

# Moderate Sedation

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## Purpose

The purpose of this course is to provide current information about moderate sedation, including preprocedural, procedural, postprocedural and discharge processes with updates from the American Society of Anesthesiologists.

## Goals

Upon completion of this course, the nurse should be able to

- Describe the four levels of sedation.
- Describe 6 main components of a preprocedural assessment.
- Describe the 1-to-6 ASA score.
- Describe the 4 classes of the Mallampati score and the 3-3-2 rule.
- List at least 10 findings of concern related to airway assessment.
- Discuss the use and components of the OBESE, MOANS, RODS, SHORT, and LEMON mnemonics.
- Discuss the primary elements of informed consent.
- Explain NPO guidelines for those 0 to 6 months and 6 months to adult.
- Discuss 6 types of medications that may or may not be used to reduce risk of pulmonary aspiration.
- Explain 5 contraindications to moderate sedation.
- List equipment that must be available, including airway management and advanced airway management equipment.
- Explain 4 requirements of the procedural team.
- Explain 5 items that should be verified with the pre-procedural time out.
- List and discuss at least 10 things that must be recorded during the procedure.
- Describe 3 different sedation scales: RAS, SS, RASS.
- Describe at least 6 drugs commonly used for sedation and 3 commonly used for analgesia.
- Describe 2 reversal agents.
- Describe at least 5 interventions for airway obstruction.
- Discuss 4 elements of a post-procedural assessment.

- Describe elements of the discharge summary.

## Introduction

Sedation is commonly used for painful or uncomfortable medical procedures and surgery. Sedation is administered along a continuum that ranges from minimal sedation to general anesthesia. The American Society of Anesthesiologists (ASA) recommended new guidelines for moderate sedation in October 2014

<b>Minimal sedation/Anxiolysis</b>	
Responsiveness	Responds normally to verbal stimulation. Cognitive function/physical coordination may be impaired.
Airway	Not affected
Spontaneous ventilation	Not affected
Cardiovascular function	Not affected



<b>Moderate sedation/Analgesia "Conscious sedation"</b>	
Responsiveness	Depressed state of consciousness with purposeful response to verbal or tactile stimulation (does not include reflex withdrawal from painful stimuli).
Airway	No intervention required
Spontaneous ventilation	Adequate
Cardiovascular function	Usually maintained



<b>Deep sedation/Analgesia</b>	
Responsiveness	Purposeful response to verbal or tactile stimulation (does not include reflex withdrawal from painful stimuli).
Airway	Intervention may be required
Spontaneous ventilation	May be inadequate
Cardiovascular function	Usually maintained



<b>General anesthesia</b>	
Responsiveness	Unarousable even with painful stimulus.
Airway	Intervention often required

Spontaneous ventilation	Frequently inadequate
Cardiovascular function	May be impaired

## Preprocedural assessment

### 1. Patient health history

The patient's health history should include:

- Review of both the past and present medical history.
- Review of current medications, including supplements and herbal preparations.
- List of allergies and adverse reactions to medications as well as latex allergy and food allergies that may suggest a cross-sensitivity to latex (kiwi, avocado, papaya, apple, chestnuts, banana, celery, carrot, melons, tomato, and potato).
- Previous experiences with anesthesia and sedation, especially negative responses or complications.
- History of stridor, snoring, or sleep apnea
- History of advanced rheumatoid arthritis
- Presence of chromosomal abnormality, such as trisomy 21.
- Review results of recent available lab tests and order additional lab tests as indicated by patient's condition.
- Consult with medical specialist if indicated.

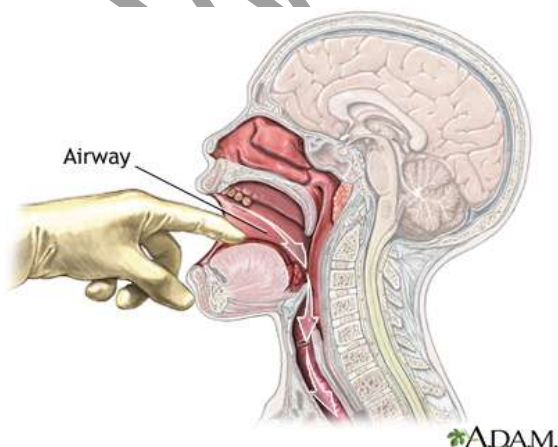
### 2. Physical examination

The patient's physical examination should include:

- Baseline vital signs.
- Oxygen saturation.
- Weight and height.
- Pain level (0-10 scale).
- Review of all systems with special focus on:
  - Cardiovascular: Unstable coronary artery disease, heart failure, hypertension, MI in previous 6 months.
  - Respiratory: COPD, asthma, OSA, URI.
  - Endocrine: Blood glucose (>250), pregnant status, GERD, morbid obesity.
  - Neurological: History of seizures or stroke in previous 6 months, intracranial mass, severe migraines.
  - Renal: Renal insufficiency.
  - Hepatic: Hepatic failure, cirrhosis.
- **ASA Score:** American Society of Anesthesiologists (ASA) physical status classification system is used to determine the patient's overall health status prior to a procedure although the classification is not validated to predict risk.

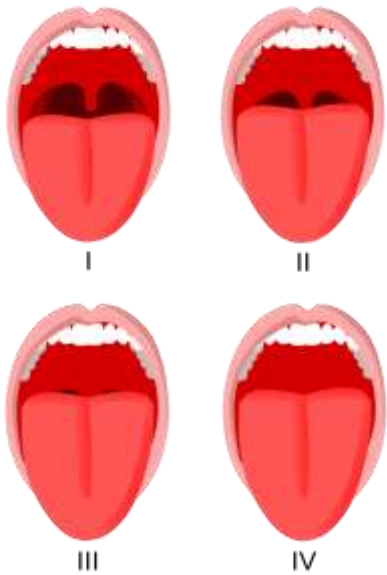
ASA Score		
<b>1</b>	Patient is healthy.	Non-smoking, no/minimal alcohol use
<b>2</b>	Patient has mild systemic disease.	Current smoker, moderate alcohol use, pregnant, obese, controlled hypertension, controlled diabetes mellitus
<b>3</b>	Patient has severe systemic disease.	Substantive functional limitations, poorly controlled hypertension, poorly controlled diabetes mellitus, active hepatitis, substance abuse, decreased ejection fraction, pacemaker, ESRD with dialysis, history (>3 months) of MI, CVA, TIA, or CAD/stents.
<b>4</b>	Patient has severe life-threatening systemic disease.	Includes recent (<3 months) MI, CVA, TIA, or CAD/stents, cardiac ischemia, valve dysfunction, severely decreased ejection fraction, sepsis, DIC, ARD, or ESRD without regularly scheduled dialysis.
<b>5</b>	Patient is moribund and survival without the operation is unlikely.	Includes ruptured aortic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel associated with cardiac pathology or multi-organ system dysfunction.
<b>6</b>	Patient is declared brain-dead and organs are being removed for donor purposes.	

The classification may be modified by the addition of E (for emergency) and P (for pregnant patient): Thus, a pregnant patient with a severe systemic disease would be classified as 3P.



### 3. Airway assessment

Because positive pressure ventilation (with or without intubation) may be needed in the event complications arise, airway assessment is essential.



Examination of the facial features and airway should include the **Mallampati score**.

The Mallampati score, which relates the size of the tongue to the pharynx, helps to determine the degree of difficulty with direct laryngoscopy, should it be necessary. Patients should be positioned sitting upright and awake for the examination with the head in neutral position.

The score is determined by asking patients to open their mouths and stick out their tongues. Scores are assigned based on visible structures:

**Class I:** The soft palate, fauces, uvula, and anterior and posterior pillars are all visible.

**Class II:** The soft palate, fauces, and uvula are visible.

**Class III:** The soft palate and the base of the uvula are visible

**Class IV:** The soft palate is not visible at all.

Patients with Class III and IV Mallampati scores are at greater risk of developing difficulty during moderate sedation and require someone present with experience providing anesthesia to at-risk patients. Mouth opening should be greater than 4 cm and thyromental distance greater than 6 cm.

- Evaluate the **3-3-2-rule** to help predict a difficult airway. The three criteria should be met:

- 3 fingers in mouth
- 3 fingers fit from mentum to hyoid cartilage
- 2 fingers fit from the floor of the mouth to the top of thyroid cartilage.



Findings of concern:

- Long prominent upper incisors (“buckteeth”).
- Edentulous status.
- Pronounced overbite.
- Highly arched or abnormally narrow palate.
- Inability of the patient to touch the chin to the chest or to extend the neck.
- Limited ability to open mouth.
- Morbid obesity.
- Beard or facial hair (may interfere with mask).
- Receding mandible.
- Short, thick neck.
- Any type of airway obstruction (tumor, abscess, hematoma, swelling).
- Abnormal facial features.

A number of different **mnemonics** can be used for airway assessment. The mnemonic **OBESE** is used to help predict the **difficulty in utilizing bag-valve mask ventilation**. Two or more of the following findings indicate increased risk of difficulty.

<b>OBESE</b>	
<b>O</b>	Obese BMI >26 kg/m <sup>2</sup>
<b>B</b>	Bearded
<b>E</b>	Elderly (>55)
<b>S</b>	Snorers.
<b>E</b>	Edentulous

The mnemonic **MOANS** can also be used to predict **difficulty in utilizing bag-valve mask ventilation**.

<b>MOANS</b>
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<b>M</b>	Mask seal difficult because of receding mandible, facial abnormalities, burns, strictures, etc.
<b>O</b>	Obesity, upper airway obstruction.
<b>A</b>	Advanced age.
<b>N</b>	No teeth.
<b>S</b>	Snorer.

The mnemonic RODS is used to evaluate the **difficulty in utilizing an extraglottic device** (such as the laryngeal mask airway).

<b>RODS</b>	
<b>R</b>	Restricted mouth opening.
<b>O</b>	Obstruction
<b>D</b>	Disrupted/Distorted airway
<b>S</b>	Stiff lungs/spine

The mnemonic SHORT is used to evaluate the **difficulty of performing a cricothyrotomy**, should an emergency situation occur.

<b>SHORT</b>	
<b>S</b>	Surgery
<b>H</b>	Hematoma
<b>O</b>	Obesity
<b>R</b>	Radiation (or other distortion)
<b>T</b>	Tumor

The mnemonic LEMON is used to evaluation the **difficulty of performing a laryngoscopy and intubation**.

<b>LEMON</b>	
<b>L</b>	Look
<b>E</b>	Evaluate 3-3-2
<b>M</b>	Mallampati score
<b>O</b>	Obstruction/Obesity
<b>N</b>	Neck

#### **4. Informed consent**

The patient/family/caregiver should be advised of the risks and benefits and alternatives to the procedure as well as risk and benefits of not having the procedure. Risks discussed should include hypotension, cardiac

dysrhythmias, bradycardia, respiratory depression, allergic reactions, need for intubation, need for assisted ventilation, and risk of deeper sedation than intended as well as inadequate analgesia.

## 5. Food and fluids

Time and extent of most recent food/drink intake should be assessed before procedure to ensure appropriate fasting. The patient/parent/caregiver should have been advised about food/fluid restrictions at least the day prior to the procedure.

NPO Guidelines			
Age	Solids/Milk/Formul a	Breast milk	Clear liquids
0-6 months	4 hours	4 hours	2 hours
6 months-adult	6 hours	4 hours	2 hours

**NOTE:** Fried and fatty foods or meat may need additional fasting times, such as 8 hours or more.

## 6. Medications that can be used to reduce the risk of pulmonary aspiration in healthy patients undergoing elective procedures.

Medication recommendations			
GI stimulants	Metoclopramide	May be used	No routine use
Gastric acid secretion blockers	Cimetidine, famotidine, ranitidine, omeprazole, lansoprazole	May be used	No routine use
Antacids	Sodium citrate, sodium bicarbonate, magnesium trisilicate	May be used	No routine use
Antiemetics	Ondansetron	May be used	No routine use
Anticholinergics	Atropine, scopolamine, glycopyrrolate	NO USE	
Combinations of the above drugs			No routine use

## Contraindications to moderate sedation

The following are generally considered contraindications to moderate sedation:

- Food/Fluid intake: <2 hours for clear liquids and 6 hours for light solids except in emergent procedures (but this should be considered when choosing appropriate drugs).
- ASA score of 4 or greater (see above).
- Lack of support staff to monitor patient.
- Lack of monitoring equipment.
- Lack of experience/credentialing for the healthcare provider who is to perform the procedure.

## **Equipment that must be available**

The following equipment should be available for patient monitoring and emergency use:

- IV equipment (appropriate for age and size of patient):
  - Gloves, tourniquets, alcohol wipes, sterile gauze pads
  - IV catheters, tubing, and fluids
  - Assorted needles for drug aspiration, IM injections
  - Appropriately sized syringes
  - Intraosseous access kit
  - Tape
- ECG monitor.
- Pulse oximeter.
- Airway management equipment:
  - Source of compressed oxygen with regulator or flowmeter
  - Source of suction with suction catheters, Yankauer suction, face masks, self-inflating breathing bag-valve set
  - Oral and nasal airways
  - Lubricant
- Advanced airway management equipment:
  - Supraglottic airway devices
  - Laryngoscope blades (various sizes) and tested handles,
  - ETTs
  - Stylet
- Capnograph.
- Crash cart with AED/defibrillator and resuscitative drugs
- Reversal agents (naloxone for opioids, flumazenil for benzodiazepines):  
Must be available in procedure room
- Sedative agents (as needed for procedure)
- Emergency medications: Recommendations include epinephrine, ephedrine, vasopressin, atropine, nitroglycerine, amiodarone, lidocaine, glucose (IV or oral), diphenhydramine, hydrocortisone or

methylprednisolone or dexamethasone, benzodiazepines, beta blocker, and adenosine

- Intravenous access (whenever IV sedation is administered or more than very light sedation is planned)

## **Procedural team**

At least one member of the procedural team must

- be capable of recognizing airway complications and can establish a patent airway and provide positive pressure ventilation.
- understand the pharmacology of the drugs administered and potential interactions with other drugs and nutraceuticals the patient may be taking.
- be able to establish IV access.
- have the skills to provide chest compressions.

Additionally, an individual or service (such as a code blue team) with advanced life support skills must be immediately available, and members of the procedural team should be able to recognize the need for additional support and know how to access emergency services.

## **Pre-procedural time out**

Once the patient is in position but before beginning the procedure, a brief time out should be carried out so that any concerns can be addressed. The time out should include verification of:

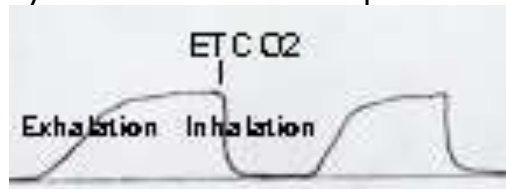
- The patient's ID.
- A signed consent form that lists the correct procedure.
- The correct side and site of the procedure (marked according to the policy of the institution).
- The correct patient position.
- Availability of all necessary monitoring and procedural equipment, supplies, and/or implants.

## **Procedural concerns**

The patient must be monitored continuously during the procedure by a designated individual that is not carrying out the procedure. This individual should be trained to recognize apnea and airway obstruction and authorized to seek additional help. The individual cannot be part of the procedural team but may assist with minor interruptible tasks once the patient is stabilized.

This individual must record the time the procedure starts and the time an incision (if utilized) is made and must record the following at least every 5 minutes during the procedure:

- Heart rate.
- BP.
- Oxygen saturation (SpO<sub>2</sub>): Continuously monitor all patients with appropriate alarms. Supplemental oxygen should be used if necessary to maintain oxygen saturation greater than 90%.
- Respiratory rate and ventilation (which should be assessed independently from oxygen saturation).
- Capnography (EtCO<sub>2</sub>): Records the amount of carbon dioxide in exhaled air and should be monitored for all patients unless precluded or invalidated by the nature of the patient, procedure, or equipment. If the patient is uncooperative, capnography may have to be instituted after moderate sedation is achieved.
  - Capnometry (partial pressure of CO<sub>2</sub>) should range from 35 to 45 mm Hg.
  - Capnograph: The waveform shows the respiratory rate and how much carbon dioxide is present during each phase of the respiratory cycle. The normal shape is fairly rectangular and regular.



**Sudden loss of waveform**

- ET tube disconnected, dislodged, kinked or obstructed
- Loss of circulatory function



**Bronchospasm ("Shark-fin" appearance)**

- Asthma
- COPD



**Decreasing EtCO<sub>2</sub>**

- ET tube cuff leak
- ET tube in hypopharynx
- Partial obstruction



**Hypoventilation**



**Hyperventilation**



**CPR Assessment**

- Attempt to maintain minimum of 10mmHg



**Decreased EtCO<sub>2</sub>**

- Apnea
- Sedation



**Sudden increase in EtCO<sub>2</sub>**

- Return of spontaneous circulation (ROSC)



- ECG monitoring for patients with clinically significant cardiovascular disease or who are undergoing procedures where dysrhythmias may occur.
- IV fluids (volume).
- Oxygen administration (L/min).
- Medications administered (name, dosage, time).

- Pain score: 0-10 scale or simplified scale (0 = none, 1 = tolerable pain, 2 = intolerable pain).
- Level of consciousness simplified scale (0 = unconscious, 1 = sedated but responsive. 2 = alert) may be utilized as assessed by asking the patient to respond to verbal commands if able or other indication (thumbs up) of consciousness.
- Score on sedation scale. Various sedation scales may be utilized:

<b>Ramsay Sedation Scale (RAS)</b>	
<b>1</b>	Anxious and agitated and/or restless
<b>2</b>	Cooperative, oriented, and tranquil
<b>3</b>	Responding to commands only
<b>4</b>	Brisk response to light glabellar tap or loud auditory stimulus.
<b>5</b>	Sluggish response to light glabellar tap or loud auditory stimulus.
<b>6</b>	No response to stimulus

<b>Sedation Scale (SS)</b>	
<b>1</b>	Alert
<b>2</b>	Responds to verbal commands or light tactile stimulus
<b>3</b>	Responds to repeated or painful stimuli
<b>4</b>	Unconscious

<b>Richmond Agitation-Sedation Scale (RASS)</b>		
<b>+4</b>	Combative	Overly combative, violent, immediate danger to staff
<b>+3</b>	Very agitated	Pulls ore removes tube or catheters, aggressive
<b>+2</b>	Agitated	Frequent non-purposeful movement, fights ventilator
<b>+1</b>	Restless	Anxious but movements not aggressive, vigorous
<b>0</b>	Alert and calm	
<b>-1</b>	Drowsy	Not fully alert, but has sustained awakening with eye-opening/eye contact to verbal stimulation for $\geq 10$ seconds

<b>-2</b>	Light sedation	Briefly awakens with eye contact to verbal stimulation for <10 seconds
<b>-3</b>	Moderate sedation	Movement or eye opening to verbal stimulation but no eye contact
<b>-4</b>	Deep sedation	No response to verbal stimulation but movement or eye opening to physical stimulation
<b>-5</b>	Unarousable	No response to verbal or physical stimulation

**Scoring Procedure:**

1. Observe patient: If patient alert, restless, or agitated, score 0 to 4+.
2. If patient not alert, state patient's name and tell patient to open eyes and look at speaker:
  - Patient awakens with sustained eye opening/eye contact, score -1.
  - Patient awakens with eye opening and eye contact, but not sustained, score -2.
  - Patient has any type of movement in response to voice but no eye contact, score -3.
3. When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum:
  - Patient has any movement in response to physical stimulation, score -4.
  - Patient has no response to any stimulation, score -5.

## **Drugs used for moderate sedation**

The medications used for sedation typically have actions that include anxiolysis (to relieve anxiety), amnesia (so the patient does not have recall of the procedure), and/or analgesia (to relieve pain associated with the procedure and post procedural recovery).

The most commonly used drug combination for moderate sedation is a short-acting benzodiazepine, such as midazolam, and an opioid, such as fentanyl, morphine, or hydromorphone. Combining benzodiazepines with opioids increases the risk of respiratory and/or cardiovascular depression, so resuscitation equipment must be available. A variety of different drugs can be used. Most drugs used for sedation are administered intravenously.

Because individuals may respond differently to drugs administered for sedation, some individuals may need more sedation than others to reach the desired level of sedation and others may be more deeply sedated than desired and require rescue from the deeper level of sedation.

Recommendations include:

- Combinations of sedative and analgesic agents may be administered as appropriate for the procedure and the patient's condition.
- Each drug component should be administered individually to achieve the desired effect, in small incremental doses that allow time for peak effect before supplementation.
- If patients received IV medications, vascular access should be maintained throughout the procedure.
- If IV becomes dislodged or patient received non-IV medications, the advisability of establishing/reestablishing IV access should be determined on individual basis.
- If drugs are administered through non-IV route, adequate time must be allowed for absorption and peak effect before supplementation.

<b>Sedating agents</b>	
<b>Midazolam</b> (Benzodiazepine, anxiolytic)	Rapid onset of sedation (80 seconds). Duration of action is 30 to 60 minutes. Associated with respiratory depression/arrest. Has both anxiolytic (primary) and amnestic (to a lesser degree) properties. May cause respiratory depression and hypoxemia. Fastest acting benzodiazepine, so is often used for short procedures. Most commonly used for pediatrics.
<b>Lorazepam</b> (Benzodiazepine, anxiolytic)	Onset of action is 3 to 5 minutes and peaks in 15 to 20 minutes, but duration is 1 to 4 hours, so generally reserved for long procedures. IV must be administered slowly at no greater than 2 mg/minute. May cause respiratory depression and hypoxemia, but is more suitable than other benzodiazepines for patients with renal or hepatic failure.
<b>Methohexital</b> (Barbiturate)	Onset of action is rapid (within one minute) and duration is short, usually 5 to 10 minutes. May result in vasodilation and hypotension and cardiac depression.

<b>Thiopental</b> (Barbiturate)	Onset of action is rapid (10 to 20 seconds) and duration is short and dose dependent, usually about 10 minutes. May cause cardiovascular and respiratory depression, especially hypotension. Rapid administration may cause apnea.
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<b>Etomidate</b> (Non-barbiturate hypnotic)	Onset of action is rapid (within one minute) and duration is short and dose dependent, usually 3 to 5 minutes. Does not have analgesic properties. Has fewer cardiovascular effects than barbiturates so is often preferred for cardiac patients. However, may cause transient neuromuscular twitching (unrelated to seizures). Repeated doses often result in postoperative nausea and vomiting. May inhibit cortisol production in children.
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<b>Ketamine</b> (Dissociative anesthetic, analgesic)	Onset of IV action is rapid (30 seconds) and emergence begins in 10 to 15 minutes but may need several hours to fully recover. Some patients may experience hallucinations, nightmares, and delirium so a quiet recovery area is needed. Should be avoided in cardiovascular patients for whom a sudden increase in BP may be dangerous. Has dissociative and amnestic actions and at appropriate dosage does not affect pharyngeal-laryngeal reflexes, so is often used in emergency procedures for possibly non-fasting patients and is recommended for patients with asthma. May be used for pediatric patients.
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<b>Dexmedetomidine</b> (Highly-selective alpha2-adrenergic agonist, hypnotic)	Has rapid distribution half-life of 6 minutes with elimination half-life of 2 hours. May be used for short-term sedation for intubated patients on mechanical ventilation or for moderate sedation for procedures. May also be combined with benzodiazepine and opioid to reduce dosages of those drugs. Is not associated with significant respiratory depression but may induce hypotension and bradycardia. May be used for pediatric patients. This drug may be administered as an alternative to a benzodiazepine on a patient by patient basis.
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<b>Propofol</b> (Hypnotic)	Most widely-used anesthetic agent. Rapid onset of action within 40 seconds with duration of 3 to 10 minutes (depending on dosage). Some patients may experience abnormal dreams or anesthesia awareness, and prolonged impairment of mental alertness may occur during recovery period. Poses a high risk of bacterial infection because the drug has to be formulated in a lipid-based medium (which is ideal for bacterial growth), so open vials must be discarded within 6 hours.
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<b>Nitrous oxide</b> (Inhalant anesthetic, analgesic)	Onset of action within 1 to 2 minutes and duration is 1 minute after last inhalation. Analgesic potency is stronger than anesthetic potency but has little effect on cardiopulmonary status. Frequently combined with other agents in order to reduce their dosages and to enhance analgesia. Must be administered with at least 30% oxygen. Often used for colonoscopies and other non-operating room procedures. May cause postoperative nausea and vomiting, especially if not mixed with adequate percentage of oxygen.
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<b>Fentanyl</b> (Opioid)	Onset of action with is within seconds and duration is 30 to 60 minutes, so fentanyl is often favored with moderate sedation over drugs that have a longer duration of action. Does not generally depress the cardiovascular system or cause hypotension but suppresses the cough reflex and may cause respiratory depression (especially if the patients are taking CYP3A5 inhibitors). May be used for pediatric patients.
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<b>Morphine</b> (Opioid)	Onset of action with IV of 4 to 5 hours. Morphine suppresses the cough reflex and may cause respiratory depression within about 7 minutes of IV administration, especially when administered with a benzodiazepine. Morphine results in vasodilation that may cause hypotension and also has emetic effects.
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<b>Hydromorphone</b> (Opioid)	Onset of action is 10 to 15 minutes with duration of 2 to 3 hours. Like other opioids, hydromorphone suppresses the cough reflex and may cause respiratory depression. May cause nausea and vomiting.
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## Reversal agents

<b>Naloxone</b> (Reversal agent for opioids)	<b>Must be readily available during procedure.</b> Used for opioid overdose and postanesthetic reversal (repeated every 2 to 3 minutes as necessary). Onset of action is 1 to 3 minutes although rebound sedation may occur. May trigger withdrawal in opioid dependent patients.
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<b>Flumazenil</b> (Reversal agent for benzodiazepines)	<b>Must be readily available during procedure.</b> Used for partial sedation reversal and for benzodiazepine overdose. Onset of action is within seconds and duration about an hour. Rebound sedation may occur. May trigger seizures and withdrawal in benzodiazepine dependent patients.
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Note that the reversal agents have short durations of action, and rebound sedation may occur, so patients must be monitored for at least one to two hours after use and return to baseline mental status (depending on the dosage of benzodiazepine and opioids that the patient received).

## Procedural complications

### 1. Airway obstruction

Partial or complete airway obstruction may result from the tongue blocking the airway, hemorrhage in the upper airway, pooled secretions, vomitus, dental fractures, foreign bodies, and edema (such as from burns or from allergic reaction).

Indications of airway obstruction include labored breathing, paradoxical chest movements, tachypnea, inspiratory stridor, snoring (associated with partial obstruction) or apnea (complete obstruction), and decrease in oxygen saturation. The patient may appear restless and have altered mental status or lose consciousness. The skin may appear cyanotic and tachycardia, bradycardia, or hypertension may be evident.



If a patient requires resuscitation and airway rescue, the patient should be immediately positioned in supine position and secured.

If the patient has no chance of a traumatic neck injury, the initial rescue maneuver should be the **head-tilt, chin-lift** as this will open an airway obstructed by the tongue or the epiglottis

If, however, a neck or spinal injury is suspected, then the head needs to be maintained in neutral position, avoiding flexion and extension. In this case, the **modified jaw thrust procedure** may be utilized as this lifts the tongue from the back of the airway without moving the neck. With this maneuver, the healthcare provider grasps the jaw behind the mandible on both sides and pushes the jaw forward and the chin down.

**Suctioning** may be needed if the obstruction results from bleeding, secretions, foreign body, or vomitus. Suctioning should be carried out while the healthcare provider has direct visualization of the posterior pharynx and should not exceed 15-second intervals because prolonged suctioning may result in hypoxia. Between suctioning, oxygen should be reapplied.

In some cases, **oral or nasal airways** may be necessary but may increase risk of bleeding and dental trauma. The oral airway may trigger laryngospasm and the gag reflex. The nasal airway should be avoided in patients with basilar skull fractures and nasal deformities.



If the patient has no or inadequate response to other rescue maneuvers and the oxygen saturation level is decreasing to less than 90%, then **bag mask ventilation** may be required.

If oxygen saturation level remains low despite rescue maneuvers, then reversal agents should be administered: flumazenil for benzodiazepines and naloxone for opioids.

## 2. Arrhythmias

Arrhythmias that may occur include:

- Sinus bradycardia: May result from sedation.
- Sinus tachycardia: May result from pain, hypoxia, or hypercarbia.
- PVCs: May result from hypoxia or hypercarbia.
- SVT

Medications and monitoring equipment must be available. If a complication arises, the procedure is typically halted until the patient is stabilized or is discontinued. Staff trained in CPR must be available.

## Postprocedural assessment

Postprocedural assessment begins as soon as the procedure is completed and the patient is transferred to the recovery area. The operating practitioner or a licensed physician is responsible for the medical supervision of recovery and discharge.

The recovery area must have appropriate equipment for age and size of patient. A nurse or other individual trained to monitor patients and recognize indications of complications must be in attendance until discharge criteria are fulfilled.

Post-procedural assessment includes:

- **Vital signs** (on admission and then at least every 5 to 15 minutes):
  - Heart rate
  - Blood pressure
  - Respiratory rate
  - Oxygen saturation: This should be monitored until the patient is no longer at risk of respiratory depression.
- **Aldrete score** is use to determine when a patient can be safely discharged from post-anesthesia care. The original Aldrete score used color but the modified version depends on oxygen saturation as it is more objective.

Parameter	Description of patient	Score
Activity level	Moves all extremities voluntarily/on command	2
	Moves 2 extremities	1
	Cannot move extremities	0
Respiration	Breathes deeply and coughs freely	2
	Is dyspneic, with shallow, limited breathing	1
	Is apneic	0
Circulation (blood pressure)	Is 20 mmHg >preanesthetic level	2
	Is 20-50 mmHg >preanesthetic level	1
	Is 50 mmHg >preanesthetic level	0
Consciousness	Is fully awake	2
	Is arousable on calling	1
	Is not responding	0
Oxygen saturation as determined by pulse oximeter	Has level >90% while breathing room air	2
	Requires supplemental oxygen to maintain level >90%	1
	Has level <90% with oxygen supplementation	0

Scoring criteria may vary somewhat from one facility to another, but generally a score of 9 or greater indicates readiness for discharge in the company of a responsible adult.

- **Sedation scale** (as above)
- **Pain scale** (0-10)

## Discharge criteria

The **discharge summary** should include the following:

- Patient alert and oriented or if infant of impaired adult, when returned to baseline.
- Indication of mobility status: Walks without assistance (or as appropriate for baseline mobility).
- Cardiovascular function, vital signs, airway patency and protective airway reflexes are satisfactory.
- Parents/Caregivers aware that pediatric patients are at risk for airway obstruction if the head falls forward while secured in a child safety seat.
- Ability to tolerate fluids.
- Ability to urinate.
- Has a reliable responsible adult caretaker and/or transportation provider.

- Discharge instructions provided and reviewed, including any restrictions (driving, use of heavy equipment) related to drugs or procedure.
- Discharge prescriptions.
- A minimum of 2 hours has passed since administration of reversal agent.
- Written instructions provided to patient/parents/caregiver with emergency contact information.

The outcome report should indicate which of the following occurred with a detailed description of any complications:

- Complications.
- Deep sedation.
- Airway obstruction.
- Respiratory arrest.
- Cardiovascular collapse.
- Reversal agent(s) administered.
- Patient died.
- Procedure was incomplete.
- Any other problems.

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