninvasively with capnography (carbon dioxide monitoring in exhaled breath) during moderate sedation. Society guidelines on the use of capnography during nonadvanced endoscopic procedures with moderate sedation vary in their recommendations [1,2,6]; however, there is consensus that patients undergoing advanced endoscopic procedures (eg, endoscopic retrograde cholangiopancreatography, endoscopic ultrasound) are routinely monitored with capnography. The benefits of capnography include facilitating early detection of apnea and airway obstruction and predicting the development of hypoxemia, and this is discussed separately. (See "Anesthesia for gastrointestinal endoscopy in adults", section on 'Monitoring'.)

  Capnography is typically obtained using a separate sample cannula that connects to the nasal cannula delivering supplemental oxygen. (See 'Supplemental oxygen' below.)

  Alternatively, this cannula can be connected to or taped within a face mask. An infrared measuring cell analyzes the carbon dioxide content of inspired and expired gases. The data are displayed as a capnographic waveform, and capnography is discussed in more detail separately. (See "Carbon dioxide monitoring (capnography)".)

Supplemental oxygen — Supplemental low-flow oxygen (eg, 3 liters per minute) is routinely provided for patients receiving intravenous sedation [2]. Oxygen is typically administered via nasal cannula, while face mask is an alternative delivery method.

Oxygen supplementation reduced the hypoxemia rate for patients undergoing GI endoscopy. In a trial of 389 patients receiving moderate sedation for endoscopic procedures, the rate of hypoxemia (oxygen desaturation ≤95 percent) was lower in patients given nasal cannula oxygen compared with no supplemental oxygen (12 versus 71 percent) [9].

Indirect data from studies of oxygen use during moderate sedation for patients in other settings (eg, emergency room) also support the routine use of supplemental oxygen [10,11].

Sedatives and analgesics

Choosing a drug regimen — For most patients having an endoscopic procedure with minimal or moderate sedation administered by the endoscopist, the typical drug regimen is a combination of midazolam (to minimize anxiety) and fentanyl (to minimize pain) [1,12].

Midazolam alone is a reasonable alternative, particularly for patients who may have increased risk for adverse events related to sedatives and analgesics (eg, older adults) [13]. (See 'Risk factors for adverse events' above.)

The dose, onset, duration, and effects of drugs that are commonly used for sedation administered by nonanesthesia clinicians are shown in the table (table 4), and they are discussed in more detail separately. (See "Anesthesia for gastrointestinal endoscopy in adults", section on 'Choice of drugs for sedation/analgesia'.)

Midazolam — Midazolam is a short-acting benzodiazepine with anxiolytic, amnestic, and sedative effects, but without analgesic effects. Midazolam potentiates the effects of other sedatives and opioids, and can cause respiratory depression when given in high doses or with other agents. (See "Monitored anesthesia care in adults", section on 'Midazolam'.)

Midazolam dosing and administration depends on patient age and comorbid conditions associated with increased sensitivity to sedation (see 'Risk factors for adverse events' above):

- Adults <65 years of age and without comorbidities – For adults <65 years of age and without comorbidities, the initial bolus dose of midazolam is 1 to 2 mg over two to three minutes. If the initial dose does not result in anxiolysis or adequate sedation, additional 0.5 to 1 mg boluses can be given every two to five minutes to achieve the desired depth of sedation.

- Adults ≥65 years of age and/or with comorbidities – For adults ≥65 years of age and/or with comorbidities, the initial bolus dose of midazolam is 0.5 to 1 mg intravenously. If the initial dose does not result in anxiolysis or adequate sedation, subsequent doses (0.5 mg intravenously) can be given every two to five minutes.

The onset of action of an intravenous bolus of midazolam occurs in about one to three minutes, with peak effect at approximately five minutes. The elimination half-life of midazolam is one to four hours [14].

If midazolam is used in combination with an opioid and additional drug doses are required during the procedure, only one drug is administered at a time for subsequent boluses. For example, we wait for two to five minutes following each midazolam dose to observe the effect before determining if an additional opioid dose is required. (See 'Opioids' below.)

If the level of sedation exceeds moderate sedation, the effects of midazolam can be temporarily reversed with flumazenil. The dosing and administration of flumazenil is listed in the table (table 5). (See 'Levels of sedation' above.)

The use of reversal agents is discussed separately. (See "Adverse events related to procedural sedation for gastrointestinal endoscopy in adults", section on 'Management'.)

Opioids — Opioids are given during procedural sedation for GI endoscopy to provide analgesia. Fentanyl is most commonly used because of its rapid onset of action and clearance. Fentanyl is typically administered intravenously in small intermittent boluses of 25 or 50 mcg, with lower doses (ie, 12.5 or 25 mcg) for patients at risk for increased sensitivity to analgesics (eg, patients with cardiopulmonary disease, older patients). (See 'Risk factors for adverse events' above.)

For fentanyl, the onset of action is two to three minutes, and the dose may be repeated in two minutes if the desired level of analgesia is not achieved (table 4).

If fentanyl is being used in combination with midazolam and additional drug doses are required during the procedure, only one drug is administered at a time for subsequent boluses. For example, we wait for two minutes following each fentanyl dose to observe the effect before determining if an additional midazolam dose is required. (See 'Midazolam' above.)

Meperidine is an opioid alternative to fentanyl. However, meperidine is rarely used and has been associated with longer recovery time and more adverse effects (eg, nausea) than fentanyl [7]. In a trial including 111 patients undergoing upper endoscopy or colonoscopy, the total time (intraprocedure and recovery time) was longer for patients receiving meperidine compared with fentanyl (103 versus 88 minutes) [15].

In addition, meperidine is **avoided** in the following patients:

- Patients taking monoamine oxidase inhibitors due to drug interactions. (See "Monoamine oxidase inhibitors (MAOIs): Pharmacology, administration, safety, and side effects".)
- Patients with cirrhosis. Meperidine is metabolized extensively in the liver, and its clearance is reduced by liver dysfunction. (See "Management of pain in patients with advanced chronic liver disease or cirrhosis", section on 'Opioids'.)

Fentanyl should be used cautiously with lower initial and subsequent doses (ie, doses of 12.5 or 25 mcg) for patients with a history of seizures because opioids lower the seizure threshold. Periprocedural care of the patient with a seizure disorder is discussed separately. (See "Perioperative care of the surgical patient with neurologic disease", section on 'Seizure disorders'.)

Opioids can be temporarily reversed with naloxone, although naloxone can induce acute opioid withdrawal in patients with a history of chronic opioid use (table 5). In addition, it may cause

a significant increase in sympathetic activity, leading to hypertension and pulmonary edema. Reversal agents are discussed separately. (See "Adverse events related to procedural sedation for gastrointestinal endoscopy in adults", section on 'Management'.)

Topical anesthesia — Topical (pharyngeal) anesthesia can be administered prior to upper GI endoscopy to suppress the gag reflex, facilitate insertion of the endoscope, and possibly reduce the doses of intravenous drugs for sedation. While we do not routinely use pharyngeal anesthesia, it may be useful for patients having minimal or no procedural sedation or for patients who report gagging easily.

Commonly used drugs for topical anesthesia include lidocaine and benzocaine, which are administered by aerosol spray or gargling. The effects last for up to one hour.

Whether pharyngeal anesthesia resulted in less discomfort for patients given moderate procedural sedation is uncertain. In a meta-analysis of five trials including 491 patients undergoing upper endoscopy, patients given pharyngeal anesthesia were more likely to report no or minimal discomfort compared with no pharyngeal anesthesia (odds ratio [OR] 1.88, 95% CI 1.13-3.12), [16]. However, indirect data suggested that for patients undergoing upper endoscopy with intravenous propofol, differences in verbal or somatic responses or gag reflex were not observed in those given pharyngeal anesthesia compared with placebo [17,18].

Benzocaine has been associated with methemoglobinemia and should be **avoided** in patients with a previous history of methemoglobinemia or known glucose-6-phosphate dehydrogenase deficiency. (See "Methemoglobinemia", section on 'Topical anesthetics'.)

Pharmacologic adjuncts — Pharmacologic adjuncts to the combination of midazolam and an opioid include diphenhydramine, which can potentiate the action of the drug regimen and prolong recovery time [1]. Diphenhydramine is not used routinely, but it may be given to selected patients who are not expected to achieve moderate sedation with a midazolam-opioid regimen (eg, patients who use benzodiazepines or opioids chronically).

When used as an adjunct, diphenhydramine, 25 to 50 mg intravenously, is typically given prior to initiating procedural sedation.

Adverse effects associated with diphenhydramine include dizziness, blurred vision, dry mouth, epigastric discomfort, thickening of bronchial secretions, and urinary retention. Warnings/contraindications include narrow angle glaucoma and symptomatic prostatic hypertrophy. Respiratory depression is a concern with combinations of diphenhydramine and a benzodiazepine and/or opioid, particularly in at-risk patients (eg, those who are obese or have obstructive sleep apnea). (See 'Presedation evaluation' above.)

Limited data on diphenhydramine use for GI endoscopy suggested that it improved sedation quality for some patients [19,20]. In a trial of 119 patients on chronic opioid therapy, diphenhydramine plus midazolam and fentanyl resulted in lower patient-reported pain scores compared with midazolam-fentanyl regimen alone [20].

The use of monitored anesthesia care and propofol for patients who do not achieve moderate sedation with a midazolam-opioid regimen is discussed separately. (See "Anesthesia for gastrointestinal endoscopy in adults".)

ADVERSE EVENTS

Mild to moderate procedural sedation for GI endoscopy is generally well tolerated, but adverse events (eg, respiratory depression) can occur. These issues are discussed separately. (See "Adverse events related to procedural sedation for gastrointestinal endoscopy in adults".)

POSTPROCEDURE CARE

The pharmacologic effects of drugs used for sedation/analgesia usually extend beyond the duration of the endoscopic procedure. Monitoring (ie, vital signs, respiratory effort, and level of consciousness) and supplemental oxygen are maintained while the patient recovers from the effects of the medications. Patient care is transferred to recovery area personnel who can promptly detect respiratory or cardiovascular compromise. (See 'Monitoring' above.)

Management of adverse events related to procedural sedation including postprocedure care for patients who required a reversal agent is discussed separately. (See "Adverse events related to procedural sedation for gastrointestinal endoscopy in adults".)

Patients who have completely recovered (ie, breathing spontaneously without need for any form of airway support, alert, speaking, responding appropriately to commands, and hemodynamically stable) can be prepared for discharge. Such patients are instructed to avoid driving a motor vehicle, operating machinery, or consuming alcohol until the following day. Patients are then discharged with an adult to accompany them home. Written instructions are also provided.

SPECIAL POPULATIONS

Pregnancy — Some pregnant women require endoscopic evaluation when it is clear that failure to do so would expose the fetus and/or mother to harm [21]. However, safety data on procedural sedation are based on small and uncontrolled retrospective studies, and potential adverse effects include teratogenicity [22].

Our approach to procedural sedation for pregnant women includes [21-23]:

- Procedure timing – Endoscopic procedures are performed in the second trimester, whenever possible.
- Obstetrics consultation – Obstetrics is consulted to assess the need for periprocedural fetal monitoring to ensure the viability of the pregnancy pre- and postprocedure.
- Anesthetic management – For most pregnant women, we consult with an anesthesia clinician to provide procedural sedation (typically propofol). (See "Anesthesia for nonobstetric surgery during pregnancy".)

  For some pregnant women having nonadvanced endoscopic procedures, alternatives to sedation provided by an anesthesia clinician include:

  - Unsedated endoscopy (with topical anesthetic for upper endoscopy) (see "Sedation-free gastrointestinal endoscopy"), or
  - Minimal to moderate intravenous sedation (typically midazolam-fentanyl regimen) administered by the endoscopist [24]

Lactation — The approach to endoscopist-administered procedural sedation for women who are breastfeeding includes [21] (see "Common problems of breastfeeding and weaning", section on 'Maternal use of medications'):

- Midazolam – Infants should not be breastfed for at least four hours after maternal midazolam administration. After four hours, breast milk should be pumped and discarded before reinitiating breastfeeding. (See "Safety of infant exposure to antidepressants and benzodiazepines through breastfeeding", section on 'Benzodiazepines'.)
- Opioids – Fentanyl is preferred for lactating women rather than meperidine because the concentrations of fentanyl in breast milk are too low to be pharmacologically significant, as opposed to meperidine, which is concentrated in breast milk [25]. Breastfeeding may be continued without interruption after maternal fentanyl administration.

The drugs and lactation database (Lactmed), produced by the National Library of Medicine, is an online reference for lactation compatibility for drugs [26].

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Endoscopy preparation, sedation, and special considerations".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword[s] of interest.)

- Basics topics (see "Patient education: Colonoscopy (The Basics)")
- Beyond the Basics topics (see "Patient education: Colonoscopy (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- Minimal or moderate sedation is appropriate for most nonadvanced endoscopic procedures (eg, diagnostic upper endoscopy, screening colonoscopy). The goals of procedural sedation for gastrointestinal (GI) endoscopy are to relieve patient anxiety and pain, improve the outcome of the examination, and diminish the patient's memory of the event. (See 'General principles' above.)
- For all patients undergoing GI endoscopy, a medical history is obtained and a focused physical examination is performed prior to giving intravenous sedation. The goals for

presedation evaluation are to identify underlying conditions that may increase risk and to create a plan for procedural sedation that minimizes risk, while managing coexisting medical conditions. (See 'Goals' above.)

- Consultation with an anesthesia clinician to administer sedation for GI endoscopy is generally obtained for any of the following patient or procedure characteristics (see 'Anesthesiology consultation' above):
  - American Society of Anesthesiologists (ASA) physical status classification ≥IV
  - History of difficult intubation
  - Potential difficult airway based on airway examination (see 'Focused physical examination' above)
  - History of a hemodynamically significant adverse reaction to sedation (eg, hypoxemia)
  - History of intolerance to procedures performed with moderate level of sedation
  - History of or active alcohol or substance abuse
  - Class III obesity (ie, body mass index [BMI] ≥40 kg/m^2)
  - Increased risk for airway obstruction (eg, severe obstructive sleep apnea)
  - Indication for urgent endoscopy (eg, patients with active GI bleeding and increased risk for aspiration)
  - Advanced and/or therapeutic procedure (eg, endoscopic retrograde cholangiopancreatography, endoscopic ultrasound)

- For patients undergoing endoscopic procedures with intravenous sedation, monitoring includes visual assessment, hemodynamic monitoring (eg, heart rate, blood pressure), pulse oximetry, and often capnography. The goal of monitoring is to detect changes in pulse, blood pressure, ventilatory status, cardiac electrical activity, and level of sedation so that they can be addressed before a significant cardiorespiratory adverse event occurs. (See 'Monitoring' above.)

- For patients having an endoscopic procedure with minimal or moderate sedation administered by the endoscopist, the typical drug regimen is a combination of midazolam (to minimize anxiety) and fentanyl (to minimize pain) (table 4). (See 'Sedatives and analgesics' above.)

- Procedural sedation for GI endoscopy is generally well tolerated but adverse events (eg, respiratory depression) can occur. These issues are discussed separately. (See "Adverse events related to procedural sedation for gastrointestinal endoscopy in adults".)

- The pharmacologic effects of drugs used for sedation/analgesia usually extend beyond the duration of the endoscopic procedure. Monitoring and supplemental oxygen are

maintained while the patient recovers from the effects of the medications. Patients who have completely recovered (ie, breathing spontaneously without need for any form of airway support, alert, speaking, responding appropriately to commands, and hemodynamically stable) can be prepared for discharge. (See 'Postprocedure care' above.)

- Anesthetic management for GI endoscopy administered by anesthesia clinicians, including the use of monitored anesthesia care, propofol, deep sedation, and general anesthesia, is discussed separately. (See "Anesthesia for gastrointestinal endoscopy in adults".)

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Topic 2567 Version 26.0

GRAPHICS

Continuum of depth of sedation: Definition of general anesthesia and levels of sedation/analgesia*

	Minimal sedation anxiolysis	Moderate sedation/analgesia ("conscious sedation")	Deep sedation/analgesia	General anesthesia
Responsiveness	Normal response to verbal stimulation	Purposeful¶ response to verbal or tactile stimulation	Purposeful¶ response following repeated or painful stimulation	Unarousable even with painful stimulus
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular function	Unaffected	Usually maintained	Usually maintained	May be impaired

- **Minimal sedation (anxiolysis)** is a drug-induced state during which patients respond normally to verbal commands. Although cognitive function and physical coordination may be impaired, airway reflexes and ventilatory and cardiovascular functions are unaffected.
- **Moderate sedation/analgesia ("conscious sedation")** is a drug-induced depression of consciousness during which patients respond purposefully¶ to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.
- **Deep sedation/analgesia** is 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** is 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.
- Because sedation is a continuum, it is not always possible to predict how an individual patient will respond. Hence, practitioners intending to produce a given level of sedation should be able to rescue$^{\Delta}$ patients whose level of sedation becomes deeper than initially intended. Individuals administering moderate sedation/analgesia ("conscious sedation") should be able to rescue$^{\Delta}$

patients who enter a state of deep sedation/analgesia, while those administering deep sedation/analgesia should be able to rescue[Δ] patients who enter a state of general anesthesia.

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* Monitored anesthesia care (MAC) does not describe the continuum of depth of sedation; rather it describes "a specific anesthesia service in which an anesthesiologist has been requested to participate in the care of a patient undergoing a diagnostic or therapeutic procedure."

¶ Reflex withdrawal from a painful stimulus is **not** considered a purposeful response.

Δ Rescue of a patient from a deeper level of sedation than intended is an intervention by a practitioner proficient in airway management and advanced life support. The qualified practitioner corrects adverse physiologic consequences of the deeper-than-intended level of sedation (such as hypoventilation, hypoxia, and hypotension) and returns the patient to the originally intended level of sedation. It is not appropriate to continue the procedure at an unintended level of sedation.

Graphic 109909 Version 4.0

American Society of Anesthesiologists Physical Status (ASA PS) Classification System

ASA PS classification	Definition	Examples, including, but not limited to:
ASA I	A normal healthy patient	Healthy, nonsmoking, no or minimal alcohol use.
ASA II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Current smoker, social alcohol drinker, pregnancy, obesity (30<BMI<40), well-controlled DM/HTN, mild lung disease.
ASA III	A patient with severe systemic disease	Substantive functional limitations; one or more moderate to severe diseases. Poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESKD undergoing regularly scheduled dialysis, premature infant PCA <60 weeks, history (>3 months) of MI, CVA, TIA, or CAD/stents.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Recent (<3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARDS, or ESKD not undergoing regularly scheduled dialysis.
ASA V	A moribund patient who is not expected to survive without the operation	Ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction.
ASA VI	A declared brain-dead patient whose organs are being removed for donor purposes	

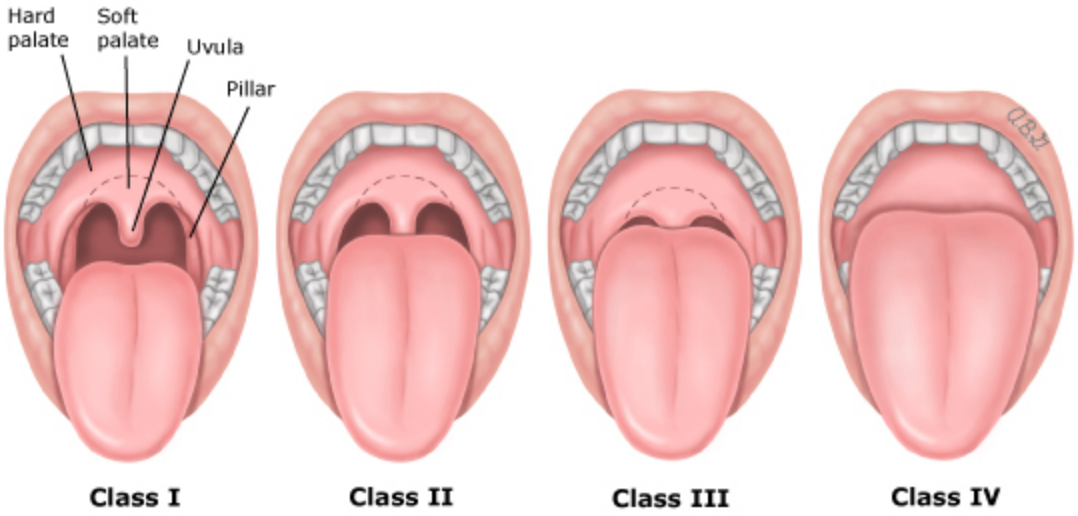
The addition of "E" to the numerical status (eg, IE, IIE, etc) denotes Emergency surgery (an emergency is defined as existing when delay in treatment of the patient would lead to a significant

increase in the threat to life or body part).

BMI: body mass index; DM: diabetes mellitus; HTN: hypertension; COPD: chronic obstructive pulmonary disease; ESKD: end-stage kidney disease; PCA: post conceptual age; MI: myocardial infarction; CVA: cerebrovascular accident; TIA: transient ischemic attack; CAD: coronary artery disease; DIC: disseminated intravascular coagulation; ARDS: acute respiratory distress syndrome.

Graphic 87504 Version 9.0

The modified Mallampati classification for difficult laryngoscopy and intubation



The modified Mallampati classification[1] is a simple scoring system that relates the amount of mouth opening to the size of the tongue and provides an estimate of space available for oral intubation by direct laryngoscopy. According to the Mallampati scale, class I is present when the soft palate, uvula, and pillars are visible; class II when the soft palate and the uvula are visible; class III when only the soft palate and base of the uvula are visible; and class IV when only the hard palate is visible.

Reference:

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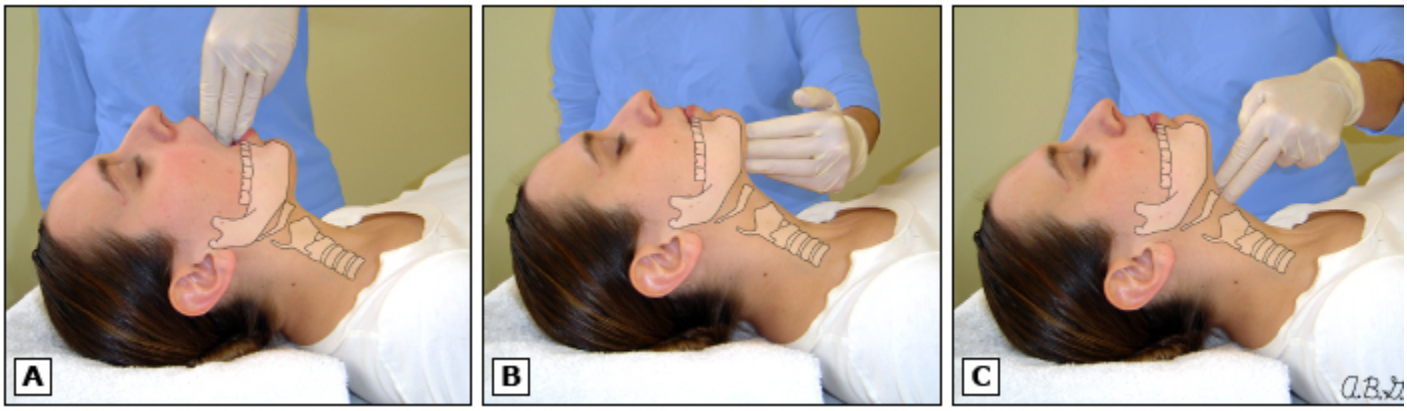
Graphic 75229 Version 10.0

The 3-3-2 rule for identifying a difficult airway



The spatial relationships described here are important determinants of successful direct laryngoscopy. The normal distances shown suggest laryngoscopy would not be difficult for this patient.

(A) The patient can open their mouth sufficiently to admit 3 of their own fingers.

(B) The distance between the mentum and the neck/mandible junction (near the hyoid bone) is equal to the width of 3 of the patient's fingers.

(C) The space between the superior notch of the thyroid cartilage and the neck/mandible junction, near the hyoid bone, is equal to the width of 2 of the patient's fingers.

Graphic 60507 Version 7.0

Fasting guidelines of international anesthesia societies

Anesthesia society	Fasting requirements at time of induction	Comments
American Society of Anesthesiologists, 2017[1,2]	▪ 2 hours clear liquids, excluding alcohol ▪ 4 hours breast milk ▪ 6 hours nonhuman milk, formula, light meal ▪ 8 hours or more for fatty meal, fried food, meat ▪ Chewing gum allowed up until induction	▪ Healthy patients, not in labor, elective surgery ▪ Light meal defined as toast or cereal with clear liquid ▪ Healthy adults should drink carbohydrate containing clear liquids up to 2 hours prior to surgery
European Society of Anesthesiology and Intensive Care[3,4]	▪ Adults: • 2 hours clear liquids • 6 hours milk, solid food • Chewing gum and sucking hard candy allowed up until induction	▪ Encourage oral fluid up to 2 hours
	▪ Children: • 1 hour clear liquids • 3 hours breast milk • 4 hours formula or nonhuman milk, light breakfast (weak recommendations) • 6 hours other solid food	▪ Encourage oral fluid up until fasting time
Australian and New Zealand College of Anaesthetists[5]	▪ Adults: • 2 hours clear liquids • 6 hours limited solid food	▪ Guidelines may not apply to patients who are at increased risk of perioperative regurgitation or vomiting ▪ Up to 400 mL of clear liquid up to 2 hours prior to induction for adults is likely safe
	▪ Children >6 months of age: • 1 hour clear liquids (≤3 mL/kg) • 4 hours breast milk • 6 hours formula and limited solid food	

	▪ Children <6 months of age: • 1 hour clear liquids (≤3 mL/kg) • 3 hours breast milk • 4 hours formula	
Association of Anaesthetists in Great Britain and Ireland[6]	▪ 2 hours clear liquids ▪ 4 hours breast milk ▪ 6 hours solid food, formula and cow's milk	▪ Gum chewing treated as clear
Canadian Anesthesiologists' Society[7]	▪ 1 hour clear liquids for children ▪ 2 hours clear liquids for adults ▪ 4 hours breast milk ▪ 6 hours for solid food, infant formula, nonhuman milk, expressed breast milk fortified with additions	▪ Encourage oral clear liquids up until fasting time
Scandinavian Society of Anaesthesiology and Intensive Care Medicine[8]	▪ 2 hours clear liquids ▪ 4 hours breast milk and infant formula ▪ 6 hours solid food and cows milk ▪ 2 hours chewing gum and any tobacco product ▪ Up to 1 hour prior to induction, 150 mL of water	▪ 2 hours for preoperative carbohydrate drinks intended for preoperative nutrition
German Society of Anesthesiology and Intensive Care[9]	▪ 2 hours clear liquids ▪ 4 hours breast milk and infant formula ▪ 6 hours meal	
Pediatric societies		
Joint statement from Association of Paediatric Anaesthetists of Great Britain and Ireland, European Society for Paediatric Anaesthesiology, L'Association Des Anesthésistes-Réanimateurs	▪ 1 hour clear liquids for children up to 16 years of age	▪ Encourage intake of clear liquids

Pédiatriques d'Expression Française[10]		
Canadian Pediatric Anesthesia Society[11]	▪ 1 hour clear liquids for children	▪ Encourage intake of clear liquids
The Society for Paediatric Anaesthesia of New Zealand and Australia[12]	▪ 1 hour clear liquids for children	▪ Encourage intake of clear liquids

GERD: gastroesophageal reflux disease.

References:

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2. *Joshi GP, Abdelmalak BB, Weigel WA, et al. 2023 American Society of Anesthesiologists Practice Guidelines for Preoperative Fasting: Carbohydrate-containing Clear Liquids with or without Protein, Chewing Gum, and Pediatric Fasting Duration-A Modular Update of the 2017 American Society of Anesthesiologists Practice Guidelines for Preoperative Fasting. Anesthesiology 2023; 138:132.*
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Graphic 94641 Version 19.0

Sedative and analgesic medications for gastrointestinal endoscopy in adults

Medication	Initial dose (adult)*	Onset	Duration	Repeat dose¶	Effects
Benzodiazepines					
Midazolam	0.5 to 2 mg IV over 2 to 3 minutes	1 to 3 minutes	10 to 40 minutes	2 to 5 minutes	▪ Sedative, amnestic, anxiolytic ▪ Potentiates effects of other agents ▪ Delayed recovery in older adults, patients with obesity or impaired hepatic function
Opioids					
Fentanyl	25 to 50 mcg IV over ≥3 minutes	2 to 3 minutes	30 to 60 minutes	2 minutes	▪ Analgesic, minimal sedation ▪ Respiratory depression, nausea and vomiting may occur ▪ Minimal hypotension and histamine release ▪ Reduce dose when used in combination with benzodiazepine
Meperidine	25 to 50 mg IV over 3 to 5 minutes	5 minutes	60 to 180 minutes	5 to 10 minutes	▪ Analgesic, sedative ▪ Respiratory depression, nausea and vomiting may occur ▪ Hypotension, histamine release ▪ Reduce dose when used in combination with benzodiazepine ▪ Interaction with MAO inhibitors

Refer to UpTodate content on procedural sedation for gastrointestinal endoscopy in adults.

MAO: monoamine oxidase; IV: intravenous.

* Doses should be modified based on patient factors (eg, doses reduced for patients with comorbidities or older adults).

¶ Sedatives and analgesics: Repeat one-half initial dose at interval noted if needed to achieve desired depth and duration of sedation. Additional titration may be needed.

Data from:

1. *Cohen LB, DeLegge MH, Aisenberg J, et al. AGA institute review of endoscopic sedation. Gastroenterology 2007; 133:675.*
2. *Early DS, Lightdale JR, Vargo JJ et al. Guidelines for sedation and anesthesia in GI endoscopy. Gastrointestinal endoscopy 2018; 87:327.*

Graphic 65736 Version 8.0

Reversal agents for opioids, benzodiazepines, and anticholinergic agents

Drug class	Reversal agent	Dose of reversal agent (IV)	Time between repeat doses	Maximum cumulative initial dose	Additional dosing if necessary
Opioids	Naloxone	40 mcg	2 to 5 minutes	10 mcg/kg	Infusion at 1 to 10 mcg/kg per hour, with careful titration of the infusion rate according to patient response.
Benzodiazepine	Flumazenil	0.2 mg	1 minute	1 mg	After a 20 minute interval, if sedation is evident, additional 0.2 mg doses may be administered to a maximum of 1 mg. After another 20 minute interval, this dosing may be repeated. No more than 3 mg should be administered in a single hour.
Anticholinergic agent	Physostigmine	0.5 to 1 mg (slow IV push)	5 to 10 minutes	2 mg	

IV: intravenous.

Data from:

1. *Nicodemus HF, Rose JB. Delayed emergence in pediatric patients. In: Complications in Anesthesia, 1st ed, Atlee JL (Ed), Saunders, Philadelphia 1999.*
2. *Anderson JA. Reversal agents in sedation and anesthesia: a review. Anesth Prog 1988; 35:43.*

Graphic 106215 Version 3.0

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