Moderate Sedation & Analgesia Initial Training

Self-Study for Nurses

Compiled by Clinical Learning
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A course to prepare all nurses, especially those in procedural, diagnostic, critical, or emergency care areas, for their critical role in safeguarding the health, safety, comfort, and well-being of the patient undergoing a procedure involving moderate sedation. Nurses will gain knowledge of key established guidelines and standards for effective patient assessment, monitoring, and medication administration before, during, and after sedation to ensure positive patient outcomes.
Moderate Sedation and Analgesia Initial Training Self-Study

Objectives

1. Determine the goals, objectives, and best practice nursing care standards for providing procedural moderate sedation in the acute care setting.
2. List the duties, responsibilities, and credentials recommended for nurses who care for patients receiving moderate sedation medications.
3. Describe the pharmacologic principles fundamental to the delivery of effective moderate sedation.
4. Review the most commonly used pharmacologic agents for moderate sedation as well as advantages and disadvantages for each.
5. Detail the components of patient care prior to moderate sedation, including patient assessment, selection, and preparation.
6. Review the pharmacological implications for sedation and analgesia in the monitoring of patients receiving moderate sedation.
7. Explain the potential complications that may arise during moderate sedation and their associated emergency measures.
8. Recognize the special needs of the pediatric patient population and how to manage them.
9. Describe the anatomic and physiologic differences in the elderly and the impact of these differences during sedation.
10. Summarize the patient care provided during the postsedation period, including the criteria for discharge.
INTRODUCTION

The guidelines outlined in the following module are designed to provide specific recommendations for the safe care of patients during the delivery of medications for sedation and analgesia by non-anesthesiologists during medical procedures.

These guidelines are NOT intended to apply to the routine administration of narcotics or sedative medications for pain or anxiety relief in an intensive care unit, post-anesthesia care unit, or emergency department.

Moderate sedation was first used by dentists who noted that many dental and oral surgery procedures are better performed on a sedated patient. Moderate sedation subsequently became popular in the emergency department, where it was used to make repairs of complex lacerations, reduce fractures, apply casts, and perform incision and drainage. Patients needing lengthy, uncomfortable, and/or invasive diagnostic studies such as bronchoscopy, endoscopy, or pacemaker placement studies found sedation to be immensely beneficial.

The use of moderate sedation has increased as more nurses become trained in the safe delivery of sedative agents and more patients demand it. We as healthcare providers have found a vast number of procedures that are uncomfortable and/or painful can be performed safely and more humanely using moderate sedation. With the development of pulse oximetry and noninvasive blood pressure monitoring, moderate sedation can be delivered safely, maximizing patient comfort.

“Anyone administering moderate sedation should have the skills necessary to rescue a patient from a deeper level of sedation than intended.”
The use of moderate sedation/analgesia (formerly known as conscious sedation) is a common and accepted nursing practice in the acute care setting. Each patient however must be closely and continuously monitored to prevent progression to a deeper sedated state, and anyone administering moderate sedation should have the skills necessary to rescue a patient from a deeper level of sedation than intended.

**Levels of Sedation Defined**

Three organizations—the Joint Commission, the American Association of Nurse Anesthetists, and the American Society of Anesthesiologists (ASA)—have established guidelines for administering procedural sedation. The Joint Commission has identified moderate sedation/analgesia as the second level in a continuum is between minimal sedation (anxiolysis) and deep sedation (anesthesia) as outlined:

**Level 1**  
**Minimal sedation:** Also known as anxiolysis. A drug-induced state during which the patient responds normally to verbal commands. Cognitive function and coordination may be impaired; however ventilatory and cardiovascular functions are unaffected.

**Level 2**  
**Moderate sedation/analgesia** (conscious sedation): A drug-induced depression of consciousness during which the patient responds purposefully to verbal command, either alone or accompanied by light tactile stimulation. No interventions are necessary to maintain a patent airway. Spontaneous ventilation is adequate. Cardiovascular function is usually maintained.

**Level 3**  
**Deep sedation/analgesia:** A drug-induced depression of consciousness during which the patient cannot be easily aroused, but responds purposefully* following repeated or painful stimulation. Independent respiratory function may be impaired or inadequate and the patient may require assistance to maintain a patent airway. Cardiovascular function is usually maintained.  
*Reflex withdrawal from painful stimuli is NOT considered a purposeful response.

**Level 4**  
**General anesthesia:** A drug-induced loss of consciousness during which the patient cannot be aroused, even to painful stimuli. The ability to maintain independent respiratory function is often impaired and assistance required in maintaining a patent airway. Positive pressure ventilation may be required due to depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function may be impaired.
Nurses must recognize that sedation is part of the continuum that progresses from minimal to moderate sedation—then from moderate to deep sedation—eventually reaching the state of general anesthesia. Each individual patient should be closely and continuously monitored to prevent this progression to the deeper sedated states. Because of the risk of airway compromise, nurses must be competent in all forms of CPR (Cardiopulmonary Resuscitation) as indicated by their patient population. For example BLS (Basic Life Support) should be augmented by ACLS (Advanced Cardiac Life Support), PALS (Pediatric Advanced Life Support), and/or NRP (Neonatal Resuscitation Program).

The Joint Commission requires that, besides the individual performing the procedure, sufficient numbers of qualified staff be present to evaluate and monitor the patient, administer medication, assist with the procedure, and recover the patient, if needed. One standard of care that is critical to safe drug delivery is that the physician be physically present in the room before sedation is given.

The Joint Commission defines Introduction to Standards PC.03.01.01 Through PC.03.01.07: The standards for sedation and anesthesia care apply when patients in any setting receive, for any purpose, by any route: - General, spinal, or other major regional anesthesia - Moderate or deep sedation (with or without analgesia) that, in the manner used, may be expected to result in the loss of protective reflexes

Elements of Performance:
1. Individuals administering moderate or deep sedation and anesthesia are qualified and have credentials to manage and rescue patients at whatever level of sedation or anesthesia is achieved, either intentionally or unintentionally. (See also MS.06.01.03, EP 6)
2. In addition to the individual performing the procedure, a sufficient number of qualified staff are present to evaluate the patient, to provide the sedation and/or anesthesia, to help with the procedure, and to monitor and recover the patient.
6. For operative or other high-risk procedures, including those that require the administration of moderate or deep sedation or anesthesia: The hospital has equipment available to monitor the patient's physiological status.
7. For operative or other high-risk procedures, including those that require the administration of moderate or deep sedation or anesthesia: The hospital has equipment available to administer intravenous fluids and medications, and blood and blood components.
Much like the Joint Commission, the American Society of Anesthesiologists (ASA) has defined moderate sedation as when the:

- Depression of consciousness is drug-induced.
- Patient is able to respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation.
- Airway is patent without interventions, and spontaneous ventilation is adequate.
- Patient’s cardiovascular function is usually maintained.

In addition to allowing a patient to tolerate an unpleasant or painful procedure while maintaining consciousness and cooperation, many of the sedation medications provide mood elevation and partial amnesia. The patient does not remember the majority of the procedure and wake up in a comfortable, relaxed state. The choice of medications depends on whether the goal is sedation, pain management, or both with a decreased risk of returning to a sedated state.

**Moderate Sedation Goals**

Ultimately, moderate sedation should result in a patient who is relaxed and cooperative with:

- Purposeful responses to verbal communication and instruction.
- Purposeful response to tactile stimulation.
- Easy and prompt arousal from sleep.

"The ultimate goal of sedation is a rapid return to the pre-sedation state."

<table>
<thead>
<tr>
<th>Goals of Moderate Sedation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Alteration of level of consciousness &amp; mood.</td>
<td></td>
</tr>
<tr>
<td>Maintenance of consciousness &amp; cooperation.</td>
<td></td>
</tr>
<tr>
<td>Minimal variation of vital signs.</td>
<td></td>
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<tr>
<td>Elevation of pain threshold.</td>
<td></td>
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<tr>
<td>Rapid degree of ambulation.</td>
<td></td>
</tr>
<tr>
<td>Safe and prompt recovery.</td>
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</tbody>
</table>
Nurse Qualifications

Competency Issues

Competency verification is a critical part in the delivery of safe patient care. Evaluation of the nurse’s skills and knowledge must be a part of the moderate sedation program and should include:

- The Florida Board of Nursing scope of practice
- Pre-sedation assessment
- Pharmacology of moderate sedation meds
- Care during and after the procedure
- Monitoring skills
- Complication recognition
- Management of complications (rescue)
- Documentation
- Discharge criteria
- Patient education
- Emergency resuscitation
- Concerns of specific populations

"If you're involved in administering or caring for patients undergoing sedation, make sure you meet the legal, professional, and institutional criteria relevant to your practice."

American Nurses Association (ANA) Position Statement

In their consensus statement regarding procedural moderate sedation, the ANA further delineates the competencies specific to the emergency nurse in relation to moderate sedation. They include, but are not limited to:
a) An understanding of the principles of oxygen delivery, transport and uptake, and respiratory physiology.

b) Demonstrated competency in airway management appropriate to the age of the patient including monitoring patient oxygenation and ventilation (e.g. skin color, respiratory rate, pulse oximetry, secondary confirmation of endotracheal tube placement), initiation of resuscitative measures, and utilization of oxygen delivery devices (e.g. nasal cannula, mask, basic airway techniques, oral/nasal airways, bag valve mask).

c) Demonstrated knowledge of anatomy, physiology, pharmacology, cardiac dysrhythmia recognition, and complications related to procedural sedation and analgesia.

d) Ability to initiate cardiac resuscitation procedures (e.g. CPR, cardioversion, defibrillation)

e) Identification and differentiation of the various levels of sedation.

f) Demonstrated competence in pre-procedural, procedural, and post-procedural nursing care from the initial patient evaluation to patient discharge (e.g. patient assessment and monitoring, IV fluid administration, medication administration).

g) The ability to recognize complications and intervene appropriately.

h) Knowledge of the legal/liability ramifications associated with an independently licensed RN administering procedural sedation.

Excerpt from Procedural Sedation Consensus Statement: For complete statement see Appendix A

"Any adverse reaction or unexpected outcome related to or occurring during a moderate sedation procedure must be reported to Risk Management by completing an incident report, indicating the event occurred during a moderate sedation procedure. Any reference to incident reports should not be made in the patient's medical record."

Hospital Policy

As per Joint Commission criteria, hospitals are required to have policies to provide guidelines and outline specific requirements for moderate sedation procedures. The moderate sedation policy is not intended to address situations that require the services of a qualified, hospital-credentialed anesthesia practitioner and it does not apply to sedation during mechanical ventilation, for seizure or pain control, or when medications are given to provide anxiolysis only. The goals of moderate sedation are to maintain adequate sedation with minimal risk, relieving anxiety, producing amnesia, and providing pain relief.
Hospital policy outlines the qualifications of the RN and the physician responsible for the care of the patient receiving sedation. There must be a registered nurse present who has been deemed competent through the hospital’s competency assessment and validation process to monitor and manage the care of sedated patient. Assessment of competency is intended to assure that the RN:

- Understands the principles of oxygen delivery and respiratory physiology;
- Understands the action, side effects and potential complications of the most commonly prescribed sedatives and their antidotes;
- Identifies abnormal and life threatening cardiac rhythms;
- Demonstrates skill in airway management and resuscitation;
- Is able to utilize emergency equipment and effectively intervene in the event of complications or undesired outcomes;
- And can assess total patient care requirements during sedation and recovery.

Physicians must be granted clinical privileges for moderate sedation procedures through the hospital’s medical staff credentialing process. Sedation privileges are granted if the physician has a current and valid state license and has the following qualifications:

- Skilled in the use of such techniques evidenced by completion of a training program in his/her specialty where the use of pharmacological agents for sedation was a routine part of performing those therapeutic or diagnostic procedures;
- Capable of managing complications and providing first line therapy which include establishing an airway, administering positive pressure ventilation and managing cardiovascular emergencies;
- Agrees to comply with Baptist Hospital Policy in accordance with guidelines set forth in those policies.
- Performing a pre-sedation patient assessment of relevant information from the patient’s medical history.
- Conducting a focused physical examination to determine the patient’s current physical risk status;
- Developing a sedation plan and obtaining informed consent;
- Ensuring patient monitoring that includes level of consciousness, ventilatory and oxygenation status, and hemodynamic indicators.
PATIENT CARE AND SAFETY

Patients receiving moderate sedation need to be assessed and monitored during three phases: before, during, and after the procedure. Nurses must remain vigilant during all phases to ensure safe drug administration and positive patient outcomes.

Pre-Sedation Assessment

According to Joint Commission standards, before moderate sedation is administered a pre-sedation patient assessment must be completed to identify the following:

1. Risk factors that may place the patient at increased risk of complications
2. Patients with high levels of anxiety who may not tolerate sedation easily
3. Pre-existing comorbidities that will complicate care delivery

This assessment allows the practitioner to plan and administer sedation in a manner that ensures patient safety. The components of pre-sedation assessment include the patient’s age, height, weight, and existing medical diagnosis. A physical examination with a review of the cardiac, respiratory, and neurologic systems should be completed.

Many of the procedures performed under moderate sedation are those in which rapid recovery and discharge of the patient is an expectation. If a procedure is expected to be lengthy and requires in-depth monitoring and post-sedation care, the patient may not be considered a candidate for moderate sedation provided by nursing staff. This decision is made during the pre-sedation assessment.

Baseline Assessment

Begin your assessment with baseline vital signs, bearing in mind "normal" vital signs may be masked by pain and fear. A baseline assessment of the patient’s level of consciousness must be recorded to allow for proper assessment during sedation as well as for assessment of readiness for discharge. Also obtain a baseline pulse oximetry reading, especially before initiating oxygen therapy.
The patient’s past medical history must be reviewed, allergies should be documented, and if necessary, therapeutic reversal agents, such as diphenhydramine and epinephrine, should be prepared in advance as a precaution. The patient’s current medical history should include current factors, such as medications, alcohol consumption, substance abuse, and/or tobacco use.

**Physical Status Classification System**

The American Society of Anesthesiologists has developed a Physical Status Classification System to determine risk for complications among patients undergoing anesthesia. This scale is frequently used in the moderate sedation setting and easily performed on all patients in all settings. Patients in Class 1 and 2 are considered good candidates for moderate sedation procedures; those in Class 3 and Class 4 carry higher risks. Nurses providing sedation should recognize that Class 3 and 4 patients may benefit from sedation and should not be excluded based upon their ASA classification. Intensive care unit (ICU) patients, mostly in Class 3 or 4, benefit greatly from sedation.

**American Society of Anesthesiologists (ASA) Physical Status Classification**

<table>
<thead>
<tr>
<th>Class</th>
<th>Physical Status Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A normal healthy patient with no systemic disease</td>
</tr>
<tr>
<td>2</td>
<td>A patient with mild-to-moderate systemic disease</td>
</tr>
<tr>
<td>3</td>
<td>A patient with severe systemic disease</td>
</tr>
<tr>
<td>4</td>
<td>A patient with severe systemic disease that is a constant threat to life</td>
</tr>
<tr>
<td>5</td>
<td>A moribund patient who is not expected to survive without surgical intervention</td>
</tr>
<tr>
<td>6</td>
<td>A declared brain-dead patient whose organs are being removed for donor purposes</td>
</tr>
</tbody>
</table>

“A nurse should be able to assert that he or she is not adequately trained to provide sedation to a particular type of high risk patient.”
After completing the pre-sedation assessment, a decision can be made as to the acceptability of the patient for moderate sedation. Every nurse providing sedation should recognize which patients are at risk. If the nurse determines a certain patient is at high risk for complications, the nurse should be able to assert that he/she is not adequately trained in providing sedation to this particular type patient. There should be no pressure on the nurse to provide sedation when suitability criteria are not met.

**Airway Assessment**

Airway assessment is easily performed using the modified Mallampati scale. If possible, the patient is placed in a comfortable sitting position and asked to open his/her mouth and protrude the tongue. The nurse then assesses the airway, noting the ability to visualize the fauces, anterior and posterior pillars, soft palate, and uvula.

The patient with a Class 1 airway has all these structures visible. The pillars are masked by the tongue in a patient with a Class 2 airway. A patient with a Class 3 airway has only the soft palate and base of the uvula visible. A patient for whom only the hard palate is visible has a Class 4 airway. If the classification exceeds Class I, the physician may proceed with the appropriate plan of action. For patients with a Class II, III and IV airway, a consultation with an anesthesia provider is recommended. The modified Mallampati scale allows the nurse to recognize which patients may be at risk for difficult airway management, including difficult intubations.

<table>
<thead>
<tr>
<th>Mallampati Technique Categories</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I:</td>
<td>Visualization of the faucial pillars, soft palate and uvula.</td>
</tr>
<tr>
<td>Class II:</td>
<td>Visualization of the faucial pillars and soft palate. The uvula is marked by the tongue.</td>
</tr>
<tr>
<td>Class III:</td>
<td>Visualization of soft palate only.</td>
</tr>
<tr>
<td>Class IV:</td>
<td>Soft palate not seen.</td>
</tr>
</tbody>
</table>
Patient Education

If the criteria are met, the patient should be educated regarding the care he/she will receive during and after sedation. The patient and family should be told what he/she can expect during the procedure, and the nurse should inform them about the continuous monitoring that will occur throughout the procedure. The mechanics of noninvasive blood pressure monitoring should be explained, because this may cause momentary pain while the cuff is inflated to its highest level. The pulse oximeter probe should also be explained and demonstrated as well as the vital sign assessment schedule, as patients will often be asked to take deep breaths. If the procedure is painful and a pain scale will be used to assess the patient’s level of pain, the patient should be instructed on its use prior to beginning sedation. Finally, discharge instructions should be provided prior to the procedure; be sure to include the family because the patient may not remember all that is told to him/her in the post-sedation period. Reinforcing these instructions before sedation will greatly enhance patient compliance after sedation.

Environment of Care and Safety

During the pre-sedation period be sure to prepare the equipment to be used and available during the sedation period. Double check the patient support equipment, including oxygen and suction, and tested it to make sure it works properly. If you only check to make sure that the equipment is available, problems could ensue if something doesn’t work when you need it most. Monitoring equipment should be warmed up and calibrated, if necessary. Medications should be available, and determination of correct dosage should be pre-calculated. Reversal medications should be readily available; drawing up an initial dose of the reversal agent is always a wise move if possible. A well-stocked emergency crash cart in the event advanced cardiac life support is necessary should be readily available.
### Suggested Equipment List

<table>
<thead>
<tr>
<th>Standard Equipment</th>
<th>Emergency Meds*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen delivery system</td>
<td>Glucose</td>
</tr>
<tr>
<td>Method to summon help</td>
<td>Dopamine</td>
</tr>
<tr>
<td>Cardiac monitoring system</td>
<td>Atropine</td>
</tr>
<tr>
<td>Policy and Procedure</td>
<td>Sodium bicarbonate</td>
</tr>
<tr>
<td>Pulse oximeter</td>
<td>Amiodarone</td>
</tr>
<tr>
<td>Documentation forms</td>
<td>Naloxone</td>
</tr>
<tr>
<td>BP monitoring device</td>
<td>Epinephrine (1:1000, 1:10,000)</td>
</tr>
<tr>
<td>Emergency supplies (see below)</td>
<td>Flumazenil</td>
</tr>
<tr>
<td>IV access equipment</td>
<td>Lidocaine</td>
</tr>
<tr>
<td>Gloves</td>
<td>Methylprednisolone</td>
</tr>
<tr>
<td>Meds approved by institution</td>
<td>Ammonia spirits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency Airway Supplies</th>
<th>Emergency Support Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naso/Oropharyngeal airways</td>
<td>Defibrillator</td>
</tr>
<tr>
<td>Magill forceps (adult, pediatric)</td>
<td>IV tubing / Extension tubing</td>
</tr>
<tr>
<td>Sterile lubricant, Tongue blades</td>
<td>IV catheters (check sizes)</td>
</tr>
<tr>
<td>Suction equipment</td>
<td>Pediatric burette</td>
</tr>
<tr>
<td>Laryngoscope handle</td>
<td>Tourniquets</td>
</tr>
<tr>
<td>Yankauer suction catheters</td>
<td>Gloves</td>
</tr>
<tr>
<td>MacIntosh blades (check sizes)</td>
<td>IV fluid</td>
</tr>
<tr>
<td>Suction catheters (check sizes)</td>
<td>Alcohol wipes</td>
</tr>
<tr>
<td>Miller blades (appropriate sizes)</td>
<td>3-way stopcocks</td>
</tr>
<tr>
<td>Bag valve mask (check sizes)</td>
<td>Adhesive tape</td>
</tr>
<tr>
<td>Endotracheal tubes (check sizes)</td>
<td>Intraosseous needles (pediatric)</td>
</tr>
<tr>
<td>Stylets (adults, pediatric)</td>
<td>Syringes (appropriate sizes)</td>
</tr>
</tbody>
</table>

*Choice of medications will vary by policy and patient population.*
Informed Consent

The patient must be informed about the risks, benefits and alternatives to sedation as a component of the procedure. There must be documentation in the medical record of informed consent and the plan of sedation prior to the procedure.

Here is a general list of risks and complications that could be associated with a sedative procedure:

<table>
<thead>
<tr>
<th>Relatively common and short-lived</th>
<th>Relatively Rare</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Nausea and vomiting</td>
<td>- Allergic reaction</td>
</tr>
<tr>
<td>- Prolonged sleepiness</td>
<td>- Diminished respiratory effort</td>
</tr>
<tr>
<td>Uncommon and short-lived</td>
<td>- Inhalation of stomach contents</td>
</tr>
<tr>
<td>- Headache</td>
<td>- Pneumonia</td>
</tr>
<tr>
<td>- Excitability and agitation</td>
<td>Extrememly Rare</td>
</tr>
<tr>
<td>- Dizziness</td>
<td>- Damage or failure of heart, liver, stomach, kidneys and or brain</td>
</tr>
<tr>
<td>- Low blood pressure</td>
<td>- Cardiopulmonary arrest</td>
</tr>
<tr>
<td>- Nightmares</td>
<td>- Death</td>
</tr>
<tr>
<td>Uncommon, but may last a short time</td>
<td></td>
</tr>
<tr>
<td>- Sore lumpy vein (if meds given IV)</td>
<td></td>
</tr>
</tbody>
</table>

Immediately Prior to Sedation

Establish IV access in the patient receiving IV sedation. If the patient has not been fasting, as is the case in emergency room patients, medications to decrease gastric contents and stomach acid should be administered. These drugs will help reduce the risk and complications of aspiration, one of the most common complications of moderate sedation.

A final set of pre-sedation vital signs should be taken. The Joint Commission requires that heart rate and oxygenation be continuously monitored by pulse oximetry in all patients undergoing moderate sedation. If the patient is going to receive supplemental oxygen therapy, a baseline pulse oximetry reading on room air should be recorded first. After oxygen therapy is initiated, another pulse oximetry reading should be obtained.
Best Practice: Universal Protocol

Pre-procedure verification. This verification ensures that all documents are available prior to the start of the procedure. Missing information and/or discrepancies must be addressed before the start of the procedure. This verification includes:

- Patient Identification with Two Identifiers (patient name, Medical Record number, date of birth)
- History and Physical in the Medical Record (According to unit policy)
- Signed Consent in the Medical Record with the correct procedure verified
- Site Marked and Verified (the patient should be involved in site marking if possible).

Time Out (final verification). The Time Out is a deliberate pause in activity involving clear communication (that includes active listening and verbal confirmation of the patient, procedure, site and side) among all members of the procedural team. The procedure is not started until any questions or concerns are resolved. The Time Out includes verifying:

- Correct patient identity
- Correct procedure verified with consent
- Correct site and side (verified with site marking as per policy)
- Correct patient position
- Availability of correct implants and any special equipment or requirements

Care of the Sedated Patient

During sedation, the two most important responsibilities of the nurse are to ensure patient safety and monitor the patient’s level of sedation. Documentation should be performed throughout the procedure as a record of patient care. One of the elements of performance established by the Joint Commission includes:

“During operative or other high risk procedures, including those that require the administration of moderate or deep sedation or anesthesia, the patient’s oxygenation, ventilation, and circulation are monitored continuously.”
This means that throughout the sedation period, the nurse remains with the patient at all times. There should be no other responsibilities for the nurse; assisting with the procedure should not be an expectation. It is essential that all persons involved with moderate sedation be aware of this requirement. The nurse should never be asked to help out "just this once," thus compromising patient safety. The policy and procedures for moderate sedation delivery should clearly delineate the nurse’s responsibilities and the right to refuse additional tasks during this period.

While the patient is receiving and recovering from sedation, the nurse should prudently monitor the patient’s airway. It is the nurse’s responsibility to ensure that during sedation, the patient’s spontaneous ventilation is maintained without intervention. Should the patient’s level of consciousness deepen to the point that the airway is compromised, the physician should be informed and measures undertaken to respond to this urgent situation.

**Oxygen Therapy**

Oxygen therapy devices used in moderate sedation range from the simple (e.g., nasal cannula) to the more complex (e.g., non-rebreather and Venturi masks). The nurse caring for the patient should understand the importance of the proper application of each device used. For example, the flow rate on the simple face mask should be, at a minimum, 5 L/min. If the oxygen flow rate were less than 5 L/min, carbon dioxide ($CO_2$) could accumulate within the mask and the patient would rebreathe this $CO_2$. This would lead to a respiratory acidotic state with further compromise of the patient’s ventilatory status. The table below summarizes the various oxygen delivery devices used in the moderate sedation setting, and notations are made about each device.
**Oxygen Therapy Devices**

<table>
<thead>
<tr>
<th>Type</th>
<th>Fraction Inspired Oxygen (FiO₂)</th>
<th>Flow (L/min)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal cannula</td>
<td>24% to 40%</td>
<td>3-6</td>
<td>Comfortable, only increases O₂ level slightly, inexpensive, high flow rate increases problems</td>
</tr>
<tr>
<td>Simple face mask</td>
<td>25% to 55%</td>
<td>5-8</td>
<td>Poorly tolerated if too tight</td>
</tr>
<tr>
<td>Face tent</td>
<td>30% to 50%</td>
<td>4-10</td>
<td>Less confining, may provide humidification during long procedures</td>
</tr>
<tr>
<td>Nonrebreather mask</td>
<td>40% to 100%</td>
<td>6-15</td>
<td>Mask with reservoir and one-way valves, best noninvasive device, requires tight seal to achieve high %</td>
</tr>
<tr>
<td>Venturi mask</td>
<td>24% to 55%</td>
<td>2-14</td>
<td>Adjustable FiO₂</td>
</tr>
<tr>
<td>Bag valve mask</td>
<td>up to 100%</td>
<td>10-15</td>
<td>Self-inflating, may increase gastric distention</td>
</tr>
</tbody>
</table>

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**MONITORING**

It cannot be stressed enough that all patients receiving moderate sedation must be continuously observed and physiologically monitored by a designated qualified nurse throughout the sedation period. Vital signs and assessment data must be documented just prior to sedation and then every 5 minutes for as long as the sedation is in effect. This may be decreased to every 15 minutes as indicated by the patient’s condition post-sedation. The sedation period includes the period of time during the administration of sedation until the patient has returned to pre-sedation status with regard to airway, breathing, circulation, and level of consciousness. The standard moderate sedation monitors are pulse oximetry, capnography, and the level of sedation.

"The accuracy of routine pulse oximetry should not be assumed; make sure you are able to use the equipment correctly and interpret the results knowledgeably."
Cardiac Monitoring

Cardiac monitoring of patients undergoing moderate sedation provides information regarding heart rate and rhythm. The Joint Commission requires continuous cardiac assessment in all patients undergoing moderate sedation because it allows for the early detection of arrhythmias that are the result of hypoxia and myocardial ischemia. While cardiac monitoring can be a useful adjunct to monitoring for all patients, it is particularly essential for high-risk patients. Patients who are at risk of developing arrhythmias include the elderly, patients with abnormal electrolyte values, those with a history of cardiac disease, and patients experiencing significant hypoxic intervals. The most common dysrhythmias that develop during moderate sedation include premature ventricular complexes and atrial dysrhythmias, such as atrial flutter and atrial fibrillation. Fortunately these arrhythmias are readily reversed with oxygen therapy and do not negatively impact the patient’s outcome.

The controversy regarding cardiac monitoring lies in the fact that many patients receiving moderate sedation are healthy, and continuous cardiac rhythm monitoring may be unnecessary in a large population of patients. Each institution should develop its own policies and procedures as to which patients are candidates for monitoring and which patient populations do not require this level of care.

Noninvasive Blood Pressure Monitoring

Noninvasive blood pressure monitoring allows for ongoing evaluation of the patient’s blood pressure with a minimal amount of nursing time. The monitor cycles at a preset interval to obtain accurate and reliable blood pressure readings.

The blood pressure cuff is placed over the brachial artery with the lower edge of the cuff one inch above the antecubital fossa. In a patient with fragile skin, a single layer of cotton padding or clothing may be placed around the arm prior to application of the blood pressure cuff. This will protect fragile tissue from injury that may occur with multiple cuff inflations.

It is important that the nurse makes sure the cuff is the right size and places the cuff appropriately. A cuff that is too wide will provide a blood pressure reading that is falsely low. Conversely, a cuff that is too narrow will provide an falsely high reading. A proper cuff is approximately 40% of the circumference of the arm to which the cuff is applied.
Pulse Oximetry

The pulse oximeter allows the practitioner to monitor the hemoglobin saturation as a method of early detection of impending hypoxia [49]. Studies have shown that monitoring pulse oximetry greatly improves the practitioner’s ability to assess changes in the early stages of hypoxia and initiate interventions to reverse developing complications.

Prior to application of the probe, it is critical to ensure that the site is prepared properly. Fingernail polish will prevent accurate measurements and should either be removed or the fingertip ruled out for probe placement [56]. It is important to recheck the probe location for good capillary refill, both immediately after probe placement and intermittently during patient monitoring. The probe should not be placed on the same extremity in which blood pressure will be measured. When the cuff inflates, the blood flow to the extremity may be compromised, producing an inaccurate saturation reading.

How It Works

- Pulse oximetry measures the amount of oxygen carried on hemoglobin in arterial blood.
- There are two forms of oxygen transport in the blood: hemoglobin and plasma:
  - 97% of the \( \text{O}_2 \) is attached to hemoglobin. 1%-3% of the \( \text{O}_2 \) is dissolved in the plasma.
- Pulse oximetry promptly and reliably, excluding artifacts, identifies hypoxemia more quickly than clinical signs such as cyanosis or disorientation which occur much later.

Advantages of Pulse Oximetry:

- Continuous monitoring
- Multiple sites available
- Noninvasive: no damage to tissues
- Calibration is not required
- It’s user friendly
- Multiple parameters measured: \( \text{SpO}_2 \), Perfusion, HR

Disadvantages of Pulse Oximetry

- The accuracy of pulse oximetry declines below 60% saturation.
- It does not measure the patient’s ventilation
- It does not monitor carbon dioxide accumulation or excretion.
- Oxygen saturation does NOT equal to \( \text{PaO}_2 \) (partial pressure of \( \text{O}_2 \) in arterial blood)
Factors that affect the accuracy of pulse oximetry:

- Slippage of the sensor: always check the position first
- Movement, shivering, patient positioning
- Poor peripheral perfusion
- Contrast/dyes
- Electrocautery (false low reading)
- MRI (Magnetic Resonance Imaging)
- Excessive ambient light (infra red lights and surgical lamps)
- Anemia: Hg < 5 may create a false decrease in SpO2 reading.
- Acrylic nails and nail polish, especially blue, green or red nail polish.
- Hypoxemia: SaO2 < 70% may cause inaccurate readings.
- Rapid or erratic heart rates where pulse does not correlate with heart rate.
- Dyshemoglobinemas: methemoglobin, carboxyhemoglobin and sulfahemoglobin.

The oxygen hemoglobin dissociation curve helps determine the correlation between oxygen saturation and PaO2 such that one can equate the following saturation with its corresponding PaO2.

<table>
<thead>
<tr>
<th>Saturation (%)</th>
<th>PaO2 (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>95</td>
<td>90</td>
</tr>
<tr>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>75</td>
<td>40</td>
</tr>
</tbody>
</table>

Capnography / End-Tidal Carbon Dioxide Monitoring

Capnography is a noninvasive technique that can alert you to hypoventilation even when your patient’s pulse oximetry readings are normal. Carbon dioxide (CO2) is the most significant factor in monitoring ventilation and capnography measures the CO2 in every breath to monitor air exchange in the patient’s alveoli. Measuring her CO2 levels during procedural sedation can detect problems in her lungs or airway and offers earlier warning of hypoventilation, airway compromise, hypermetabolism (Malignant hyperthermia), and hypoperfusion than monitoring SpO2 with pulse oximetry alone. Here’s how it works:

The device measures CO2 with infrared technology and gives graphic and digital numeric displays for end-tidal CO2 (ETCO2) and SpO2. It also measures respirations and pulse rate and sounds an alarm if the readings go beyond set ranges.

"At no time should alarms be silenced."

"Like all other technology used to monitor patients, care should remain focused on the patient and not the machine."
To measure ETCO2, the system aspirates exhaled breath from the patient’s airway and transfers it to an infrared sensor in the monitor or the sensor is positioned with an adapter at the patient’s airway. When ready, you should show your patient the monitor and explain that you’ll apply a cannula to the nares and a probe to a finger to monitor during the procedure. If the patient is going to receive oxygen, explain that it’ll flow through the nasal tubing. Apply the cannula as well as the SpO2 sensor. Observe the monitor and verify that a capnograph waveform is displayed with each exhaled breath. Record baseline numeric values and waveform characteristics.

Monitor the capnograph values and waveforms continuously while your patient is receiving moderate sedation and during recovery from it. If an alarm sounds, assess the patient for a change in clinical status and always check the equipment for problems, such as a disconnected circuit. You may need to stimulate the patient. You must continue to monitor until your patient has recovered from the sedation, according to either the Post Anesthesia Recovery Score or the Modified Post Anesthesia Discharge Score.

The Capnograph Waveform plots the patient’s CO2 level on the vertical axis and time on the horizontal axis. The highest point represents end-tidal CO2—ETCO2—the concentration of CO2 at the end of exhalation, which provides a clinical estimate of alveolar CO2.

Follow these interventions for any change from baseline:
✓ Check the patient.
✓ Stimulate the patient.
✓ Consider withholding additional sedating medication.
✓ Inform the practitioner.
✓ Stop the procedure if necessary.
✓ Administer a reversal agent if necessary.
Level of Sedation

During sedation, the patient has to be monitored for his or her response to the medications given. If a patient displays agitation and restlessness, the nurse should first determine if this is a sign of hypoxemia. It is possible that the agitation is secondary to inadequate pain management, but if you consider hypoxemia as the primary cause you can intervene appropriately and immediately and the risk of further hypoxemia is eliminated. Further assessment can then be performed and the patient made comfortable.

The assessment of vital signs should be done every 5 minutes and additionally at one minute after each dose of IV sedative. This will ensure that you recognize developing cardiovascular and respiratory complications secondary to medication administration right away. It is also good practice to assess the patient’s airway every time you take vital signs, asking the patient to take a deep breath (unless contraindicated by the procedure). This will keep your patient safe throughout the procedure.

An occasional concern during sedation is the accumulation of secretions in the airway. Certain medications (such as ketamine) are more likely to increase secretion formation, and you should maintain constant vigilance of the airway to prevent airway obstruction. If suctioning it is indicated, it should be done using a Yankauer-type device.

Assessing Levels of Sedation

There are a number of sedation scales available, and the one for your unit should be easy to use, interpret, and record in. Scoring a patient’s level of sedation should never be painful or uncomfortable for the patient. Sedation scales define the goals of sedation, help simplify documentation, and make your observations more objective. The patient should be able to be assessed by a number of different staff at the same time and receive the same score with each assessment.

Some of the well-known scales are the Ramsay Sedation Score, the Sedation-Agitation Score, the Richmond Agitation-Sedation Scale (RASS), and the Motor Activity Assessment Scale. The Ramsay Sedation Score was created for critical care patients and is one of the scoring systems most widely used during moderate sedation. The desirable level of sedation using the Ramsay Sedation Score is a level of 2 or 3, although it can be difficult to distinguish between the levels.
Modified Ramsey Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Awake States</td>
</tr>
<tr>
<td>1.</td>
<td>Patient anxious, agitated, or restless</td>
</tr>
<tr>
<td>2.</td>
<td>Patient cooperative, oriented, tranquil</td>
</tr>
<tr>
<td>3.</td>
<td>Patient asleep, brisk response to loud auditory stimulus</td>
</tr>
<tr>
<td></td>
<td>Sleep States</td>
</tr>
<tr>
<td>4.</td>
<td>Patient asleep, sluggish response to loud auditory stimulus</td>
</tr>
<tr>
<td>5.</td>
<td>Patient has no response to loud auditory stimulus, but does respond to painful stimulus</td>
</tr>
<tr>
<td>6.</td>
<td>Patient does not respond to painful stimulus</td>
</tr>
</tbody>
</table>

Documentation

Careful observation of the patient must include continuous assessment of the patient’s level of consciousness, oxygenation and ability to maintain protective reflexes. Your nursing documentation should include at least the following:

**Basic Documentation**
- Informed consent
- Assessment data, medical history
- Time procedure initiated & ended
- Evidence of monitoring
- What meds given, the time, & the patient’s response
- Any adverse reactions & treatment
- Recovery and discharge data
- Discharge instructions
- Release to a responsible adult

**Monitoring Documentation:**
- Baseline vital signs prior to procedure
- Vital Signs every 5 to 15 min., including:
  - Level of consciousness/sedation
  - Heart/respiratory rate, blood pressure
  - Oxygen saturation, Capnography
  - Cardiac rhythm
  - Pain assessment
  - Type/amount of IV fluids/blood
How Much Sedation?

Sedation is a continuum, and the medication effects depend on the patient’s medical status, body size, and general health. You must titrate IV drugs slowly to determine the best dosage for each patient and procedure.

Never give a second dose of medication—even a small dose—until you assess the effect of the first dose. What appears to be weight-appropriate dose of midazolam (Versed) or fentanyl (Sublimaze) could cause unconsciousness and respiratory arrest in the rare patient. In contrast, the opioid-tolerant patients may need much higher doses of opioids or an alternative sedative medication for adequate effect.

MEDICATION ADMINISTRATION

The choice of medication for sedation and analgesia depends on the type of procedure being performed and the approximate time it should take. The ideal moderate sedation drug would have all of the following characteristics:

- Rapid acting with limited cardiorespiratory effects
- Titratable, with length of action equal to time required
- Provides both analgesia and sedation
- Rapid return to the pre-sedation state
- Readily and easily reversed

Unfortunately, there is no one medication that is effective and appropriate for all types of patients. Because this ideal drug does not exist, the following discussion will focus on the advantages and disadvantages of each class of medications. There are basically only a handful of IV medications used for moderate sedation in today’s healthcare, and basic information about each will be provided. In addition, we will briefly provide information about medications previously used, as they are sometimes used when drug allergies necessitate substitution.
Administration of Intravenous Medications

IV medications for sedation/analgesia can be administered by way of single-dose injection technique, bolus technique, continuous infusion technique, or drug combination therapy. Each method has distinct advantages and disadvantages, and certain drugs can only be administered by one method.

Single-dose injection is also known as "titration to effect." This is the incremental increase in drug dosage to a level that provides the optimal therapeutic effect. The patient is given frequent, small doses of the medication, and the effects are monitored prior to giving another incremental dose. The nurse must monitor the patient’s vital signs and level of sedation after each drug dose and adjust subsequent doses based upon these responses. Single-dose injection provides for better control of the amount of drug delivered, although repeated doses may prolong the patient’s recovery time. This method requires more nursing time in order to prepare the drug, administer the drug, and monitor the effects, but is one of the safest methods for sedation. The risk of over-sedation or under-sedation is minimal.

The bolus technique is the administration of the entire dose, or a large percentage of the drug, all at once. The drug has a rapid onset of action, reaching a therapeutic level very quickly; however the onset of complications can be more profound. Deep, rapid sedation happens more frequently, thus increasing the risk of respiratory depression. This method's major disadvantage is that the drug's effects may be shorter than the procedural time, causing the patient to be inadequately sedated toward the end of the procedure. The question of whether the patient should be re-sedated, prolonging recovery time, or be instructed to "hold on" until the end of the procedure has to be made. The second choice is obviously not in the best interest of the patient and should be avoided.

Another dilemma that may develop with the bolus technique is the rapid onset of complications. This is most often seen when high doses of fentanyl are given rapidly. Chest wall rigidity develops in these patients, making the patient unable to breathe. Efforts to support ventilations can be made so difficult that the patient needs a neuromuscular blocking agent, such as succinylcholine. This causes the patient to be paralyzed for a short period of time, and respiratory assistance must continue until spontaneous respirations returned. Naloxone should be administered to reverse the effects of the narcotics. This complication can be avoided completely with proper drug dosages and administration techniques.
Continuous infusions are beneficial in that they provide a constant blood level of the medication. Recovery time is often shorter, and the individual begins to awaken as soon as the drug is discontinued. Propofol (Diprivan) is administered by this route, as its extremely short length of action makes other methods and routes impractical. This technique does require constant monitoring of the infusion to prevent under-sedation as well as accidental overdose. It should be noted that unlike other sedation agents (e.g., midazolam, morphine), there is no reversal agent for propofol. Adverse effects must be treated until the drug is metabolized.

Finally, a combination drug therapy may be used. Opiates and benzodiazepines are most commonly combined to achieve an appropriate level of both sedation and pain control. Benzodiazepines do not provide analgesia, so bear in mind that for any procedure that is painful another agent should be used. A possible disadvantage of drug combinations is the synergistic, cumulative effects of drugs, producing the risk of profound, deep sedation. The likelihood of side effects increases, and the risk of a cross reaction does exist. Despite these concerns, drug combination therapy can effectively meet the goals and objectives of moderate sedation with proper drug dosages.

### Medications Used in Moderate Sedation

The two most common medications administered for moderate sedation are midazolam and fentanyl. These drugs, as well as many others, are included in the following discussion. The following medication tables list the usual dosages that are safe to begin sedation. Please bear in mind however that higher doses are often administered, and the nurse must be aware that the higher the dose, the greater the risk of complications.

"Benzodiazepines do not provide analgesia."
Benzodiazepines

Benzodiazepines are a class of drugs familiar to most nurses. They are used on a daily basis because their therapeutic effects predictably meet the patient’s needs. However, a major effect of these drugs is upon the respiratory system and patients can experience a depressed response to increasing carbon dioxide levels with subsequent falling levels of arterial oxygenation. Each 0.1 mg per kilogram of midazolam is said to reduce the body’s response to rising carbon dioxide levels by 50%. There is also a rise in pulmonary airway resistance. As the patient’s level of consciousness decreases, the risk of respiratory insufficiency increases greatly. If the patient is unable to compensate for falling arterial oxygen, carbon dioxide levels will continue to rise. It is imperative that the nurse administering these drugs be aware of this risk and continuously monitor the patient’s respiratory effort and oxygen saturations.

The central nervous system effects of the benzodiazepines include a reduction in cerebral blood flow, a decrease in cerebral oxygen consumption, and an increase in the seizure threshold. The hypnosis produced by this class of drugs helps facilitate the relaxation and event amnesia for which these drugs are known. Use with caution in patients with:

- A history of chronic obstructive pulmonary disease or sleep apnea
- Drug and/or alcohol intoxication or abuse
- Liver and/or renal disease
- Difficult airways

Extra caution should be exercised for the very young, the elderly, and the pregnant or lactating patient. Patients on heparin may experience prolonged bleeding times with midazolam use. Certain medications, including propranolol and digitalis, may have an increased effect of slowing the heart rate. Patients taking these medications should be monitored for the development of symptomatic bradycardia.

**Bear in Mind:**

"Benzodiazepines do not provide analgesia, so for painful procedures an analgesic should also be used."

"Benzodiazepines can increase the seizure threshold."
## Benzodiazepines (Antagonist: Flumazenil)

<table>
<thead>
<tr>
<th>Benzodiazepine</th>
<th>Usual Dose</th>
<th>Pediatric Dose</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Midazolam</strong> (Versed)</td>
<td>IV: 0.5 - 2.0 mg (0.02 to 0.03 mg/kg) over 2 to 3 minutes. Reduce dose by 30% - 50% if patient was pre-medicated.</td>
<td>6 months to 5 years: 0.05 to 0.1 mg/kg over 2 to 3 min.</td>
<td>Titrate to slurred speech. Monitor airway, oxygen saturation, HR. BP monitoring required during IV administration. Adolescent/pediatric patients may exhibit paradoxical excitement. Avoid use with alcohol, St. John's Wort, Valerian, Kava-Kava, and gotukola. May increase CNS depression. Contraindicated in acute narrow-angle glaucoma. May potentiate adverse effects of opioids - including respiratory depression - when used in combination. Reduce dose in patients with compromised renal or hepatic dysfunction.</td>
</tr>
<tr>
<td><strong>Pediatric Dosage</strong></td>
<td>IV - Dilute to 0.1 mg/ml</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elderly: Adults &gt; 60; debilitated or chronically ill</td>
<td>IV: 1.5 mg maximum dose over 2 to 3 minutes. If additional titration is needed, give at a rate not exceeding 1 mg over 2 min. Usual max total dose: 3.5 mg.</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Onset: 1 to 2 minutes Duration: 10- 40 minutes Recovery usually occurs within 2 hours, but effects may last as long as 6 hours.</td>
<td></td>
</tr>
</tbody>
</table>

### Flumazenil (Romazicon)

<table>
<thead>
<tr>
<th>Flumazenil</th>
<th>Usual Dose</th>
<th>Pediatric dose</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.2 mg IV over 15 sec, Max 3 mg/hr.</td>
<td>0.01 mg/kg over 15 sec, May repeat q1 min to max 2 mg.</td>
<td>Observe for re-sedation. Use with caution in patients with a history of benzodiazepine abuse or seizures.</td>
</tr>
<tr>
<td></td>
<td>May repeat q1 min to max 1 mg.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Onset 1-3 mins Peak 6-10 mins Duration 1 hour</td>
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<td></td>
</tr>
</tbody>
</table>
Opioids / Narcotics

Opioids bind to specific receptors in the central nervous system to provide pain relief and sedation during procedures. When given in higher doses, all opioid narcotics will produce a profound decrease in the patient’s level of consciousness and the risk of respiratory arrest. The action of each receptor type varies but all provide some level of analgesia and the main use of narcotics during sedation is to provide some level of pain relief.

### Opioids (Antagonist: Naloxone)

**Morphine**

**Dosage:**
- IV: Dilute to achieve concentration of 1mg/mL. Administer 1 or 2 mg over 1 to 2 min. May repeat incremental dose at 5 minute intervals to achieve desired endpoint. Usual max total dose: 10 mg/24 hours. Reduce dose in elderly or debilitated patients.
- **Pediatric Dosage:** IV: 0.02 to 0.03 mg/kg over 2 to 3 minutes. Once sedation is achieved, additional doses should be 25% of the dose required to produce sedative endpoint; for maintenance, use 0.25 mg to 1 mg. Total dose: usually < = 5 mg

**Notes**
- Titrate to slurred speech and Ramsay Score of 3. Monitor respiratory rate and depth continuously; respiratory depression may occur. Be prepared to assist ventilation.
- Contraindicated if drug allergy; use cautiously in elderly and debilitated patient.
- Hypotension is possible especially if the patient is hypovolemic.
- Nausea and vomiting may occur. (Less nausea/vomiting than meperidine).

**Fentanyl** (Sublimaze)

**Dosage:**
- IV: 25 mcg to 50 mcg up to 150 mcg . Slow IV administration over 2 21 calico minutes. May repeat 25 mcg every 5 mins.
- **Pediatric Dosage:** IV: < 6 years 0.3-1.5 mcg/kg/dose slow IV push over 1-2 mins. > 6 years 1-5 mcg slow IV push over 1-2 minutes. Reduce dose if used with a benzodiazepine.

**Notes**
- Titrate to slurred speech. Monitor respiratory rate and depth continuously; respiratory depression may occur. Crosses the blood brain barrier quickly. Give slowly to prevent chest wall rigidity; Apnea may occur. More sedative effects when compared with morphine. Shorter acting when compared to morphine.

### Opioid Antagonist

**Naloxone** (Narcan)

**Usual Dose**
- May titrate for reversal (add 0.4 mg in 10 ml syringe: give 1 ml=0.04 mg)

**Pediatric Dosage:** IV: 0.1-2 mg/kg

**Notes**
- MR q1 min to max of 10 mg. Observe for re-sedation. May not reverse cardiovascular effects. May cause noncardiogenic pulmonary edema.
Antagonists

Antagonists, also known as reversal agents, act on the receptors in the central nervous system to reverse the effects of the sedation. They have no other pharmacological effects and their duration is usually shorter than the duration of the drug being reversed. This means that dosage must be repeated for as long as the sedation is in effect. They have gained widespread use as "rescue" medications, allowing patients who have unintentionally become deeply sedated to return to the moderately sedated level and for procedure completion.

Opioids such as morphine and Fentanyl and benzodiazepines such as Versed both have antagonists available to reverse their actions. Naloxone (Narcan) is the opioid antagonist, and flumazenil (Romazicon) is the benzodiazepine antagonist. The advantage of the antagonists is that they can be administered in small doses, with a goal of reversing deep sedation and respiratory depression but not completely reversing sedation. By giving the antagonists in small doses, the patient’s respiratory drive increases but the patient remains sedated.

To reverse benzodiazepine sedation, flumazenil is given in 0.2 mg increments, repeating the dose at one-minute intervals to a maximum of 1 mg. Eighty percent of the reversal effect will be achieved within the first 3 minutes after administration. After receiving flumazenil, the patient may have a transient hypertensive episode with flushing, headache, and fatigue.

Rapid administration of the antagonists should be avoided. Naloxone can produce a non-cardiogenic pulmonary edema, with increasing shortness of breath and decreasing blood oxygen levels. In rare cases, ventilatory support is necessary. Flumazenil can precipitate seizure activity in patients with a history of benzodiazepine abuse or addiction. When giving flumazenil, seizure precautions should be taken because patients often under-report their drug use. The reversal of narcotics will reverse the analgesic effects, and if reversal is abrupt, the patient is not allowed time to slowly reorient to his/her surroundings and may also experience significant pain.
Moderate Sedation of the Pediatric Patient

The American Academy of Pediatrics offers the following guidelines and requirements for the safe sedation of children for procedures:

- Moderate sedation is performed under medical supervision
- A pre-sedation evaluation to uncover underlying medical/surgical conditions
- Elective procedures are done with appropriate fasting
- A focused airway exam is done to uncover potential airway obstruction
- There is a clear understanding of the medication affects
- Appropriate training and skills in airway management to allow rescue
- Appropriate medications and reversal agents
- Sufficient people to carry out the procedure and monitor the patient
- Appropriate physiologic monitoring during and after the procedure
- A properly equipped and staffed recovery area
- Recovery to pre-sedation level of consciousness before discharge
- Appropriate discharge instructions

Moderate sedation for the pediatric patient is a safe and effective method of controlling pain, discomfort, and agitation. A child’s ability to control his or her own behavior and cooperate during a procedure depends on the child’s chronologic and developmental age. Small children less than 6 years of age and those who are developmentally delayed may need deep levels of sedation to adequately control behavior. The nurse must be able to anticipate that a child may pass from moderate sedation to a deeper, unintended level and be able to respond immediately. The ability to rescue is particularly essential because sedation medication has a more profound effect on the protective reflexes, airway patency, and respiratory drive of a child. The nurse must be able to take into consideration the anatomic and physiologic differences in children.

Vigilant monitoring of the child at all times; complications may occur rapidly and the risk of untoward events happening is higher. Besides medications also used for the adult population such as Morphine, Fentanyl (Sublimaze), and Midazolam (Versed), there are medications used almost exclusively in the pediatric population. They are phenobarbital (Nembutal) and chloral hydrate.
More Pediatric Considerations

- Recognize family members may be filled with anxiety. Provide education and an opportunity to ask questions about sedation and analgesia.
- Use age-appropriate communication for the child’s developmental level.
- Only pediatric-trained professionals with documented competency can provide pediatric moderate sedation.
- Follow your entity’s policies and procedures for defining pediatric patients, sedation medications, maximum dosages, and route of administration.
- When discharging, instruct the family to prevent the risk of airway obstruction by preventing the child’s head from falling forward while the child is secured in a car seat or sleeping upright.

Pentobarbital (Nembutal)

Pentobarbital is a barbiturate given to immobilize pediatric patients, especially during radiology procedures. It has very strong sedative properties which can lead to deep sedation, but does not provide pain relief. Pentobarbital can cause paradoxical excitement in children, especially those with pain. Pentobarbital is titrated in 1mg/kg increments over 3-5 minutes until desired effect is achieved, but never any faster than 50 mg/min. There is no reversal agent for Phenobarbital.

<table>
<thead>
<tr>
<th>Pentobarbital (Nembutal)</th>
<th>Dosage:</th>
<th>Onset:</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV: 50 – 100 mg at a rate no greater than 50mg/min to prevent hypotension and respiratory depression. May repeat in 2 minutes to achieve sedation endpoint. PO: 150 – 200 mg in divided doses. If desire repeat, consider IV to titrate effect. <strong>Pediatric Dosages</strong> IV: 0.5-1.0 mg/kg titrate to a max of 6 mg/kg 150 mg</td>
<td><strong>Duration:</strong> PO = 1-4 H; IV = 15 min</td>
<td>PO = 20 mins; IV = 15 sec</td>
</tr>
</tbody>
</table>

**Notes**

- Alternative for benzodiazepine allergy
- Titrate to slurred speech.
- Side effects: respiratory depression, laryngospasm, hypotension bronchospasm.
- Contraindicated in patients with hypersensitivity to barbiturates or porphyria or with severe respiratory disease when dyspnea or obstruction is evident. Use cautiously in geriatric or debilitated patients.
- No reversal agent
Chloral Hydrate

Chloral hydrate sedation provides effective and safe sedation in children if the American Academy of Pediatrics guidelines for patient selection, monitoring, and management are followed. A careful medical screening is important to exclude patients at high risk for life-threatening hypoxia because the side effects include respiratory depression. Chloral hydrate may be given by mouth or per rectum and is used effectively in the infant and toddler population for brief procedures. The half-life of the drug is prolonged and the child may require a longer observation period after the procedure. Despite the widespread belief that chloral hydrate is a very safe drug, administration has resulted in a number of deaths. Bear in mind that no reversal agent exists for chloral hydrate.

Sedative Hypnotics

Antagonist: None

<table>
<thead>
<tr>
<th>Chloral Hydrate</th>
<th>Pediatric dose:</th>
<th>Onset: 10-15 mins</th>
<th>Duration: 1 to 4 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral or Rectally: 25 – 50 mg/kg/dose 60 minutes prior to a procedure. (500-1000 mg)</td>
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</tr>
<tr>
<td>May repeat dose in 30 mins to a max dose of 100 mg/kg or 500 mg per single dose (sedative) or 1g per single dose (hypnotic). Max total: 2 g/day</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes

Induces sleep 1-4 hrs. Monitor airway, O2 saturations. Sedation failure increases with age. Best used in children younger than 3 years of age.
Dissociative Agents

Ketamine is one of the few drugs that provide both analgesia and amnesia during moderate sedation. It is an agent that "dissociates" the thalamus from the limbic system. The drug produces a cataleptic state, and onset of sedation is noted when nystagmus (involuntary eye movement) and an open-eye gaze develops. When receiving Ketamine, the patient remains responsive but not always appropriate.

Ketamine imitates the sympathetic nervous system and stimulates the heart, which can lead to an increased heart rate and blood pressure. Because myocardial oxygen demand increases, patients with a history of coronary artery disease or congestive heart failure should not receive Ketamine. It induces bronchodilation and has a minimal effect on the patient’s respiratory drive, making it the sedative of choice for the asthmatic patient. It also increases saliva and mucus production, especially in the pediatric patient.

Ketamine causes cerebral vasodilation, which can lead to an increase in intracranial pressure and should be avoided in patients with a history of neurological disorders. Another central nervous system effect is the development of emergence delirium in the patient when awakening, more common in patients over the age of 15 and when given intramuscularly. This makes Ketamine a choice sedative for children. The patient may exhibit combative behavior, experience dreams or nightmares, and hallucinate. Fortunately, this complication is brief in almost all cases. To decrease the risk of delirium, slow administration and recovery in a quiet location with soft lighting is recommended. No antagonist exists for Ketamine.

### Dissociatives

<table>
<thead>
<tr>
<th>Dosage:</th>
<th>Antagonist: None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketamine (Ketalar)</td>
<td>Onset:</td>
</tr>
<tr>
<td>IV: 1-4.5 mg/kg</td>
<td>IV: 30-60 secs</td>
</tr>
<tr>
<td>IM/Rectal: 3-8 mg/kg</td>
<td>IM: 3-4 mins</td>
</tr>
<tr>
<td>PO: 5-6 mg/kg</td>
<td>Duration:</td>
</tr>
<tr>
<td>Pediatric dose:</td>
<td>IV: 5-10 mins</td>
</tr>
<tr>
<td>IV: 1-2 mg/kg/dose</td>
<td>IM: 12-25 mins</td>
</tr>
<tr>
<td>PO: 6-10 mg/kg</td>
<td></td>
</tr>
<tr>
<td>IM: 4-5 mg/kg/dose</td>
<td></td>
</tr>
<tr>
<td>Rectal: 5-10 mg/kg</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>May cause emergence reactions, including vivid dreams, hallucinations, or delirium.</td>
<td></td>
</tr>
</tbody>
</table>
Other Sedative Hypnotics

Two additional medications, propofol and etomidate, are also used in moderate sedation although both have been the focus of much controversy because of their properties and labeled use as general anesthetics. Make sure you are familiar with your state’s nurse practice act and your hospital policies regarding nurse administration of these medications. Some Boards of Nursing have developed strict guidelines for sedation administration, whereas others have more loosely defined the nurse’s responsibilities. Many state boards allow the nurse and the institution to develop their own policies regarding medication delivery.

Propofol is a sedative hypnotic that is being used more frequently in the moderate sedation setting. It produces sedation of very short action; the patient wakes up very quickly when the medication is discontinued. Propofol has an antiemetic but not an analgesic effect. It slows the heart rate, leading to a significant drop in blood pressure after administration. This hypotension can be associated with decreased cardiac output and possible arrhythmias. Respiratory effects include a dose-dependent respiratory depression which can progress to apnea in higher doses. The patient may experience hiccoughs, wheezing, and coughing which can be quite uncomfortable for the patient.

The patient receiving Propofol may complain of a headache or appear confused and/or mildly euphoric. The peak effect of propofol can be achieved within 1 minute and lasts 3 to 10 minutes; thus, the drug is administered by continuous infusion. Special handling of the drug is required; make sure you are familiar with preparation and administration.

Etomidate is another ultra short-acting sedative hypnotic that has a very rapid onset of action, with peak effect reached within one minute. The sedating effect lasts 3 to 5 minutes. Etomidate is only recommended for short-term sedation, and the patient should be closely monitored for adverse effects.

Etomidate has been found to lack of significant hemodynamic and respiratory effects, making it an appropriate drug for use in patients with unstable heart disease, difficult airways, or asthma. The rapid onset and lack of significant side effects make etomidate suitable for procedural sedation in emergency situations, specifically for cardioversion, intubation, dislocation or fraction reduction, and abscess incision and drainage. Be aware that both propofol and etomidate are painful when infusing.
### Sedative Hypnotics

**Antagonist: None**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage:</th>
<th>Onset:</th>
<th>Duration:</th>
</tr>
</thead>
</table>
| **Propofol (Diprivan)** | Initial: 2-2.5 mg/kg  
Maintenance: 150-200 mcg/kg/min  
**Pediatric dose:**  
Initial: 2.5-3.5 mg/kg  
Maintenance: 125-300 mcg/kg/min | IV: 30-60 secs  
**Duration:** 3-10 mins  |            |

**Notes:** May cause hypotension, bradycardia, or respiratory depression.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage:</th>
<th>Onset:</th>
<th>Duration:</th>
</tr>
</thead>
</table>
| **Etomidate (Amidate)** | Initial: 0.2-0.6 mg/kg over 30-60 secs  
Maintenance: 5-20 mcg/kg/min | 30-60 secs   | 3-5 mins   |

**Notes:** Solution may cause pain on injections. Pre-administration of lidocaine may be considered.

---

**Less Frequently Used Medications for Sedation**

**Diazepam (Valium)** is the benzodiazepine to which all others are compared. It is long-acting (1 to 8 hours), making it unsuitable to use as a short-term medication for moderate sedation. Throughout the years diazepam has been consistently effective as a single-dose injection with good outcomes in many patients. Diazepam is given intravenously because intramuscular injection is quite painful. The half-life of diazepam is long, ranging from 20 to 50 hours in healthy adults. The elderly, neonates, and those with hepatic disorders are more at risk for prolonged action, and the dosage given should be carefully reduced.

**Meperidine (Demerol)** in years past was used extensively for its analgesic properties. However, the American Pain Society and Institute for Safe Medication Practices (ISMP) do not now recommend the use of meperidine for its analgesic properties unless the patient is experiencing acute pain. If the patient experiences acute pain, it is recommended that treatment with meperidine be limited and used with caution in patients with liver and renal disease.
# Benzodiazepines

**Agranist: Flumazenil**

<table>
<thead>
<tr>
<th>Benzodiazepines</th>
<th>Usual Dosage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diazepam (Valium)</td>
<td>IV: 2.5 mg in increments, not to exceed 5 mg per single dose over 60 seconds. Individual response is variable. Do not dilute with saline or H2O Do not mix with other drugs Reduce dose of narcotic by a third when used with diazepam; reduce diazepam dose by 30-50% in elderly.</td>
</tr>
<tr>
<td></td>
<td><strong>Pediatric dose</strong>:</td>
</tr>
<tr>
<td></td>
<td>IV: 0.2-0.3 mg/kg/dose PO: 0.2-0.3 mg/kg/day (Max 10 mg)</td>
</tr>
</tbody>
</table>

**Onset:**
- IV: 1-5 mins
- PO: 15-60 mins

**Duration:**
- IV: 20-30 mins; (sedative effects usually last for 3 hours)

**Notes:**
- Administer into a large vein; monitor airway, O2 sats and HR. Titrate to slurring of speech.
- Contraindicated in untreated narrow-angle glaucoma; irritating to veins—may cause phlebitis, thrombosis, & local inflammation.
- Avoid in pregnant women, esp. during first trimester.
- Increased half-life in neonates, elderly.

---

# Opioids

**Antagonist: Naloxone**

<table>
<thead>
<tr>
<th>Opioids</th>
<th>Dosage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meperidine (Demerol)</td>
<td>IV: Dilute to achieve concentration of 10mg/mL and administer 12.5 – 25 mg over 2 minutes. May repeat incremental dose at 2 minute intervals to achieve desired endpoint for sedation. Do not exceed 200 mg in 1 H. Do not exceed 600 mg over 24 hour period. (It’s 1/10 as potent as morphine) Reduce dose in elderly or debilitated patients.</td>
</tr>
</tbody>
</table>

**Onset:**
- 5 min

**Duration:** 2 – 4 H

**Notes**
- Pure opioid agonist
- Antagonist Naloxone
- Titrate to slurred speech.
- Contraindicated in patients with hypersensitivity to the drug and in those who have received an MAO inhibitor within the past 14 days.
- Normeperidine, a metabolite of meperidine is a CNS endotoxin.
- Patients with compromised renal function are particularly at risk.
- Meperidine should not be used for more than 48 hours for acute pain or at a dose greater than 600 mg/ 24 hours.
Moderate Sedation of the Geriatric Patient

- Loss of hearing may make assessing level of consciousness difficult.
- Impaired circulation and response time may increase the risk of oversedation.
- Arthritis may make positioning and monitoring placement challenging.

Geriatric patient sedation can facilitate a relaxed, comfortable environment for the patient who may be experiencing a high level of anxiety. There is often a need for significant emotional support in this population as well as an increased risk of complications is readily. Allowing enough time for adequate history taking and patient education is imperative to provide safe care delivery.

Geriatric Anatomic and Physiologic Differences

As adults age there is a decrease in both laryngeal and pharyngeal reflexes, which causes an increased risk for airway compromise. The loss of a full set of teeth changes the shape of the mouth, and it can become a challenge to achieve proper ventilation mask placement and seal the need would arise. In the event of airway compromise, osteoarthritis of the neck may make it impossible to place the patient in the standard head-tilt/jaw-thrust maneuver. Positioning the elderly patient’s head becomes a difficulty that requires the practitioner to be adaptable and able to work within the confines of the situation. If the head-tilt maneuver is not possible, placing the patient in the left lateral decubitus position may help decrease the risk of aspiration.

"Osteoarthritis of the neck may preclude the standard head-tilt/jaw-thrust maneuver. Placing the patient in the left lateral decubitus position may help decrease the risk of aspiration."

The aging process results in a decrease in cardiac output, leading to decreased renal and hepatic blood flow. By the time an adult reaches 80 years old, their cardiac output is about one-half that of an adult 20 years old. In addition, the cardiac conduction system experiences impairment, enhancing the risk of developing dysrhythmias. Combined with developing hypoxia or hypoxemia, it is not uncommon to see dysrhythmias in the geriatric population.
One of the major complications of moderate sedation in the elderly occurs when benzodiazepines and/or opiates are used. Both of these drug classifications produce enhanced depression of the patient’s respiratory drive, which is technically a normal change that occurs as we get older. With rising levels of $CO_2$ and falling levels of oxygenation, the younger adult will increase the depth and rate of respirations to compensate. This ability to respond to these changes is impaired in the elderly, putting them at risk for profound hypoxemia. At the same time, the blood oxygen levels gradually decrease with age; it is not uncommon for the elderly individual to have blood oxygen levels of 80 torr with oxygen saturations of approximately 93% to 95%. These compounded problems lead to a patient who is at increased risk for hypoxia and hypercapnia, which requires careful monitoring to prevent from happening.

For the elderly patient, there is an increased sensitivity to medications used for moderate sedation because they affect the central nervous system. The dosage of sedating agents should be decreased in the elderly person to prevent profound, deep sedation. The standard neurologic assessment should be done with consideration of possible decrease in cognitive abilities, memory, and data acquisition that occurs naturally with aging.

It is estimated that a large percentage of the elderly population is chronically dehydrated. The frequent use of diuretic therapy predisposes this population to circulating volume deficits. Drugs that are water soluble have an enhanced action potential in these volume depleted patients.

You may not be surprised to know that approximately 6% of older adults are heavy users of alcohol, many of whom under-report their alcohol intake. Unfortunately, a large percentage of older persons in hospitals or other healthcare facilities evidence either illness or other serious consequences of alcohol abuse. These patients can present a unique challenge when they respond poorly during sedation due to combined effects of the alcohol remaining in their blood stream and the sedating medication given.
Geriatric Pharmacologic Considerations

Aging causes natural decreases in both hepatic and renal function, leaving to a longer half-life and longer clearance time for most medications. This translates into a slower recovery from moderate sedation in the elderly than in other adult populations. Additionally, the elderly patient is at risk for cumulative drug effects, especially when this population is given benzodiazepines and opiates together.

Adverse drug reactions and interactions are more common in this population due to the fact that the number of over-the-counter and prescription drugs and herbal supplements ingested is much higher. Elderly patients should be monitored for adverse drug reactions and these should be reported appropriately. Cardiovascular medications can cause significant cardiovascular instability in the elderly by producing significant bradycardia and hypotension.

Recommended drug dosing in the elderly patient should be done with the following statement in mind: Start Low and Go Slow. Adherence to this advice will greatly reduce the risk of complication development.

Geriatric Nursing Care

Cardiac monitoring should be instituted prior to sedation and continued throughout the sedation and recovery periods. Fluid volume replacement may be necessary; however, it is important to prevent volume overload in the patient with a cardiac history. It is also important to remember that the elderly patient is at risk for developing hypothermia, and the patient should be kept warm during procedures, especially those that require exposure.

Discharge criteria for the elderly patient have to be adjusted as they may not be able to meet presedation status. The normally hypertensive patient may remain slightly hypotensive secondary to prolonged cardiovascular effects of the drugs administered. This hypotension could last as long as 24 hours and should not prevent the patient from being discharged.
Post-Sedation Care

After sedation has been completed, patient monitoring should continue until the patient achieves his or her pre-sedation level of consciousness and functioning. If the patient is to be transferred to a separate recovery area, a complete, concise handoff report from the nurse who gave the sedatives should be given to the nurse responsible for further patient care. This report should include:

- Data regarding vital functions before and during the procedure.
- Interventions to control pain as well as the time and effectiveness of pain meds.
- Total amount of sedative drugs received and the time of reversal agents, if given.
- Any untoward complications and what was done to treat them.
- The patient’s fluid status and knowledge of ability to take oral fluids or to void.
- The pre-procedural level of functioning should have been clearly documented so that the decision to discharge can be based on these findings.

During the post-sedation period, the patient’s vital signs and pulse oximetry readings should be assessed on a regular basis. The time frame for these assessments can vary, depending on the drug, the route, the amount of drug received, and the time since the last dose. Generally, vital signs and pulse oximetry readings are obtained on a 15-minute cycle until stable and then on a regular basis until the time of discharge.

It is not unusual to find that the patient needs reorientation to time and place. The amnesic effects of many of the medications given will prevent the patient from remembering certain facts about his or her surroundings. As the medications wear off, memory will return. Every attempt to limit the amount of stimuli to the patient should be made. There is a greater chance of untoward reactions, and limiting these exposures will ensure a safe, comfortable recovery for the patient.

When ready for discharge, protective reflexes must be intact. The patient should have his or her pain under control and the procedural site should be clean and dry, without bleeding or other complications. Discharge to home is the norm for most patients, and care of the patient should be defined so that both the patient and the family or caregiver is comfortable with the expectations for ongoing recovery.
Recovery and Discharge

An objective scoring system will be used to assess the patient’s recovery from sedation effects and determine his or her eligibility for discharge from the procedure area or hospital. The Aldrete Post Anesthesia Scoring System (PARS) or the Modified Post Anesthesia Discharge Scoring System (MPADS) is used to assess the patient for adequate recovery. A score of eight (8) or greater (PARS) and ten (10) for MPADS must be achieved to be eligible for discharge.

<table>
<thead>
<tr>
<th>Aldrete Post Anesthesia Recovery (PAR) Score</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activity</strong></td>
<td></td>
</tr>
<tr>
<td>0 = Unable to lift head or move extremities</td>
<td></td>
</tr>
<tr>
<td>1 = Moves two extremities voluntarily or on command and can lift head</td>
<td></td>
</tr>
<tr>
<td>2 = Able to move four extremities voluntarily or on command. Can lift head</td>
<td></td>
</tr>
<tr>
<td><strong>Respiration</strong></td>
<td></td>
</tr>
<tr>
<td>0 = Apneic. Condition necessitates ventilator assisted respirations.</td>
<td></td>
</tr>
<tr>
<td>1 = Labored or limited respirations. May have mechanical airway</td>
<td></td>
</tr>
<tr>
<td>2 = Can take a deep breath and cough well. Has normal respiratory rate, depth.</td>
<td></td>
</tr>
<tr>
<td><strong>Circulation</strong></td>
<td></td>
</tr>
<tr>
<td>0 = Has abnormally high or low BP (&gt; 50% pre sedation level)</td>
<td></td>
</tr>
<tr>
<td>1 = BP 20-50% of pre sedation level</td>
<td></td>
</tr>
<tr>
<td>2 = Stable BP and pulse. BP 20% of pre sedation level</td>
<td></td>
</tr>
<tr>
<td><strong>Neurological</strong></td>
<td></td>
</tr>
<tr>
<td>0 = Not responding or responding to painful stimuli</td>
<td></td>
</tr>
<tr>
<td>1 = Responds to verbal stimuli but drifts to sleep easily</td>
<td></td>
</tr>
<tr>
<td>2 = Awake, alert, oriented to time, place and person</td>
<td></td>
</tr>
<tr>
<td><strong>O₂ Saturation</strong></td>
<td></td>
</tr>
<tr>
<td>0 = O₂ saturation &lt; 90% with O₂ supplement</td>
<td></td>
</tr>
<tr>
<td>1 = Needs O₂ inhalation to maintain O₂ saturation &gt; 90% or &lt;95%</td>
<td></td>
</tr>
<tr>
<td>2 = Able to maintain pre procedure O₂ saturation on room air or &gt; 95% on O₂</td>
<td></td>
</tr>
</tbody>
</table>

Total Recovery Score
To be used for outpatients discharged from facility:

<table>
<thead>
<tr>
<th>Modified Post Anesthesia Discharge Score (MPADS)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vital Signs</strong></td>
<td></td>
</tr>
<tr>
<td>0 = within 40% or &gt; of pre sedation levels</td>
<td></td>
</tr>
<tr>
<td>1 = within 20% - 40 %</td>
<td></td>
</tr>
<tr>
<td>2 = within 20 %</td>
<td></td>
</tr>
<tr>
<td><strong>Pain Level</strong></td>
<td></td>
</tr>
<tr>
<td>0 = severe (8-10)</td>
<td></td>
</tr>
<tr>
<td>1 = moderate (4-7)</td>
<td></td>
</tr>
<tr>
<td>2 = minimal / none (0-3)</td>
<td></td>
</tr>
<tr>
<td><strong>Nausea &amp; Vomiting</strong></td>
<td></td>
</tr>
<tr>
<td>0 = severe</td>
<td></td>
</tr>
<tr>
<td>1 = moderate</td>
<td></td>
</tr>
<tr>
<td>2 = minimal / none</td>
<td></td>
</tr>
<tr>
<td><strong>Surgical Bleeding</strong></td>
<td></td>
</tr>
<tr>
<td>0 = severe</td>
<td></td>
</tr>
<tr>
<td>1 = moderate</td>
<td></td>
</tr>
<tr>
<td>2 = minimal / none</td>
<td></td>
</tr>
<tr>
<td><strong>Ambulation</strong></td>
<td></td>
</tr>
<tr>
<td>0 = none / dizziness</td>
<td></td>
</tr>
<tr>
<td>1 = with assistance</td>
<td></td>
</tr>
<tr>
<td>2 = steady gait / no dizziness (age appropriate)</td>
<td></td>
</tr>
</tbody>
</table>

Total Discharge Score

Many hospitals have criteria for discharge that includes a time requirement of 30 to 60 minutes after the last sedative dose or two hours after the last reversal dose was given. Many healthy adult patients may awaken much faster than this. On the other hand, elderly patients may need additional monitoring because circulation times are slower and the risk of slow release of a sedative from the fatty tissue is possible.

Patients are often required to be able to tolerate fluids orally prior to being released from care. There is sometimes a problem with using oral fluid intake as a requirement for discharge because many patients will willingly force fluids so that they are free to leave. For this reason, the latest guidelines recommend that toleration of fluids should only be required for specific populations, such as diabetics. Patients who are discharged before taking fluids should be instructed to start drinking clear liquids as soon as they feel ready. Likewise, only patients at risk for urinary retention should be required to void prior to discharge. Patients who do not void prior to discharge should be given clear instructions on seeking medical attention if they remain unable to void eight hours after discharge.
Sample Discharge Instructions

Today you received medications to make you sleepy during your procedure. The medications you received are: ________________________________.

The following items are recommendations for your care during the next 24 hours.

1. Do not drive or operate heavy machinery for 8 to 24 hours.
2. Do not consume any alcoholic beverages for 24 hours.
3. Do not make any important decisions for 24 hours.
4. Describe pain management plan and medication use (if appropriate): You will experience pain for the next few hours (or specific time frame). Your doctor provided you with the name of medication to take every 3 to 4 hours for pain. If you did not receive pain medications, you can take... (List over-the-counter medications and instructions for use).
5. You may resume your regular diet unless instructed otherwise. If you feel sick to your stomach, you may begin with clear liquids and add items as you feel ready.
6. It is best to rest the remainder of the day.
7. Describe surgical site management (if appropriate).
8. If you are unable to reach your physician, you can call the emergency room at 555-5555.

(Note: These should be provided in written format and signed by the patient and caregiver.)

COMPLICATIONS DURING MODERATE SEDATION

Although the incidence of complications during moderate sedation is low, there are risks. When complications do occur, they are usually related to pre-existing medical conditions in the patient. With a good pre-sedation assessment and appropriate selection of medications, the incidence of complications can be kept to a minimum.

Complications of Moderate Sedation

<table>
<thead>
<tr>
<th>Over- or Under-sedation</th>
<th>Aspiration / Airway obstruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac arrest care may</td>
<td>Malignant hyperthermia</td>
</tr>
<tr>
<td>Respiratory insufficiency</td>
<td>Hemodynamic instability</td>
</tr>
<tr>
<td>Unrelieved Pain</td>
<td>Paradoxical reactions</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>Dysrhythmias</td>
</tr>
</tbody>
</table>
Oversedation and Undersedation

The most common complication is less than therapeutic sedation of the patient. The nurse newly educated in moderate sedation may undersedate in order to reduce the risk of oversedating the patient. Although undersedation may seem a lot more desirable than oversedation, the effects of undersedation can be just as negative. The patient who is undersedated experiences a significant stress response. This activates the sympathetic nervous system and increases the heart rate and blood pressure, both of which can be highly detrimental.

Populations that are at increased risk of oversedation and undersedation are the young, the elderly, the critically ill, and the morbidly obese. Patients with liver and/or renal disease are especially at risk for over sedation. Patients with high levels of anxiety may also be at risk because the heightened anxiety state can prevent the patient from achieving the full benefits of analgesia and relaxation.

Both oversedation and undersedation can be prevented with proper drug dosaging and titration techniques. If oversedation becomes a problem, administering the reversal agent (if available) is indicated.

Oropharyngeal Airway

The oropharyngeal airway is essentially a curved hollow tube that is used to create an open conduit through the mouth and posterior pharynx.

The guide for correct size is as follows: hold the airway beside the patient’s mandible, orienting it with the flange at the patient’s mouth and the tip at the angle of jaw.

Starting with the curve of the airway inverted, insert the oropharyngeal airway and then rotate the airway as the tip reaches the posterior pharynx. If there are problems ventilating the patient after insertion of the airway then it should be removed and reinserted.

Head Tilt; Chin Lift
Aspiration

Aspiration is the most common cause of death secondary to intravenous moderate sedation, however the incidence of aspiration remains lower in moderate sedation than in general anesthesia. Any patient with a history of reflux is at risk for aspiration, as are obese, obstetric, and elderly patients. The relaxed cardiac sphincter tone that develops with deeper levels of sedation is the most common cause of aspiration.

Some of the interventions that can reduce the risk of aspiration include giving preprocedural medications to decrease gastric secretions or medications that increase gastric pH. Also elevating of the head of the bed may help if not contraindicated by the procedure being performed. If the patient does aspirate, suctioning and airway protection with intubation may be required. The patient may be started on antibiotic therapy and vigorous pulmonary toilet will be instituted. Post-aspiration pneumonia, if not recognized and treated early, results in high mortality.

Respiratory Insufficiency

Differentiating oversedation from respiratory insufficiency can be challenging. Respiratory insufficiency is a known effect of sedation agents and should also be considered a potential complication. Patients with high respiratory rates, such as the pediatric patient and the obese patient, are at increased risk of respiratory insufficiency secondary to their high minute volumes. It is clear that the patient with the higher resting respiratory rate is at increased risk for hypoxemia. Adding to the risk is the sedated patient’s response to a developing hypoxemia. Many sedating agents blunt the patient’s response to impending hypoxemia, and a cycle is set in motion where the patient’s respiratory drive is insufficient to meet his/her tissue oxygen demands.

Preventing respiratory insufficiency can be accomplished by monitoring the patient’s respirations and oxygen saturations every five minutes. Stimulating the patient to breathe with each vital sign assessment can also ensure adequate respiratory effort, assuming that this does not adversely interfere with the procedure being undertaken. Providing supplemental oxygen is also very effective in preventing further development of hypoxemia, especially for patients at risk.

Pulse oximetry is essential in effectively detecting oxygen desaturation and hypoxemia in patients who are receiving sedation. Early detection of hypoxemia through the use of
oximetry during sedation can decrease the progression to serious complications such as cardiac arrest. Bear in mind that supplemental oxygen is a simple intervention that can significantly decrease a patient’s risk for hypoxemia as well. If the situation is deteriorating, administering a reversal agent (if available) or terminating the procedure may be necessary to correct the problem and stabilize the patient.

**Compromised Airway**

Airway obstruction is another common complication that can be prevented with close monitoring. Obstruction of the airway is more common in the young child, whose tongue is larger in proportion to the size of his/her mouth. The modified Mallampati Scale is a useful tool in evaluating patients at risk for airway compromise. The scale classifies the patient’s airway as Class 1, 2, 3, or 4. The patient with either a Class 3 or 4 airway has an increased risk of airway obstruction in comparison to a patient with a Class 1 airway, as outlined previously. Any patient with a Mallampati Class 2 airway may also be at increased risk. The patient’s airway may become compromised from accumulated vomitus, blood, or oral secretions. Patients who are sedated without the benefit of fasting will be at increased risk of aspiration. Controlling secretions with suction and head positioning is important in protecting this group of patients.

In the event of unintentionally inducing deep sedation, the patient will lose submandibular muscle tone, resulting in a slack jaw and unprotected airway. It is important to remember that sedation is a continuum; the progression to deep sedation is highly individualized. The development of deep sedation and a slack jaw can occur at any time, and the patient’s muscle tone and airway should be monitored continuously.

In most adult patients, the head-tilt/jaw-thrust maneuver is all that is necessary to open the airway. (In the pediatric patient, a head-tilt is NOT an appropriate airway maneuver; the child should be placed in the sniffing position with the jaw forward.) Insertion of an oral airway is generally contraindicated, as the patient’s level of consciousness is not deep enough to allow placement and may actually stimulate laryngospasm in the lightly sedated patients.
Hypotension

Hemodynamic instability is the most common cardiac complication of moderate sedation because of the hypotensive effect of sedation medications. The patient with a history of compromised circulating volume is at greatest risk for this complication. If hemorrhage and/or hypovolemia occur, they require aggressive volume and blood replacement to prevent dangerously low circulating pressures. In acute cases, vasoactive drugs may be required to supplement hemodynamic status. Patients identified as being at risk for hypotension can be supplemented with adequate fluid volume prior to sedation, thereby avoiding this problem.

Dysrhythmias

Dysrhythmias most commonly occur in the elderly and are usually secondary to hypoxia and can be prevented or treated with increasing oxygen percentages. Dysrhythmias may also be caused by fluid overload, pain, and/or hypovolemia. All patients should be placed on continuous cardiac monitoring and continuously monitored before, during, and after the sedation period and during the recovery phase. Supplemental oxygen may be recommended prior to beginning the procedure. Antidysrhythmics and defibrillation are rare requirements, but access to these interventions should always be readily available.

Fentanyl and the barbiturates are associated with bradycardia, while dissociative agents such as ketamine are more commonly associated with tachycardia, myocardial depression, and ventricular ectopy.

Cardiac Arrest

Although rare, cardiac arrest can occur in the event of significant cardiovascular compromise from multiple causes. With good presedation evaluation and risk assessment, cardiac arrest can be avoided. If this might hold a life-threatening event does occur, the team caring for the patient should immediately stop the procedure and begin resuscitation. The code team may be called to provide expert back-up assistance in resuscitating the patient and everyone caring for the patient should be well versed in the American Heart Association’s cardiac arrest protocols and implement them without delay.
Chest Wall Rigidity

Chest wall rigidity is an uncommon, but life-threatening, complication that can occur with the rapid intravenous administration of opioids, especially fentanyl. The chest wall muscles become tight, and the patient is unable to be ventilated. To successfully resuscitate the patient, the administration of succinylcholine should be performed rapidly and the patient ventilated with a bag-valve-mask device until the respiratory drive returns. Additionally, naloxone should be administered to combat the effects of the narcotics and repeated if necessary. Obviously, with this development, the goals and objectives of moderate sedation are no longer being met and other actions should be undertaken if the procedure is to be continued.

Pain

The provision of quality patient care precludes the patient experiencing pain as a complication during moderate sedation. Instructing the patient in the use of the pain scale and the importance of reporting the onset of pain is a preprocedural nursing responsibility. Another important teaching point is that there is a difference between pain and discomfort. The patient can expect that medication may be provided for pain control but that discomfort may be a part of the procedure that cannot be eliminated. The patient should be aware of these differences, and open communication is the key to preventing misunderstandings. Of course non-pharmacologic interventions may be instituted to relieve discomfort, such as padding under the back or neck to relieve pressure and discomfort.

When it is known that the procedure the patient is about to happen is painful, the sedation medications should have analgesic properties. Assessing the patient’s level of pain is imperative to provide safe, centered care. If the patient is experiencing a significant amount of pain, you may be reluctant to administer further pain medications due to their synergistic effects upon sedation. To avoid a deeper level of sedation, the issue should be addressed with the physician immediately so that nonsteroidal anti-inflammatory agents may be considered.
Nausea and Vomiting

Nausea and vomiting are not unavoidable side effects; they are additional complications that put the patient at risk and greatly increase the patient’s discomfort. Increased vagal tone can produce the sensation of nausea and potential vomiting. The use of opiates is known to produce nausea and vomiting in some patients, and those especially at risk for experiencing these complications include those that are hypovolemic, obese, or in pain. Assessing for this increased risk should take place in the pre-procedural period, in particular for procedures known to induce this response.

Giving antiemetics may help reduce or eliminate nausea and vomiting, but remember to use with caution because these drugs can produce additional sedation. For significant gastric distension, the use of a nasogastric tube to suction may help reduce the risks although many patients find them to be quite uncomfortable. Of course hypovolemia should be corrected prior to the procedure and pain should always be cautiously treated with additional analgesics.

Paradoxical Reactions

The risk of a patient experiencing a paradoxical reaction complete with agitation, dysphoria, and/or confusion, either during sedation or while recovering, is at risk for self-inflicted injury. These types of reactions are more common in the pediatric and elderly populations and are known side effects of medications such as midazolam use (in the elderly) and benzodiazepine use (in children). Paradoxical reactions can also occur with respiratory insufficiency and strangely enough, under-medicating. As always for safety, hypoxia should always be considered as the primary cause, and interventions to correct it implemented immediately. Under-medication of either analgesics or sedatives can lead to an increased level of fear or an intolerable amount of pain, thus precipitating this reaction.

Treating hypoxia with oxygen in this agitated patient may be difficult and may only increase the patient’s combativeness. In this case, gently allowing oxygen to flow into the patient’s face may help reverse the hypoxemia. Administering pain medications may help ease the reaction as well, but may also result in additional sedation.

Another suspected cause of paradoxical excitement is reversal agents. The rapid awakening of the patient may bring on intense fear, leading to a reaction which is opposite to that of sedation. When giving a reversal agent, slow titration has been found to help decrease the risk of excitement.
Malignant Hyperthermia

Malignant hyperthermia is a rare but potentially life-threatening complication. The agents that can precipitate malignant hyperthermia include anesthetic gases, catecholamines, atropine, and succinylcholine. Although these drugs are not generally used in the moderate sedation realm, the risk of this complication developing should not be overlooked.

The onset of malignant hyperthermia symptoms begins with the development of masseter muscle spasm (or rigidity) and rising CO2 levels. The patient can develop tachycardia and ventricular dysrhythmias. The patient’s core temperature remains normal in the early stages, but the skin appears flushed and feels warm to the touch. It is important that nurses recognize these symptoms in this early stage, because once the syndrome progresses to the state of high fever and muscle rigidity, the incidence of mortality increases. Along with cooling measures, Dantrolene is the medication used to treat malignant hyperthermia. Most operating room suites have a malignant hyperthermia crash cart at the ready to treat this very rare but potentially fatal complication.

SUMMARY

Moderate sedation is becoming more common as newer, safer sedation medications become available and technology for monitoring patients improves. Nurses must be skilled and knowledgeable regarding pharmacologic principles before and during drug delivery, especially when providing care to vulnerable pediatric and geriatric patient populations. The risk of complications can be greatly reduced when the risk is identified early, precautions are taken, and vigilant monitoring detects any early signs of patient deterioration. Protecting patient safety is the most important aspect of nursing care delivery, and when nurses strive to achieve and maintain competency in in moderate sedation, the patient’s safety assured.
References


The Florida Board of Nursing Chapter 464, Part I: Nurse Practice Act and Florida Administrative Codes Chapter 64B9: Board of Nursing. Available at http://www.floridasnursing.gov/resources/


Appendix A

ANA Position Statement - Approved 3/20/08

Procedural Sedation Consensus Statement

The immediate availability of interventions including procedural sedation is critical to serving the needs of our patients. Preserving life, restoring health, and alleviating suffering have been fundamental to the practice of nursing and medicine for centuries. We are challenged as health care professionals to provide this care in a manner that meets the Institute of Medicine’s Six Quality Aims of safe, effective, timely, efficient, equitable, and patient centered care. Patients with emergency medical conditions frequently experience significant treatable pain and anxiety. There is ample evidence to support the routine use of procedural sedation by appropriately trained and credentialed emergency nurses and physicians.

PRINCIPLES FOR PROCEDURAL SEDATION IN EMERGENCY CARE SETTINGS

Patients have a right to expect that:

- their survival and recovery will always be top priorities;
- their care will be provided in a safe and patient centered manner;
- their comfort will be assessed and pain managed in an equitable, timely, and efficient manner;
- their care in emergency care settings will be consistent with current medical knowledge and practice;
- their emergency caregivers will be appropriately trained and credentialed; and
- they will be provided sufficient information, when possible, to allow them to participate in therapeutic decisions and provide informed consent.

The primary goal of procedural sedation for patients in emergency care settings is to manage pain and anxiety while facilitating immediate interventional procedures.

The response to sedating medications follows a broad continuum that varies from patient to patient. Care must be customized to both the patient and the clinical situation, and caregivers must be able to recognize and manage potential complications.

Procedural sedation is safe and effective when performed by appropriately trained, credentialed, and supported emergency nurses and physicians.

We, the undersigned organizations, agree:

1. Medications including, but not limited to, etomidate, propofol, ketamine, fentanyl, and midazolam are utilized by healthcare professionals to facilitate management of a continuum of painful conditions. These extend from simple pain management and maintenance sedation to moderate-deep sedation for painful procedures. Because of the myriad ways these medications might be used, it is best to focus on the goal of the intervention rather than the medication itself.
2. Procedural sedation is defined as a technique of administering sedatives or dissociative agents with or without analgesics to induce a state that allows the patients to tolerate an unpleasant procedure while maintaining cardiorespiratory function. (American College of Emergency Physicians [ACEP] Clinical Policy for Procedural Sedation and Analgesia in the Emergency Department, Annals of Emergency Medicine 2005).

3. Procedural sedation medications may be administered by a registered nurse (RN) in the presence of a physician, advanced practice registered nurse, or other health care professional credentialed and privileged for procedural sedation. RNs administering such medications must possess the training and competencies described in item 4 below.

4. Administration of medications for procedural sedation by a RN is a specialized skill that requires specific knowledge and competencies including, but not limited to:
   □ An understanding of the principles of oxygen delivery, transport and uptake, and respiratory physiology.
   □ Demonstrated competency in airway management appropriate to the age of the patient including monitoring patient oxygenation and ventilation (e.g. skin color, respiratory rate, pulse oximetry, secondary confirmation of endotracheal tube placement), initiation of resuscitative measures, and utilization of oxygen delivery devices (e.g. nasal cannula, mask, basic airway techniques, oral/nasal airways, bag valve mask).
   □ Demonstrated knowledge of anatomy, physiology, pharmacology, cardiac dysrhythmia recognition, and complications related to procedural sedation and analgesia.
   □ Ability to initiate cardiac resuscitation procedures (e.g. CPR, cardioversion, defibrillation)
   □ Identification and differentiation of the various levels of sedation.
   □ Demonstrated competence in pre-procedural, procedural, and post-procedural nursing care from the initial patient evaluation to patient discharge (e.g. patient assessment and monitoring, IV fluid administration, medication administration).
   □ The ability to recognize complications and intervene appropriately.
   □ Knowledge of the legal/liability ramifications associated with an independently licensed RN administering procedural sedation.

5. Procedural sedation requires the presence of two licensed professionals at the bedside. One licensed professional must be a RN whose competency in procedural sedation has been verified. This RN may administer the medication or monitor the patient and must not be involved in performing the procedure. Health care professionals monitoring the patient undergoing procedural sedation must not have other responsibilities that would compromise their ability to adequately monitor the patient before, during, and after the procedure.

6. Resuscitation equipment and supplies must be age appropriate and readily available for the patient undergoing any procedure. At a minimum, equipment should include oxygen and oxygen delivery devices, suction devices and suction source, cardiac and pulse oximetry monitoring devices, defibrillator, oral/nasal airways, intubation equipment, alternative airways, bag-valve mask device, equipment to allow secondary confirmation of endotracheal tube placement, reversal agents and ACLS medications. (ACEP Guidelines for Equipment and Supplies for Use in
Pediatric Patients in the ED, 2000; Alaska Board of Nursing Advisory Opinion on Nurse Administration of Sedating and Anesthetic Agents, 2007)

7. Written policies, procedures, clinical guidelines, and protocols for procedural sedation should be in place in the institution. These policies should be age appropriate and should include, but not be limited to:
   - Equipment and supplies
   - Mandatory education and competency validation
   - Risk management
   - Quality monitoring to include patient outcomes
   - Required documentation

Signed by:
Air & Surface Transport Nurses Association
American Academy of Emergency Medicine
American Association of Critical Care Nurses
American College of Emergency Physicians
American Nurses Association
American Radiological Nurses Association
American Society for Pain Management Nursing
Emergency Nurses Association
National Association of Children's Hospitals and Related Institutions