

VIDEOS IN CLINICAL MEDICINE

Conscious Sedation for Minor Procedures in Adults

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OVERVIEW

This supplement provides a summary of the teaching points that appear in the accompanying video, which demonstrates the equipment and techniques used to provide intravenous conscious sedation for minor procedures in adults.

LEVELS OF SEDATION

Practice guidelines for sedation and analgesia may vary in different regions of the world. The American Society of Anesthesiologists has developed such guidelines for use by physicians who are not anesthesiologists. The society considers sedation to be a continuum but does define three different levels (Table 1).¹ Minimal sedation provides a drug-induced state of anxiolysis during which patients respond normally to verbal commands. Moderate sedation or analgesia, or conscious sedation, is a drug-induced depression of consciousness during which patients respond purposefully to verbal commands when aroused by the sound of a voice or light tactile stimulation. No interventions are required to maintain a patent airway during conscious sedation. Deep sedation or analgesia is a drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully after the administration of repeated or painful stimulation. Ventilatory function may be impaired during deep sedation or analgesia. Invasive or painful procedures require this level of sedation.

INDICATIONS

Conscious sedation may be considered for any procedure that causes discomfort or pain in the patient.²

CONTRAINDICATIONS

Lack of written informed consent obtained from the patient is a contraindication to performing conscious sedation. The procedure is also contraindicated when the patient has a history of allergic reaction to analgesic or sedative medications, has unstable cardiorespiratory function, or is in a nonfasting state.³ Patients undergoing conscious sedation should have had no liquids by mouth for 2 hours before the procedure and no food for 6 to 8 hours before the procedure.³

TRAINING AND CREDENTIALING

Since sedation is a continuum, a patient undergoing conscious sedation may become deeply sedated, and impaired airway reflexes and hypotension may develop. This means that if a clinician intends to induce conscious sedation in a patient, the clinician must be capable of supporting the patient's ventilation, oxygenation, and hemodynamics in the event that the patient becomes deeply sedated. Ultimately, it is the clinician's responsibility to ensure that conscious sedation is performed by

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Table 1. Levels of Sedation.**Minimal sedation**

Patient is in drug-induced state of anxiolysis
 Patient responds normally to verbal commands

Conscious sedation

Patient has drug-induced depression of consciousness
 Patient responds purposefully to voice or tactile stimulation
 No interventions are needed to maintain a patent airway

Deep sedation

Patient has drug-induced depression of consciousness
 Patient cannot be easily aroused
 Patient responds purposefully after repeated or painful stimulation
 Ventilatory function may be impaired

qualified personnel.^{1,2} Many hospitals and institutions have developed their own guidelines and credentialing systems for clinicians who provide sedation. Any clinician providing conscious sedation must be informed about these guidelines and must be appropriately credentialed.

EVALUATION OF THE PATIENT

A thorough history and physical examination are required immediately before a patient is given conscious sedation. The physical examination should include a review of vital signs and should focus on evaluation of the patient's airway and nervous and cardiorespiratory systems.² Physical signs that a patient has a potentially difficult airway include obesity, a limited range of motion in the neck, a small mandible, and a limited ability to open the mouth.¹ If there are concerns that the patient may have a difficult airway, such as a history of severe sleep apnea or marked obesity, consultation with an anesthesiologist should be considered before the procedure is performed.¹ Appropriate laboratory tests should be obtained and reviewed, particularly when a patient is at risk for alterations in drug metabolism, such as in cases of liver or kidney disease.^{1,4}

MONITORING THE PATIENT

Since sedation is a continuum and a patient's level of sedation can change rapidly, the clinician should have the ability to monitor the patient's level of consciousness, hemodynamics, ventilation, and oxygenation.⁵ The patient must have a working intravenous catheter before conscious sedation is initiated. Emergency equipment for intubation and resuscitation must be immediately available,^{1,2} and the clinician must know how to use this equipment and how to administer appropriate medications in case cardiopulmonary resuscitation is required. Monitors for the hemodynamic variables of heart rate and blood pressure should be at hand.⁵ Detection of airway obstruction may be facilitated by monitoring end-tidal carbon dioxide.⁴ Oxygenation should be monitored with continuous pulse oximetry,⁴ and vital signs recorded at least every 5 minutes while the patient is being sedated.¹

INTRAVENOUS SEDATIVES AND ANALGESICS

To provide conscious sedation, the clinician must know the pharmacologic actions and the contraindications for every medication that will be or may be used. The brief set of descriptions provided here constitutes an overview; before proceeding

with conscious sedation, the practitioner should conduct a detailed review of each medication that may be used.

Midazolam, a potent benzodiazepine, is a commonly used sedative, and the opioid agonist fentanyl is a commonly used analgesic. Both are available in intravenous formulations. These drugs have a rapid onset and offset, their doses can be adjusted, and pharmacologic antagonists are available that can reverse their effects in the event of an overdose. Midazolam may be administered intravenously. Its action on γ -aminobutyric acid (GABA) receptors in the brain causes anxiolysis and amnesia. Clinically effective doses for sedation vary widely. It is important to adjust the dose of the drug for the desired effect. For adults, a dose of 0.5 mg can be administered intravenously and repeated as needed every 5 minutes.

Flumazenil is a benzodiazepine antagonist used to treat benzodiazepine overdose.^{1,4} To reverse the sedative effects of midazolam after conscious sedation has been induced, administer an initial dose of 0.2 mg of flumazenil intravenously over a period of 15 seconds. If the desired level of consciousness is not obtained after 1 minute, administer a second dose of 0.2 mg; repeat administration of that dose at 1-minute intervals up to a maximum total dose of 1.0 mg. Flumazenil is associated with seizures and should be avoided in patients with severe liver disease or those who require long-term treatment with a benzodiazepine. Patients who receive flumazenil need to be monitored closely, since they may become sedated again as the effects of the antagonist abate.¹

Fentanyl is a potent opioid that may be delivered through several routes. Intravenous fentanyl acts on μ -opioid receptors in the brain and causes rapid onset of analgesia and sedation. The clinically effective doses required to induce sedation vary widely among patients. It is important to adjust the dose to the desired effect for each patient. For adults, an initial intravenous dose of 25 μ g can be administered and then repeated as needed every 5 minutes.

Naloxone is an opioid antagonist used to reverse the respiratory depression caused by opioids.⁴ It may be administered intravenously in increments of 0.1 to 0.2 mg at intervals of 2 to 3 minutes. The dose should be adjusted according to the patient's response. The clinician administering naloxone to reverse the action of opioids must monitor the patient carefully, since the duration of action of some opioids may outlast that of naloxone.¹ In such instances, additional doses of naloxone may be required. However, doses that are larger than necessary may cause pain and hypertension. If naloxone leads to rapid reversal of the action of opioids, then nausea, vomiting, and diaphoresis may ensue. Naloxone should be avoided in patients who are physically dependent on opioids.

EQUIPMENT

When conscious sedation is being provided, one clinician should be responsible for the sedation while another clinician performs the intended procedure; the patient's level of consciousness should be monitored continuously. Before starting the procedure, make sure that the equipment needed to monitor and support the patient is present and available (Table 2).

An Ambu bag and a source of oxygen should be available in the event that the patient needs oxygenation and ventilation support.¹ Both rigid and flexible suction catheter tips and active suction devices should also be at hand.

Devices for monitoring blood pressure, heart rate, and respiratory rate should be available, and a pulse oximeter should be used to track oxygen saturation.¹ Although the American Society of Anesthesiologists does not require the presence of an electrocardiographic monitor or an end-tidal carbon dioxide detector, we recommend having both pieces of equipment on hand.¹

Table 2. Equipment for Conscious Sedation.

Ambu bag, face mask, nasal and oral airways, and source of oxygen
Suction device
Device for measuring blood pressure
Pulse oximeter
Electrocardiographic monitor
End-tidal carbon dioxide detector
Supplies needed to obtain intravenous access, such as syringes, needles, catheters, and fluids
Emergency medications and emergency cart

Airway equipment, such as a face mask or oral and nasal airways, should be present, as should any materials and equipment needed to obtain intravenous access, such as fluids, catheters, needles, and syringes. The drugs that will be used (or may be needed) should be prepared, including sedatives, analgesics, reversal medications, and emergency medications.¹

Finally, an emergency or crash cart with advanced airway devices and medications must be immediately available.

CONSCIOUS SEDATION

Conscious sedation can be induced in many different ways. As a general rule, one should start with small, incremental doses and adjust according to the desired effect. When combining sedatives and analgesics, the dose of each should be reduced.

To start, midazolam boluses can be administered every 5 minutes, with constant reevaluation of the patient's status.² For example, the clinician should start with a small intravenous dose, such as 0.5 mg, and evaluate the patient's response. At this point, if necessary, a small amount of fentanyl — initially, 25 μ g — can be injected by means of an intravenous bolus, with particular attention paid to ensuring that the patient's respiratory function is preserved.

Depending on the length of the procedure to be performed and the patient's response, the doses of the medications used may be repeated as required to maintain conscious sedation. Each patient responds differently to sedatives and analgesics, and the clinician must remain vigilant in monitoring the patient's status throughout the procedure.^{1,4}

COMPLICATIONS

The most serious complications of conscious sedation occur when a patient becomes deeply sedated and respiratory and cardiovascular depression develops; because respiratory depression or apnea can lead to death, the need for written consent from the patient, adequate preparation, careful monitoring, and qualified personnel cannot be overstated.⁵ Cardiovascular depression can be associated with respiratory depression or can occur in isolation. If hypotension develops, sedative medications should be held, and intravenous fluids and medications such as phenylephrine or ephedrine should be used to raise blood pressure to baseline levels.

RECOVERY

Once the procedure requiring conscious sedation has been completed and sedation is no longer needed, the patient should be monitored until he or she returns to a baseline level of consciousness.^{1,2}

SUMMARY

Conscious sedation can provide benefits for both the patient who is undergoing an invasive procedure and the clinician who is performing it. Sedation is a continuum, and clinicians providing conscious sedation must be capable of supporting the patient's ventilation, oxygenation, and hemodynamics in the event that the patient becomes deeply sedated. A thorough evaluation of the patient is required to identify any contraindications. When a patient is given conscious sedation, the equipment needed to monitor the patient's level of consciousness, hemodynamics, ventilation, and oxygenation must be available. The clinician must be knowledgeable about the pharmacologic actions of the sedatives and analgesics to be used. The most serious complication of conscious sedation is respiratory and cardiovascular depression. At the completion of the procedure, the patient should be monitored until he or she returns to a baseline level of consciousness.

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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