

# Conscious Sedation

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*In memory of:*  
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## Goals and Objectives:

1. Define “Conscious Sedation”.
2. Define the different levels of sedation.
3. Define “Monitored Anesthesia Care” (MAC).
4. Identify the appropriate pre-operative evaluation, and the intra-operative and post-operative management of patients undergoing conscious sedation.
5. Identify the appropriate monitoring of patients undergoing conscious sedation
6. Identify the appropriate recovery and discharge criteria for patients undergoing conscious sedation
7. Discuss the on-going debate about providing procedural sedation

**Conscious Sedation**, also known as **Moderate Sedation/Analgesia**, was defined by the American Society of Anesthesiology (ASA) at its annual meeting in 1999. It was amended in 2004. **Moderate Sedation/Analgesia (Conscious Sedations (CS))** 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 maintained. [Reflex withdrawal from a painful stimulus is NOT considered a purposeful response]<sup>1</sup>

This type of sedation is becoming more commonly used for diagnostic and therapeutic procedures often outside of the operating room environment; examples include endoscopies - both pulmonary and gastrointestinal, radiology procedures, as well as orthopedic manipulations. **What distinguishes Moderate Sedation (CS) from deep sedation is the patient's ability to independently maintain his own airway.** A physician supervises or personally administers sedative and/or analgesic medications that can allay patient anxiety and control pain during a diagnostic or therapeutic procedure.<sup>1</sup> The intention is to facilitate successful performance of the diagnostic or therapeutic procedure while providing patient comfort and cooperation. The physician responsible for directing administration of the sedating medication is not required to be an anesthesiologist. In addition, the directing physician may supervise a nurse in administration of medications. Physicians providing moderate sedation must be qualified to recognize Deep Sedation, manage its consequences and adjust the level of sedation to a moderate or lesser level. The continual assessment of the effects of sedative or analgesic medications on the level of consciousness and on cardiac and respiratory function is an integral element of this service.<sup>1</sup> The care providers, physicians or nurses, responsible for administering CS include preparing and monitoring the patient before, during and after the procedure. Informed consent must be obtained prior to the procedure and prior to administration of any sedating medication. Discharge instructions need to be given to the patient and/or the care-giver responsible for the patient's continued recovery outside the hospital.

There are multiple levels of sedation and these have also been defined, approved in 1999 and amended in 2004 by the ASA as follows:<sup>2</sup>

1. Minimal Sedation (Anxiolysis) is a drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.
2. Moderate Sedation/Analgesia (Conscious Sedation) is defined above
3. 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. [Here also reflex withdrawal from a painful stimulus is NOT considered a purposeful response.]
4. 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, 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. A patient may progress to different levels of sedation depending on the medications used, the underlying medical status and the patient's age. This can occur unintentionally and suddenly. Hence, practitioners intending to produce a given level of sedation should be able to rescue patients who enter a state of deeper sedation. 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. Administration of Deep Sedation and General Anesthesia require the presence of an anesthesiologist.<sup>2</sup>

### **What is Monitored Anesthesia Care (MAC) and how does this fit into the continuum of sedation?**

The definition of MAC by the ASA has last been amended in 2003. What distinguishes MAC from other forms of sedation is the anesthesia assessment and management of a patient's actual or anticipated physiologic derangements and/or medical problems that may occur during a procedure. While the medications administered and monitoring of MAC patients may be similar to those undergoing CS, the MAC provider must be prepared and qualified to convert to general anesthesia when necessary. Additionally, a provider's ability to intervene to rescue a patient's airway from any sedation induced compromise is a prerequisite to the qualifications to provide MAC. These components of MAC are unique aspects of an anesthesia service that are not part of Moderate Sedation (CS).<sup>3</sup>

The administration of sedative, hypnotics, analgesics, as well as anesthetic drugs commonly used for induction or maintenance of general anesthesia is often, but not always, a part of MAC. In some patients who may require only minimal sedation, MAC is often indicated because even small doses of these medications could precipitate adverse physiologic responses that would necessitate acute clinical interventions and resuscitation. If a patient's condition and/or procedural requirement is likely to require sedation to a "deep" level or even a transient period of general anesthesia, only a practitioner privileged to provide anesthesia services should be allowed to manage the patient's sedation.<sup>3</sup>

Like all anesthesia services, MAC includes an array of post-procedure responsibilities beyond the expectations of practitioners providing Moderate Sedation, including assuring a return to full consciousness, relief of pain, management of adverse physiological responses or side effects from medications administered during the procedure, as well as the diagnosis and treatment of co-existing medical problems.<sup>3</sup>

MAC allows for the safe administration of a maximal depth of sedation in excess of that provided during Moderate Sedation. The ability to adjust the sedation level from full consciousness to general anesthesia during the course of a procedure provides maximal flexibility in matching sedation level to patient needs and procedural requirements. In situations where the procedure is more invasive or when the patient is especially fragile, optimizing sedation level is necessary to achieve ideal procedural conditions.<sup>3</sup>

In summary, MAC is a physician service which is clearly distinct from Moderate Sedation due to the expectations and qualifications of the provider who must be able to utilize all anesthesia resources to support life and to provide patient comfort and safety during a diagnostic or therapeutic procedure.<sup>3</sup>

Patient selection for CS is an important factor to increase safety as well as to provide optimal conditions for these procedures. The ASA recommends that conscious sedation be used for ASA Class I and II patients. ASA Class III patients may need consultation by other physicians including anesthesiologists and/or medicine subspecialists to help determine whether they are appropriate candidates for Moderate sedation or if Anesthesia services are needed. ASA Class IV and V patients require the presence of an anesthesiologist.<sup>4</sup>

All patients must have a history and physical prior to any sedation. The following must be included: NPO status, baseline vital signs, weight, airway status, focused physical exam, current medications, allergies, pertinent medical and anesthetic history, history of tobacco, alcohol or substance abuse, mental status, and lab studies as warranted per individual condition and/or procedure. Patients at extreme ages both young and old, those with renal or hepatic disorders, or those with congenital or acquired mental impairment may not be good candidates for CS and may have unpredictable effects to sedating medications.<sup>4</sup>

Recommendations for NPO status are the same as the ASA fasting guidelines for anesthesia involved procedures. NO solid food or full liquid for at least 6 hours and NO clear liquids for at least 2 hours prior to sedation. These recommendations apply to healthy patients undergoing elective procedures. They are not intended for women in labor. Clinical judgment must be used in cases that are urgent or in patients who may have alteration in gastric emptying time. These clinical decisions include the procedure time, the level of sedation that will minimize the risk of aspiration or the necessity of tracheal intubation for airway protection.<sup>1</sup>

Positive pressure ventilation, with or without tracheal intubation, may be necessary if respiratory compromise develops during CS. This may be more difficult in patients with atypical anatomy. Also, some airway abnormalities may increase the likelihood of airway obstruction during spontaneous ventilation. Some factors which may be associated with difficulty in airway management are: (1)<sup>1</sup> a history of: previous problem with anesthesia or sedation; stridor, snoring, or sleep apnea; advanced rheumatoid arthritis; chromosomal abnormality

(2) physical examination characteristics of: significant obesity especially involving neck and facial structures; short neck, limited neck extension, decreased hyoid mental distance, neck mass, cervical spine disease or trauma, tracheal deviation, dysmorphic facial features; small mouth opening, loose teeth, dental appliances, macroglossia, tonsillar hypertrophy, non-visible uvula; micrognathia, retrognathia, trismus, significant malocclusion.

Patients or their legal guardians, in the case of minors or legally incompetent adults, should be informed of and agree to the administration of sedation / analgesia including the benefits, risks, and limitations associated with this therapy, as well as possible alternatives.

Prior to the administration of sedation, the provider must make sure that all monitoring equipment to be used and all emergency equipment is present and functioning. Patients must be monitored before, during, and after the procedure.

Level of consciousness prior to sedation should be assessed and documented. Monitoring the level of consciousness reduces risks for moderate sedation. Monitoring of patient response to verbal commands should be routine during moderate sedation, except in patients who are unable to respond appropriately, or during procedures where movement could be detrimental. Note that a response limited to reflex withdrawal from a painful stimulus is NOT considered a purposeful response and thus represents a state of general anesthesia<sup>1</sup>. Many of the complications associated with sedation and analgesia can be avoided if adverse drug responses are detected and treated in a timely manner.

Ventilation and oxygenation are separate though related physiological processes. Ventilation should be assessed by rate, depth, effort of respirations whereas oxygenation should be measured by continuous pulse oximetry<sup>1</sup>. The primary causes of morbidity associated with sedation are drug-induced respiratory depression and airway obstruction. Monitoring of ventilatory function by observation or auscultation reduces the risk of adverse outcomes associated with sedation. Hypoxemia is a leading cause of cardiac dysrhythmias especially bradycardia<sup>4</sup>. Supplemental oxygen should be provided for every patient undergoing CS.

Hemodynamic changes can result from intravascular volume status, side effects of sedation medications, and reaction to the procedure. Sedative and analgesic agents may blunt the appropriate autonomic compensation<sup>4</sup> for hypovolemia and procedure-related stresses<sup>4</sup>.

EKG monitoring should be used during CS in patients with significant cardiovascular disease or those who are undergoing procedures where dysrhythmia is anticipated.

A reliable intravenous site should be in place prior to sedation and maintained throughout the recovery period.

A dedicated individual, other than the practitioner performing the procedure, should be present to monitor the patient throughout procedures performed with CS. This individual may assist with minor, interruptible tasks once the patient's level of sedation and vital signs have stabilized, provided that adequate monitoring for the patient's level of sedation is maintained<sup>5</sup>.

Resuscitation equipment including emergency, anesthetic, and sedation reversal medications, ACLS monitors and defibrillator, devices for establishing a patent airway and providing positive pressure ventilation, suction, and personnel trained in ACLS and airway management should be readily available<sup>5</sup>.

Common medications used for CS include benzodiazepines and narcotics. Combination of sedation drugs are synergistic and may cause more side effects, especially respiratory depression, at standard doses. The propensity for combinations of sedative and analgesic agents to cause respiratory depression and airway obstruction emphasizes the need to appropriately reduce the dose of each component as well as the need to continually monitor respiratory function. When used in combination, sedation drugs should be titrated and patient monitoring should be more vigilant. Sufficient time must elapse between doses to allow the effect of each dose to be assessed before subsequent drug administration<sup>1</sup>. As a general rule, only individuals trained in anesthesiology should administer anesthetic agents including Ketamine, Pentothal, Methohexital, Propofol, Etomidate and nitrous oxide. If not trained in anesthesiology, practitioners should be qualified to rescue patients from any level of sedation including general anesthesia<sup>1</sup>. The patient's health status, co-morbidities and ability to metabolize medications need to be considered before administration of sedation medication. All medications including reversal or vasoactive agents should be recorded on the patient's procedure chart.

Benzodiazepines are ideal agents for sedation requiring procedures and have the following properties: anxiolysis, anti-convulsant, sedation, muscle relaxation and amnestic properties. There are NO analgesic, antipsychotic or antidepressant properties. The common used medications include midazolam and diazepam. These medications bind to the postsynaptic GABA neuron at sites along the CNS (limbic system and reticular formation). They enhance the inhibitory effect of GABA on the neuronal excitability by increasing membrane permeability to Cl<sup>-</sup> ions resulting in hyperpolarization and membrane stabilization<sup>5</sup>.

Midazolam is a short acting benzodiazepine CNS depressant. Routes of administration include IV, IM, PO, PR, or intranasal. Rapid or excessive doses may result in respiratory depression or arrest. Dosage should be titrated to the desired effect. Midazolam has anterograde amnesia. Slurred speech is an excellent indicator of adequate dosing<sup>5</sup>. Lower doses should be given to elderly, debilitated and those concurrently receiving other sedating medications<sup>5</sup>. Its onset of action is within 3-5 minutes and lasts 1 to 6 hours. Half-life is from 1 to 12 hours. Contraindications to its use include benzodiazepine hypersensitivity and acute narrow angle glaucoma. Adverse reactions include hiccups, nausea, vomiting, over sedation, headache, coughing, and pain at the

injection site. Patients should be advised to refrain from driving or performing tasks requiring fine motor skills for at least 12 to 24 hours post procedure. Midazolam crosses the placenta and enters breast milk.

Diazepam is available IV, IM, and PO. IM injection is very painful and not recommended. Dose should be titrated to desired effect starting at 1-2 mg every 2 minutes up to a maximum of 20 mg. Slurred speech is a good indicator of adequate dosing. Lowered doses should be administered to elderly, debilitated, and those receiving other sedation medications<sup>5</sup>. Its half life is significantly longer at 30 to 90 hours. Intravenous diazepam is irritating to tissue and should be injected slowly by way of a large vein. It cannot be diluted or mixed with other medication because of its propensity to precipitate. Adverse reactions include thrombosis, phlebitis, apnea, and hypotension.

Narcotics are ideal agents for sedation as they provide: analgesia, sedation and increase the pain threshold. They bind to sites within the CNS and increase pain threshold, alter pain reception, and inhibit ascending pathways.

Fentanyl (Sublimaze) is a synthetic opioid that provides potent analgesia for a short duration. Dosage as a single sedation agent starts at 1-2 mcg/kg. When administered with other medications its dose should be reduced. Half-life is 2 to 4 hours. Patients should refrain from driving or tasks requiring fine motor skills for at least 12 hours post procedure. Adverse effects include chest wall rigidity if given rapidly and respiratory depression.

Demerol (meperidine) is a synthetic opioid that provides both analgesia and sedation. Its use is absolutely contraindicated in patients taking MAO inhibitors as this can cause severe hypertension and tachycardia.

Reversal agents must be readily available whenever sedation medications are used. Following pharmacologic reversal, patients should be observed long enough to ensure that sedation and cardio respiratory depression does not recur once the effect of the antagonist dissipates. The use of sedation requirements which include routine reversal of sedative or analgesic agents is discouraged.

Flumazenil is a benzodiazepine antagonist. It is a competitive inhibitor of benzodiazepines binding to its receptor site. Dosage is 0.1 to 0.2 mg every 2 minutes up to a maximum of 1 mg. Effects last for only 1 hour and patients must be monitored for re-sedation especially if they have received diazepam with its much longer half-life. Chronic benzodiazepine using patients and those with a seizure disorder are at higher risk for grand mal seizures with use of this agent<sup>4</sup>. Naloxone (Narcan®) is a pure narcotic antagonist. It is a competitive inhibitor binding to the opiate receptor sites. All opioid effects are reversed including sedation, respiratory depression and analgesia. Sudden reversal of pain relief can cause sympathetic effects including tachycardia, hypertension, arrhythmia, stroke, CHF and cardiac arrest<sup>4</sup>. Dosage should be gradual and titrated to desired effect of reversing respiratory or mental depression. Dosing starts at 0.1 to 0.2

mg every 2 to 3 minutes. The half life is 60 to 90 minutes therefore patients are at risk of re-narcotization and should be monitored.

Monitoring for CS should at minimum include baseline vital signs, oxygen saturation, heart rhythm and level of consciousness prior to sedation. Monitoring parameters should be recorded every 5 minutes. The supervising physician should be informed of BP or pulse variance by more than 20% of baseline, continuous cardiac dysrhythmia, > 5% decrease in oxygen saturation, dyspnea, apnea, hypoventilation, diaphoresis, inability to arouse patient, need to maintain an airway mechanically, undesired patient response. Measurement of parameters can be decreased to every 15 minutes when physiologic parameters have returned to pre-procedure baseline. Monitoring must continue until the patient is hemodynamically stable and level of consciousness has returned to pre-procedure baseline<sup>6</sup>.

Complications during CS are usually either respiratory depression or cardiovascular compromise. Respiratory depression is the most common and should be treated with supplemental oxygen and necessary airway management to restore adequate oxygenation and ventilation including jaw thrust, oral or nasal airway placement, and positive pressure ventilation by mask or intubation<sup>4</sup>. Hypotension is the most common cardiovascular complication. Rescue methods include Trendelenburg position, IVF bolus or vasoactive drug administration. Cardiac dysrhythmias should be quickly identified and treated.

Following CS, patients should be observed in an appropriately staffed and equipped area until they are near their baseline level of consciousness and are no longer at increased risk for cardio respiratory depression. Medical supervision of recovery and discharge following CS is the responsibility of the operating practitioner or a licensed physician. A nurse or other individual trained to monitor patients and recognize complications should be in attendance until discharge criteria are fulfilled. Level of consciousness, vital signs and oxygenation should be recorded at regular intervals. The duration and frequency of monitoring should be individualized depending upon the level of sedation achieved, the overall condition of the patient, and the nature of the intervention for which CS was administered. Oxygenation should be monitored until patients are no longer at risk for respiratory depression<sup>7</sup>.

Discharge criteria include the patient's ability to follow commands and return of circulatory, respiratory and consciousness levels to those prior to the procedure. Out-patients should be discharged in the presence of a responsible adult who will accompany them home and be able to report any post-procedure complications. Out-patients and their escorts should be provided with written instructions regarding post-procedure diet, medications, activities, follow-up and a phone number to call in case of an emergency<sup>7</sup>.



1. American Society of Anesthesiologists. Practice Guidelines for Sedation and Analgesia by Non-Anesthesiologists. Available at <http://www.asahq.org/publicationsAndServices/practiceparam.htm#sedation>; page 1-29.
2. American Society of Anesthesiologists. Continuum of Depth of Sedation Definition of General Anesthesia and Levels of Sedation/Analgesia. Available at <http://www.asahq.org/publicationsAndServices/standards/20.pdf>
3. American Society of Anesthesiologists. Distinguishing Monitored Anesthesia Care (MAC) from Moderate Sedation/Analgesia (Conscious Sedation). Available at <http://www.asahq.org/publicationsAndServices/standards/35.pdf>
4. Wyman, CI. Conscious Sedation: A Self Study Guide. Available at <http://www.gasnet.org/protocols/sedation/>
5. Waring JP, Baron TH, Hirota WK, Goldstein JL, Jacobson BC, Leighton JA, Faigel DO. Guidelines for Sedation and Monitoring during Gastrointestinal Endoscopy. *Gastrointestinal Endoscopy*. 2003;58(3):317-322
6. A Shaughnessy TE. Safe Sedation of the Elderly Outside the Operating Room. Available at <http://www.asahq.org/clinical/geriatrics/safe.htm>
7. Comprehensive Accreditation Manual for Hospitals: The Official Handbook. 2004 CAMH. Oakbrook Terrace: Joint Commission on Accreditation of HealthCare Organizations, 2004
8. American Society of Anesthesiologists. Clinical Pearls for Moderate Conscious Sedation Montefiore Medical Center – The University Hospital for TheAlbert Einstein College of Medicine. Available at <http://www.asahq.org/clinical/toolkit/clinicalpearlsold.htm>

## Questions

1. The most common adverse reaction associated with Moderate Sedation/Analgesia or Conscious Sedation is:
  - a. Arrhythmia
  - b. Hypotension
  - c. Respiratory Depression or Apnea
  - d. Hypertension
  - e. Stroke
  
2. Benzodiazepines can cause all the following effects except:
  - a. Analgesia
  - b. Muscle Relaxation
  - c. Anti-convulsant
  - d. Anxiolysis
  - e. Amnesia
  
3. All are true regarding NPO guidelines except:
  - a. Black coffee is considered a clear liquid
  - b. The minimum fasting period for clear liquids is 2 hours
  - c. NPO guidelines apply to all patients
  - d. Non-human milk is similar to solids
  - e. The fasting periods apply to all ages
  
4. A reliable indicator of adequate conscious sedation is:
  - a. Unresponsiveness
  - b. Unconsciousness
  - c. Normal blood pressure and heart rate
  - d. Slurred speech
  - e. Bradycardia
  
5. All of the following are required prior to administration of Conscious Sedation except:
  - a. Informed consent of the patient or guardian
  - b. List of medications and allergies
  - c. Focused history and physical examination
  - d. Airway exam
  - e. Consultation of medical subspecialists

ANSWERS: c / a / a / d / e