



# Pediatric & Adult Moderate Sedation

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FBN Number: 50-12426  
CE Broker Number: 20-295403

## Moderate Sedation Self-Study Module

### **Purpose:**

This module is designed to enhance awareness of the nurse's role, scope of practice and care when administering and/or monitoring patients receiving moderate sedation. This module also includes a discussion of the nursing responsibilities in the event of an adverse reaction or a life-threatening complication.

### **Objectives:**

Upon completion of this self-study module, the learner will be able to:

1. Define the continuum of sedation.
2. Differentiate between levels of sedation.
3. List at least 3 differences in clinical appearance between moderate sedation and deep sedation.
4. Describe complications and high risk factors of sedation.
5. Discuss the indications for and the goals of sedation in children.
6. Define pre-procedure, intra-procedure, and post-procedure assessment parameters.
7. Define the ASA classification system.
8. Discuss methods of drug administration and specific agents.
9. List 3 potential complications of moderate sedation and describe the nursing interventions.
10. Discuss the Aldrette Score pre and post procedure.
11. List at least 5 criteria for discharge from moderate sedation level of care.

### Competency in Monitoring of Moderate Sedation:

In order to obtain and maintain competency in the care of the sedated patient, the RN will:

1. Complete the moderate sedation module self-study packet.
2. Attend the moderate sedation workshop (one-time mandatory class)
3. Complete moderate sedation initial competence checklist for employee file.
4. Review moderate sedation self-study packet as per specific department standards.
5. Complete moderate sedation competency skill set annually as per specific department standards.
6. Must hold current PALS or ACLS certification

## **Introduction**

This self-learning module is designed to provide the information necessary to administer moderate sedation safely and effectively.

Moderate (Conscious) Sedation also known as Procedural Sedation refers to sedation and/or analgesia given under the supervision of a physician to allay patient anxiety and to control of pain during diagnostic or therapeutic procedures.

The information contained in this packet follows the established guidelines of Joint Commission (Standard PC.13.20, 13.30, and 13.40), American Association of Nurse Anesthetists, American Society of Anesthesiology, American Society of Peri-Anesthesia Nurses, Association of Peri-Operative Nurses and the Florida State Board of Nursing.

The Policies and Guidelines surrounding facilities that administer sedation are very strict. The American Society of Anesthesiologists *Guidelines for Ambulatory Anesthesia and Surgery* specifies that at minimum:

- ❖ A licensed physician should be in attendance in the facility at all times during patient treatment, recovery, and discharge.
- ❖ The facility must be established, equipped, constructed, and operated in accordance with applicable federal, state, and local laws.
- ❖ Staff in attendance should be adequate to meet patient and facility needs and must consist of:
  - Professional staff including physicians, nurses, and other practitioners who are duly licensed and qualified
  - Administration staff
  - Housekeeping and maintenance staff

The physicians who provide medical care in the facility should be organized into a medical staff. This group will assume responsibility for credential review, delineation of privileges and responsibilities, quality assurance, and peer review. There must be adequate personnel and equipment available to manage emergencies. The facility must have established policies and procedures to handle unanticipated patient transfer to an acute care hospital.

Also, patient care shall include:

- ❖ Preoperative instructions and patient preparation.
- ❖ An appropriate history and physical exam by a physician prior to sedation.
- ❖ Preprocedure studies as indicated.
- ❖ Procedural sedation shall be administered by or under the direction of a qualified physician.
- ❖ General anesthesia shall be administered by the appropriate anesthesiology personnel.

- ❖ The physician is responsible for directing discharge criteria.
- ❖ Patients must be provided with written postoperative and follow-up instructions.
- ❖ Medical records must be accurate, confidential and current.

## **Definitions**

Current definitions of sedation define the following 4 levels:

**Minimal Sedation (Anxiolysis)** is a drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.

**Moderate Sedation/Analgesia (Conscious Sedation)** is a drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by minimal tactile stimulation. No interventions are required to maintain a patent airway and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.

**Deep Sedation/Analgesia** is a drug-induced depression of consciousness during which patients cannot be easily aroused, but respond purposefully following repeated or painful stimulation. The ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained.

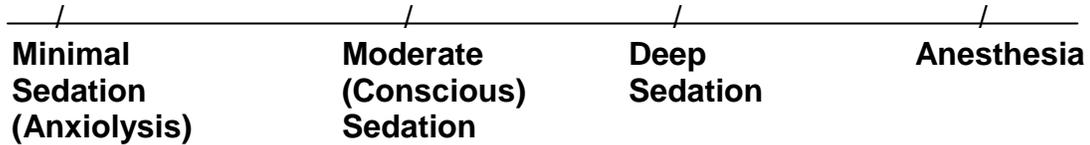
*\* Reflex withdrawal from a painful stimulus is NOT considered a purposeful response.*

**Anesthesia** is a drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation. The ability to independently maintain ventilatory function is often impaired. Patients often require assistance in maintaining a patent airway, and positive pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function may be impaired.

2004 CAMH PC-41

## The Continuum of Sedation

Sedation occurs on a continuum from minimal sedation to general anesthesia and patients progress along that line based on the medication given, the route, the dose and the patient's own current clinical status.



**Moderate sedation** may be administered and monitored by a competent RN. **Deep sedation** and **general anesthesia** are to be initiated **only** by an anesthesia provider. The non-anesthesia provider caring for the patient must be able to recognize the clinical differences between the levels of sedation, and be able to rescue the patient, should the patient progress to a deeper level than was intended. For example, the healthcare provider who is capable of monitoring or administering **Moderate Sedation** must be able to recognize when that patient has slipped into **Deep Sedation** and provide any necessary emergency care. This care may include airway support, fluids, more frequent assessments, or an immediate consult with an anesthesia provider or other practitioner with advanced airway skills, if necessary.

The following table reviews the levels of sedation, and their effect upon the patients' airway, breathing, and cardiovascular system.

## LEVELS OF SEDATION

Level	Other Terms	Patient Responsiveness	Airway	Spontaneous Ventilation	Cardiovascular Function
Minimal Sedation	Anxiolysis	Responds normally to verbal commands	Unaffected	Unaffected	Unaffected
Moderate Sedation	Conscious Sedation, Twilight sleep	Responds purposefully to verbal commands, either alone or with light tactile stimulation	Patent, no intervention needed	Adequate	Usually maintained
Deep Sedation		Not easily aroused, but responds purposefully after repeated or painful stimulation	May be impaired; intervention may be needed	May be impaired; intervention may be needed	Usually maintained, possibly change in heart rhythm or blood pressure
General Anesthesia		Not arousable, even upon painful stimulation	Often impaired; intervention often needed.	Often depressed; positive pressure ventilation usually required	May be impaired

## **Goals of Moderate Sedation**

- ❖ Reduce the patient's anxiety and discomfort.
- ❖ Change level of consciousness and mood.
- ❖ Maintain a level of consciousness and responds appropriately for level of sedation cooperate as instructed.
- ❖ Achieve higher pain threshold.
- ❖ Maintain baseline vital signs.
- ❖ Patient returns to baseline functions post procedure.
- ❖ Patient experiences safe and prompt recovery.

Unresponsiveness and unconsciousness  
**ARE NOT**  
the objectives of moderate sedation.

### **What Moderate Sedation is Not:**

- ❖ Sedation given for labor of childbirth
- ❖ Pre-operative medication
- ❖ Postoperative pain relief, including use of PCA

**Note:** The guidelines used for Moderate Sedation do not apply to patients on mechanical ventilation.

## **PROCESS OF SEDATION**

The process of administering and/or monitoring a patient for moderate sedation involves several key elements:

1. Determining if the ordered sedation falls under the guidelines for moderate sedation.
2. Determining if the patient is an appropriate candidate for nurse-monitored sedation.
3. Preparing the patient and the setting.

4. Patient care during the procedure.
5. Recovery of the patient after the procedure.
6. Discharge from the sedation level of care.

The risk of complications is diminished if all these elements are addressed **safely** and **successfully**

### **Is this Moderate Sedation?**

A frequent question that arises is how do I know if what is ordered for my patient is moderate sedation? Keep in mind that **minimal sedation** (anxiolysis) is mild sedation that is ordered for relief from anxiety or pain in a conscious patient. The patient is easily awakened by normal or softly spoken verbal commands and is oriented when awake. The patient is able to respond normally to verbal commands. There is no change in vital signs and there is no significant risk of losing protective reflexes. The patient is able to maintain pre-procedure mobility. (ASA Sedation Model Policy)

**Moderate sedation** is a minimally depressed level of consciousness in which the patient is able to maintain a patent airway without intervention and can be aroused by physical stimulation. These patients are usually unable to carry on a normal conversation, but can respond to verbal commands by appropriate action or brief words.

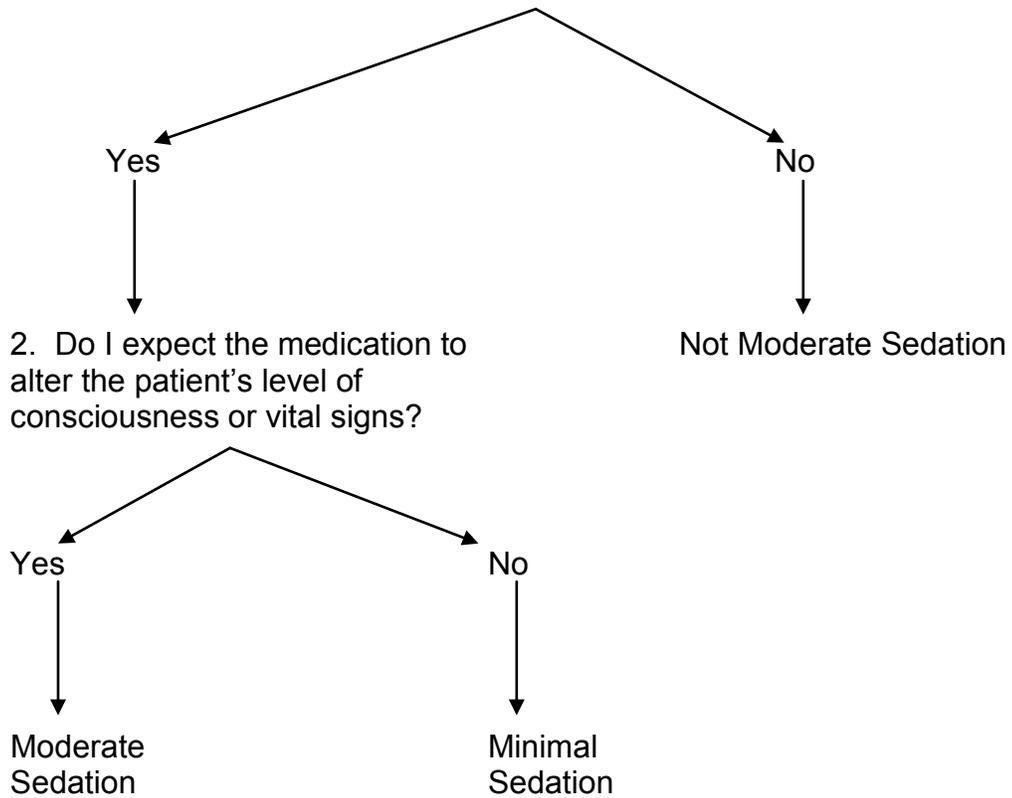
**It is important to understand that it is the patient's response to a medication and not a particular medication or route that actually determines if the moderate sedation guidelines are to be followed. This rule applies to children as well as adults.**

**Regardless of the procedure being performed or the medication being administered, sedation represents a continuum, in which the patient may easily progress from a state of moderate sedation to one of deep sedation or general anesthesia.**

## DECISION TREE

When sedation has been ordered for a patient, the nurse must first determine whether this constitutes moderate sedation. You can do this by asking two key questions as shown on the decision tree below:

1. Am I giving the medication to decrease pain and/or anxiety during a procedure?





### Is this Moderate Sedation?

Situation	Is medication being given to ease pain and/or anxiety for a procedure?	Do I expect the medication to affect LOC or vital signs?	Moderate Sedation?
Versed 1 mg and Morphine 4 mg IV for reduction of dislocated shoulder	Yes	Yes	Yes
Xanax 0.25 mg po 1 hour before MRI	Yes	No	No Minimal Sedation
Ativan 2 mg IV in divided doses 1 hour prior to MRI	Yes	Yes	No Minimal Sedation
Morphine 4 mg IV for complaints of post-op pain	No	Possibly	No, pain relief
Chloral hydrate per rectum for CT scan	Yes	Yes	Yes
Anesthesia provider comes to the bedside for cardioversion*	Yes	Yes	No It is Anesthesia, not sedation
Versed 2 mg, Sublimaze 100 mcg for cardioversion	Yes	Yes	Yes
Morphine PCA	No	Possibly	No, pain relief

\*The presence of an anesthesia provider automatically indicates an anesthesia case, regardless of the medication administered. The medications listed above are examples only, and do not represent the only choices for moderate sedation

There are several other factors that determine the patient's risk for sedation, two of which must be determined by the **physician** who is prescribing the sedation. The **first** factor is the determination of the **ASA score**:

The ASA score is a classification system devised by the American Society of Anesthesiologists (ASA) to rank the patient's physical status and corresponding risk of sedation on a scale from 1 to 6. The scale is:

- ASA 1** - Normal, healthy patient with no systemic disease
- ASA 2** - Mild to moderate systemic disease, controlled on medication, i.e. controlled hypertension, diabetes.
- ASA 3** - Severe systemic disease with functional limitation that is not incapacitating, i.e. asthma, heavy smokers, obesity or multiple severe systemic illnesses (hypertension, COPD, diabetes or coronary artery disease), all well-controlled on medications, any patient with a history of MI or CVA.
- ASA 4** - Severe systemic disease that is incapacitating and life-threatening, i.e. poorly controlled hypertension, diabetes, CAD, or multiple medications.
- ASA 5** - A moribund patient not expected to survive 24 hours regardless of intervention.
- ASA 6** – A patient declared brain-dead whose organs are to be removed for donation.: This patient is being maintained on ventilator support.

Patients who are in category **ASA 1** or **ASA 2** are appropriate for monitoring by a RN who is competent in moderate sedation. Anesthesia providers are available for consultation for patients in categories 3, 4, and 5. An anesthesia consult is **highly recommended** for any patient with an ASA score of 4 or 5. Patients with an ASA of 6 are not candidates for moderate sedation.

The **second** physician decision will involve assessment of airway adequacy. This is extremely important because medications commonly used for sedation are respiratory depressants. As the majority of complications involve airway or breathing difficulties, it's important to know if there are potential problems with opening the airway or ability to ventilate the patient.

The physician will classify the airway as:

**Adequate** – no significant risk factors identified

**At Risk** – for example, a receding chin, history of TMJ, history of cervical, neck problems, or craniofacial abnormality. Or the inability to fully open mouth or flex the neck. In short, anything that may make managing that patient's airway difficult.

**High Risk** – for example, history of head or neck surgery, head or neck deformity, morbid obesity, history of difficult airway problems. This also includes a history of sleep apnea.

In addition, there are other factors that may increase the risk for adverse reactions and/or complications from sedation and may require consultation with an anesthesia provider. These include but are not limited to:

- ✓ Cardiovascular History – may increase the risk of hypoxia, arrhythmias, and blood pressure problems.
- ✓ Pregnancy – medications may adversely affect fetus; higher risk of aspiration for mother
- ✓ Significant Kidney or Liver Disease – may require reduction in medication doses and/or longer recovery time.
- ✓ Previous problems with sedation, analgesia or anesthesia.
- ✓ Snoring or Sleep Apnea – may indicate difficulty with intubation.
- ✓ Patients receiving MAO inhibitors – select opioid analgesics, i.e. Demerol, should not be used.
- ✓ Patients receiving tricyclic antidepressants or CNS depressants – may have an additive effect with sedative medications.
- ✓ Seizure Disorders – Use of Romazicon for benzodiazepine reversal may also reverse the anti-seizure medication.
- ✓ Insulin-Dependent Diabetes – signs and symptoms of hypoglycemia may be confused with a drug reaction
- ✓ History of long-term pain medication use or substance abuse – medications commonly used for moderate sedation may have little or no effect.
- ✓ GI Reflux or full stomach – increases the risk of vomiting and aspiration into the lungs.
- ✓ Thyroid Dysfunction –
- ✓ Hyperthyroidism – patients may be difficult to sedate
- ✓ Hypothyroidism – effects of sedative medications may be prolonged.
- ✓ Patient or family history of malignant hyperthermia.
- ✓ Congenital abnormalities such as:
- ✓ Down's Syndrome- may pose an airway management problem due to short neck and large tongue.
- ✓ Pierre Robin – small lower jaw, soft cleft palate, and the tongue has tendency to fall back and down – may occlude airway.
- ✓ Goldenhar syndrome – multiple facial abnormalities

Prior to beginning sedation, it is critical to obtain a full medical and nursing history because the sedation itself is not without risk. Many patients neglect to tell their doctor or the nurse taking the history about their use of dietary supplements they may be taking. Patients may fear the physician will be unhappy about the patient using nonconventional therapy. However, doctors and nurses need to know if the patient is taking any supplements because the risk of complications from herbal supplements may be elevated in the perioperative period. This is because of potential interactions between herbals the patient is taking and the anesthesia drugs and other medications that may be administered during the procedure.

Rare complications that might in part be due to supplements include myocardial infarction and stroke (e.g. ephedra) liver injury (e.g., echinacea; kava), ineffective anticoagulation and bleeding (e.g., garlic and ginko), prolonged or inadequate anesthesia (e.g., kava), and rejection of organ transplant (e.g. St. John's wort). As a result it is generally recommended to avoid herbal supplements for 2 weeks prior to a surgical procedure and anesthesia.

The following chart shows some of the more common supplements that are of particular concern in the perioperative period.

Herb/Drug Interaction by Medication Class			
Medication Effect	Drug	Herb	Interaction
<b>Stimulants</b>	caffeine, decongestants (Sudafed, Actafed, etc.)	ephedra, yohimbine, guarana, ginseng	Potentiate stimulation
<b>Sedatives</b>	alcohol, benzodiazapines, barbituates	valerian, kava, St. John's wort	Potentiate sedation
<b>Platelet aggregation</b>	warfarin, aspirin, clopidogrel, dipyridamole, ticlopidine	garlic, ginger, ginkgo, feverfew, ginseng	Potentiate anticoagulant effect
<b>Antidepressant</b>	SSRI drugs, phenelzine sulfate, sertraline, citalopram, bupropion, tranylcypromine sulfate	St. John's wort	Serotonin syndrome, Monoamine oxidase inhibitors (MAOI) interaction potentially leading to mental effects such as confusion, as well as shivering, sweating, fever, muscle twitching

<b>Hypoglycemics</b>	insulin, all antidiabetics	bilberry, bitter melon, dandelion, garlic	Potentiates lowering of glucose levels
<b>Immunostimulant</b>	anabolic steroids, amiodarone, HIV drugs	echinacea, astragalus	Decrease action of corticosteroids; may interfere with immunosuppression

### **Pre-Procedure Preparation**

Once it's determined that the patient is an appropriate candidate for nurse-monitored sedation, both the patient and the setting must be prepared. The assessment of the patient must include the ASA score, airway evaluation, and presence of risk factors. It must also include:

1. Baseline physical status, such as skin color, level of consciousness
2. Baseline vital signs
3. Baseline Aldrette score
4. Allergies
5. Current medications, including herbal supplements and OTC products.
6. NPO status

<b>NPO Guidelines</b>	
<u>Ingested Material</u>	<u>Minimum Fasting Period</u>
Solid food	6-8 hours
<b><u>Pediatric Patients</u></b>	
Milk/solid foods	6-8 hours
Formula	6 hours
Breast milk	4 hours

\*In the event of an emergency, the need for sedation may outweigh the risk of aspiration from a full stomach, and a consultation with an anesthesia provider is recommended.

7. Medical and surgical history
8. Patent IV access, if applicable ie; pediatric patient that receives PO Chloral Hydrate may not have IV
9. Baseline pain level
10. Informed consent/patient education
11. Current History and Physical (within 24 hours of procedure)
12. Review most recent lab results

**ARE YOU READY?**

The area must also be properly prepared for sedation. This includes:

1. Oxygen and a delivery method, i.e. nasal cannula, mask
2. Suction
3. Cardiac monitor for all adults
4. Cardiac monitor for all children who've received IV sedation; for other routes, monitoring heart rate and saturation by pulse oximetry is sufficient
5. Pulse oximeter- measures the oxygen saturation of hemoglobin in peripheral blood. Pulse oximetry value changes are not immediate.
6. ETCO<sub>2</sub>- is the continuous analysis and recording of carbon dioxide (CO<sub>2</sub>) concentrations in respiratory gases throughout respiration. The measurement of end-tidal carbon dioxide (ETCO<sub>2</sub>) offers the clinician a useful adjunct to other monitoring methods in determining if hypercarbia is present. Capnography may be able to detect hypoventilation before pulse oximetry indicates oxygen desaturation. It has also been shown to be a more sensitive gauge of hypoventilation than visual observation.
7. Continuously cycling blood pressure cuff
8. IV solutions
9. Reversal agents, located in crash carts
10. Ambu bag and emergency supplies, i.e. crash cart nearby and readily available
11. All equipment must be age-appropriate, i.e., pediatric or adult

### **Intra-Procedure Responsibilities**

***\* Before proceeding – the RN and the physician must reassess the patient immediately prior to the administration of the first dose of medication. This is also the time to STOP and verify the patient's identity and procedure.***

Moderate sedation may be performed in any location where the standard of care can be met. This means that oxygen, suction and monitoring equipment are required, and age-appropriate emergency equipment must be readily available. The RN must be clinically competent to administer medications and monitor the patient who is receiving sedation.

The **MOST IMPORTANT** point is:

**THE RN WHO IS RESPONSIBLE FOR MONITORING THE PATIENT DURING THE COURSE OF SEDATION MUST HAVE NO OTHER RESPONSIBILITIES THAT WOULD COMPROMISE CONTINUOUS MONITORING.**

This means that this RN may not assist the physician with the procedure; if assistance is needed, an additional person is required. This also means that this RN may not leave the room to obtain supplies, check on other patients or be occupied in any way that prevents continuous monitoring of the patient during and immediately after the procedure.

During the procedure and course of sedation, the RN is responsible for:

- ❖ Assessment of airway and breathing
- ❖ Oxygen delivery
- ❖ Assessment of IV site
- ❖ Assessment of response to medication and procedural interventions
- ❖ Providing emotional support, reassurance to the patient
- ❖ Vital signs – at least every 5 minutes during the procedure, and more often if indicated. Measurement of blood pressure may cause arousal in small children who would otherwise remain sedated; in that case, blood pressure readings are done at the discretion of the RN monitoring the patient.
- ❖ Cardiac monitoring is required for all adults and for all children who receive IV sedation. For other routes of medication administered to children, monitoring of heart rate and oxygen saturation via pulse oximetry is sufficient
- ❖ Continuous pulse oximetry measurement
- ❖ Observe for and report any changes to the physician, such as,
- ❖ Changes in vital signs, oxygen saturation
- ❖ Airway or respiratory difficulty
- ❖ Arrhythmias
- ❖ Restlessness
- ❖ Cyanosis
- ❖ Flushing or pallor
- ❖ Diaphoresis
- ❖ Complaints of nausea, dizziness, palpitations, pain

The RN must **document** all data appropriately.

### **Children and Moderate Sedation**

Diagnostic, therapeutic and surgical procedures are commonly performed on neonates, infants, and children in various settings throughout most facilities that provide services to this age group. At any given time it is possible to find a pediatric patient who is undergoing a computerized tomography scan (CT scan) in the Radiology Department or an infant who requires an electroencephalogram (EEG) in Pediatric Ambulatory Services, while yet another child is having laceration repair in the Pediatric Emergency Department. You must remember

that children are not small adults! Their vital sign numbers can be higher than in the adult population and their reaction to medication differs greatly.

Fear, anxiety, temperament, age, and developmental stage of the child contribute to his or her ability to cooperate during necessary procedures such as these. To ensure cooperation, it is important to take the time to prepare an anxious child prior to a procedure:

- ❖ Approach the child in a non-threatening manner.
- ❖ Consider the child's age and developmental level when interacting.
- ❖ Use vocabulary that the child can understand.
- ❖ Attempt to build trust – be honest about what will and will not hurt.
- ❖ During the procedure, non-pharmacological measures may be employed to enable the child to stay calm and cope with the situation:
- ❖ Encourage parental participation as much as possible.
- ❖ Allow the child to bring a small toy or stuffed animal to the procedure for security.
- ❖ Use distraction techniques (i.e., light conversation, bubbles, toys, books, music, etc.).
- ❖ Use guided imagery (i.e., "Close your eyes and think of your favorite place.").
- ❖ Request Child Life staff or humor therapist (if available) to work with the child before and during the procedure.
- ❖ Keep pain to a minimum.

After the procedure, the child should be rewarded for his or her efforts to cooperate (i.e., praise, stickers, age-appropriate toy, etc.).

Sedation is routinely used to increase a child's cooperation during a procedure while decreasing his or her pain and memory of the experience. A child who has had a previous unpleasant experience at a hospital may be difficult to manage long before any noxious stimuli occur. This child may require sedation when another child the same age may not. Sedation should allow a child to tolerate an unpleasant procedure while meeting the following goals:

- ❖ The child's safety and welfare are maintained.
- ❖ Pain or discomfort is minimal.
- ❖ Anxiety is relieved.
- ❖ Cooperation is maximized.
- ❖ Effects on vital signs are minimal.
- ❖ Amnesia is maximized, if possible.

Knowing the normal vital sign parameters in the care of a pediatric patient is vitally important as they may more easily progress to a deeper state of sedation than what was originally intended. In many instances, a child is likely to require deep sedation, where an adult would require little or no sedation (i.e., placement of a peripherally inserted central catheter (PICC)). Sedation of children may be

associated with serious risks such as hypoventilation, apnea, airway obstruction, and respiratory or cardiac arrest.

## Pediatric Heart Rates

The normal pediatric heart rate is influenced by the child's age and activity level and such conditions as fever, dehydration, anxiety, pain, or loss of blood. There is a wide variation in the normal heart rate and a gradual decline with age. The child's clinical condition and level of consciousness must always be considered when the heart rate is evaluated. Refer to TABLE I: *Normal Ranges of Heart Rates for Children*. Bradycardia in children most often results from respiratory insufficiency. Therefore, once airway patency and adequate oxygenation and ventilation are established, the heart rate usually returns to normal without further intervention. If early recognition and proper intervention do not occur, cardiac arrest can eventually ensue from prolonged hypoxemia and acidosis. Thus in the pediatric age group attention must first be directed toward establishment of a patent airway, effective ventilation, adequate oxygenation, and circulatory stabilization. An apical pulse should be taken in children less than two years old.

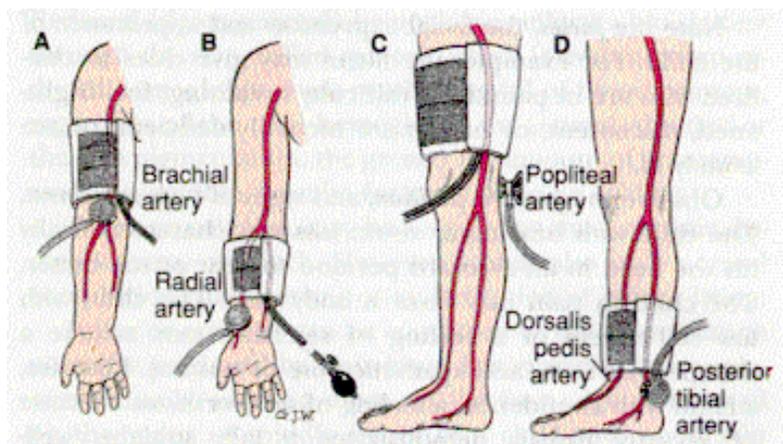
TABLE I

**Normal Ranges of Heart Rates for Children**

AGE	Heart Rate (beats/min)		
	RESTING (Awake)	RESTING (Sleeping)	EXERCISE (Fever)
Newborn	100 - 180	80 - 160	Up to 220
1 week - 3 months	100 - 220	80 - 180	Up to 220
3 months - 2 years	80 - 150	70 - 120	Up to 200
2 years - 10 years	70 - 110	60 - 100	Up to 180
10 years to adult	55 - 90	50 - 90	Up to 180

## Pediatric Blood Pressures

For an accurate reading, the blood pressure cuff should cover 2/3 of the upper or lower extremity (i.e., 2/3 of upper arm, calf, etc.). Refer to TABLE II: *Normal Ranges of Blood Pressure for Children*.





<b>2 years</b>	<b>25</b>	<b>14 years</b>	<b>18</b>
<b>4 years</b>	<b>23</b>	<b>16 years</b>	<b>17</b>
<b>6 years</b>	<b>21</b>	<b>18 years</b>	<b>16 - 18</b>
<b>8 years</b>	<b>20</b>		

### Pulse Oximetry

Pulse oximetry provides an early warning of oxygen desaturation before cyanosis or changes in vital signs can be observed. Normal pulse oximetry readings in children are 95 – 99% and in neonates 85 – 90% on room air. An oxygen delivery system should be available at the patient’s bedside before sedation is administered.

### There are several important key points to the medications commonly used in moderate sedation for all patients:

1. The **GOAL** of moderate sedation is to use the least amount of medication to produce the needed effect. Some things that may help are allowing **sufficient time** for the medication to take effect before beginning the procedure. It’s also helpful to explain the procedure and sedation to the patient, using simple terms, and provide frequent reassurance, both verbally and by touch.
2. Nearly all sedative agents cause some degree of **respiratory** or **cardiovascular** depression. These medications need to be given cautiously in children, the elderly or patients with liver or kidney disease.
3. Medications have to be **titrated** to individual patient condition and response. Refer to hospital policy and drug information sources for specific medication guidelines.
4. Moderate sedation can be given by any route of administration, especially in pediatrics, but medications given **intravenously** tend to work more quickly and may be associated with a higher degree of complications.
5. Moderate sedation may involve giving two types of medications, one for **anxiety** and one to prevent **pain**. Remember that this combination has a **synergistic effect**, which means that both drugs given together have a greater effect than each would if given separately; total doses may have to be reduced.
6. **Reversal agents** are given for adverse reactions such as respiratory depression or loss of consciousness, not as a routine measure. A patient who has received reversal agents must be monitored an additional two hours, as the sedatives last longer than the reversal agents.

The pharmacological agents used to induce sedation may be sedatives, barbiturates, hypnotics and/or anesthetics given via different routes. Although PO

Meds are not typically thought of as moderate sedation in adults, care should be taken when administering them depending on the patient's medication history, general condition, or age. Reassessment of the patient's level of consciousness and vital signs is critical in determining if that patient has crossed the line into a state of sedation.

One of the advantages of IV moderate sedation is a rapid onset, which can be titrated to the patient's response. This will in turn decrease recovery time as well as the incidence of nausea and vomiting, gag reflex impairment and motor disturbances. It should be noted that the intramuscular route is typically avoided in children whenever possible, unless there is time for a topical anesthetic to be administered prior to the injection.

Unpredictable absorption, metabolism and excretion of medications make the patient (especially children or the elderly) particularly vulnerable to complications of over-sedation. Familiarity with reversal drugs or antagonists, available for both narcotics and benzodiazepines, is essential. Drug dosages should be titrated to the patient and his or her response in consideration of age, weight and clinical condition.

For complete description of drug indications, use, actions, etc., please refer to whichever drug handbook or computer tool is available to you at your facility. The following sedation dose schedule serves as a guideline only. Each patient must be individualized as to his or her past medical history, present condition and goals of sedation.

#### ❖ Sedatives

- **Benzodiazepines** produce sedation, amnesia, diminished anxiety, skeletal muscle relaxation and anti-convulsant effects. They have no analgesic properties. Adverse effects include respiratory depression, laryngospasm, cardiac arrhythmia, bradycardia, hypotension, and CNS excitement. Reversal may be obtained with Flumazenil (Romazicon®).
- **Lorazepam (Ativan®)**
  - Adult Dose: 1-2 mg IV or 0.5 – 2 mg. PO – Minimal Sedation
  - Pediatric Dose: 0.05 – 0.1 mg/kg  
IV slowly over 2 – 5 minutes. Titrate dose to desired effect. Dilute with equal volume of dilutant.
  - Contraindications: Hypersensitivity to the drug, depressive disorder/psychosis
  - Onset: Rapid
  - Peak: 15 – 20 minutes
  - Duration: Amnesic effect: 6 – 8 hrs
- **Diazepam (Valium®)\***

Adult Dose: 2-5 mg. IV 2-10 mg PO  
 Pediatric Dose: 0.1 – 0.2 mg/kg IV Inject slowly: less than 1 – 2 mg/min IV push. Titrate dose to desired effect.  
 Contraindications: Hypersensitivity to the drug, comatose, respiratory depression, and severe uncontrolled pain. Hypotension, bradycardia, and cardiac arrest can result from rapid IV infusion.  
 Onset: Rapid (1-5 min.) IV or 30-60 PO  
 Peak: 8 minutes  
 Duration: 30 minutes to one hour, May be up to 24 hours.

**\* IV not recommended in children less than 18 years old**

▪ **Midazolam (Versed®)\***

Adult Dose: 0.5 – 2.5 mg IV  
 \*Pediatric Dose: 0.05 – 0.2 mg/kg IV Titrate dose to desired effect. Total maximum IV dose = 0.6mg/kg  
 0.5 – 0.7mg/kg PO  
 Contraindications: Hypersensitivity to the drug, existing CNS depression, shock, and uncontrolled pain  
 Onset: 1 – 5 minutes  
 Peak: Rapid  
 Duration: 30 minutes to one hour. May last 2-6 hours.

\*Requires direct physician supervision during administration to pediatric patients.

❖ **Narcotics**

- Opioids produce analgesia and sedation. Adverse effects include respiratory depression, hypotension, airway obstruction, bradycardia, cardiac arrest, and seizures. Reversal may be obtained with Naloxone (Narcan®).

▪ **Morphine Sulfate**

Adult Dose: 2-5 mg IV, slowly  
 Pediatric Dose: 0.05 – 0.1 mg/kg IV Titrate to desired effect.  
 Contraindications: Hypersensitivity to the drug, increased ICP, severe respiratory depression, liver or renal insufficiency  
 Onset: Rapid (1-3 minutes)  
 Peak: 20 minutes  
 Duration: 1 – 2 hours

- **Dilaudid (Hydromorphone)**  
 Adult Dose: 0.5-1 mg IV, slowly over 2-3 minutes  
 Pediatric Dose: 0.01mg/kg- 0.02 mg/kg IV, slowly  
 Contraindications: May increase risk of respiratory depression when used in combination with phenothiazines, in patients with hepatic or renal insufficiency, elderly patients, or those taking CNS depressants.

**Note: 2 mg Dilaudid = 10 mg. of morphine**

- **Fentanyl (Sublimaze®)\***  
 Adult Dose: 25-50 mcg. Over 1-2 minutes  
 \*Pediatric Dose: 1 – 2 mcg/kg as a slow IV bolus (Rapid infusion may cause skeletal muscle and chest wall rigidity). Titrate dose to desired effect.  
 Contraindications: Hypersensitivity to the drug, increased ICP, severe respiratory depression, renal or liver insufficiency  
 Onset: 1 – 3 minutes  
 Peak: 3 – 5 minutes  
 Duration: 30 minutes to 1 hour  
 \*Requires direct physician supervision during administration to pediatric patients.

#### ❖ **Barbiturates**

- Barbiturates produce sedation and amnesia, and depress pain responses. Adverse effects include respiratory depression, laryngospasm, cardiac arrhythmia, bradycardia, hypotension, and CNS excitement.
- **Pentobarbital (Nembutal®)** (may be used in children)  
 Dose: 2 mg/kg IV (50 mg maximum initial dose). Wait 10 minutes, then 1 mg/kg every 5 minutes for desired effect. Maximum total dose over 30 minutes is 4 mg/kg. Do not give faster than 50 mg/min.  
 Contraindications: Hypersensitivity to barbiturates, liver insufficiency  
 Onset: Immediate  
 Peak: 10 – 30 minutes  
 Duration: 4 – 10 hours

## ❖ Hypnotics

- Hypnotics are short-acting with no analgesic or amnesic properties. Adverse effects include respiratory depression, headache, confusion, dizziness, ataxia, nausea/vomiting, diarrhea, and paradoxical excitement.
  - **Chloral Hydrate (Noctec<sup>®</sup>)**
    - Dose: 30 – 100 mg/kg PO or PR Maximum dose 2 grams in two divided doses.
    - Contraindications: Hypersensitivity, hepatic or renal impairment, gastritis or ulcers, and severe cardiac disease
    - Onset: 30 minutes
    - Peak: Unknown
    - Duration: 4 – 8 hours
    - Reversal agent: None

## ❖ Anesthesia

- Anesthetic agents act upon the brain to produce general anesthesia, which is partial or complete loss of sensation with loss of consciousness. Since anesthesia may result in partial or complete loss of protective reflexes, therefore anesthesia must be present to continuously monitor the patient's status.
- **Ketamine (Ketalar<sup>®</sup>)\***
  - Dose: 0.5 – 2 mg/kg IV. Titrate to desired effect.  
3 – 4 mg/kg IM\*\*
  - Do not exceed 2 mg/kg – may produce anesthesia**
  - Contraindications: Increased ICP, hypertension, CHF, patients with psychotic disorders, hypersensitivity to the drug
  - Adverse effects: Hypertension, tachycardia, muscle hyperactivity, increased airway resistance, depressed cough reflex, vivid dreams, nausea/vomiting, (and respiratory depression or apnea with large or rapid infusions)
  - Onset: IV 40 seconds, IM 3 – 4 minutes
  - Peak: IV 5 – 10 minutes, IM 12 – 25 minutes
  - Duration: 1 – 2 hours

**Restricted to Peds ED, ICU or Anesthesia physicians use only.**

- **Propofol**

- Dose: 1 – 2 mg/kg IV bolus
- Considerations: Shake well before using. Do not administer via filter of less than 5 micro pore size.
- Contraindications: hypersensitivity to other components of the formulation; e.g., this formulation egg yolk phospholipid and egg lecithin.
- Adverse effects: Seizures, apnea, hypotension, nausea/vomiting, pain at injection site, and cardiac arrest

**Etomidate:**

Dose: 0.1 to 0.2 mg/kg over 30 to 60 seconds. Followed by .05 mg/kg every 3 – 5 minutes, as needed for sedation.

Contraindications: Hypersensitivity to Etomidate products

Precautions

- A)** due to hazards of prolonged suppression of endogenous cortisol and aldosterone production, this formulation is not intended for administration by prolonged infusion
- B)** marked hypotension
- C)** severe asthma
- D)** severe cardiovascular disease

Adverse Reactions

- Endocrine & metabolic: Adrenal suppression
- Gastrointestinal: Nausea, vomiting on emergence from anesthesia
- Local: Pain at injection site (30% to 80%)
- Neuromuscular & skeletal: Myoclonus (33%), transient skeletal movements, uncontrolled eye movements

❖ **Reversal Agents**

Flumazenil (Romazicon®) reverses the sedative effects and psychomotor impairment but not respiratory depression associated with benzodiazepine administration. Naloxone (Narcan®) reverses the CNS and respiratory depression caused by narcotics. Antagonists should be available when either of these types of medications are used.

- Reversal agents are administered to reverse the effects of a specific type of sedation medication.

- **Naloxone (Narcan®)**  
 Dose: 0.01 – 0.1 mg/kg IV  
 Indications: Reverses respiratory and CNS depression after narcotic use  
 Contraindications: Hypersensitivity to drug  
 Adverse effects: Hyper- or hypotension, tachycardia, nausea/vomiting

\* **Narcan is to be diluted to make a concentration of 0.04 mg/ml**

- **Flumazenil (Romazicon®)**  
 Adult Dose: 0.2 mg over 30 seconds, IV  
 Pediatric Dose: 0.01 mg/kg IV (max dose 0.2 mg)  
 Indications: Benzodiazepine antagonist  
 Contraindications: Hypersensitivity to the drug, seizure disorders, or patient on routine benzodiazepines  
 Adverse effects: Seizures, arrhythmia, dizziness, headache, and agitation

### **Recovery and Discharge**

An important scoring system is used to assess the patient's recovery from the sedative effects and to determine their eligibility for discharge from that level of care (whether from the procedure area or home). The scoring system used to determine this is the Aldrette Post Anesthesia Scoring System (PARS), or simply Aldrette score, ranges from 1-10. While this is a system used to assess the degree of post-procedure recovery, it's important to make a baseline assessment for comparison purposes. Discharge criteria generally assume an Aldrette score of at least 8 or greater. That's usually not possible if the patient scored less than 8 before the sedation was administered, such as a quadriplegic, a confused patient, or a patient who's oxygen dependent.

The Aldrette score may not fit every patient exactly, but it provides a simple, reliable way to evaluate status. When evaluating the pre-procedure Aldrette score, evaluate the patient based on his/her usual status, i.e. usual blood pressure, respiratory status, etc.

## ALDRETTE SCORE:

<b>Activity</b>	2.....Able to move all 4 extremities 1.....Able to move two extremities voluntarily on command 0.....Unable to move extremities
<b>Respiration</b>	2.....Able to deep breathe and cough without difficulty 1.....Dyspnic, shallow, or limited breathing 0.....No spontaneous respirations
<b>Circulation</b>	2.....B/P and/or heart rate +/- 20% of pre-procedure levels 1.....B/P and/or heart rate +/- 20-50% of pre-procedure levels 0.....B/P and/or heart rate is $\leq$ 50% of pre-procedure levels
<b>Consciousness</b>	2.....Fully awake 1.....Arousable to verbal stimulus or light touch 0.....Unresponsive
<b>Oxygenation</b>	2.....Able to maintain O <sub>2</sub> saturation greater than 92% or baseline on room air 1.....Needs O <sub>2</sub> to maintain saturation greater than 92% 0.....O <sub>2</sub> saturation less than 92% even with oxygen supplement

## Recovery of the Patient after Sedation:

Once the procedure is finished the RN must monitor the patient until:

- The Aldrette score is greater than 8. This means that the patient must be awake, able to move, able to maintain oxygen saturation greater than 92% on room air and vital signs must be within 20% of baseline. If the baseline Aldrette score was less than 8, the patient must be stable, and returned to the pre-sedation level.
- Vital signs need to be taken at least every 15 minutes until stable or within 20% of baseline. Ranges for vital signs are:

Age	Resp. Rate	Heart Rate (Awake)	Heart Rate (Asleep)	Systolic B/P	Diastolic B/P
Infant/Neonate	30-60	100-180	75-150	60-90	35-60
Toddlers	24-40	80-110	60-90	87-105	53-66
Preschoolers	22-34	70-110	60-90	95-105	53-66
School-Age	18-30	65-110	60-90	96-110	55-69
Adolescents	12-16	60-90	50-90	97-112	57-71
Adults	12-18	60-100	50-80	112-128	66-80

**The patient's baseline vital signs and clinical status must always be considered. Heart rate, respiratory rate,**

and blood pressure may be elevated with fever, stress or anxiety.

The RN recovering the patient must also observe and document any unusual events or post-procedure complications, how those events were managed, and the patient's condition, including pain level.

## Complications

The most common complications of moderate sedation are **respiratory depression and cardiovascular problems**. Respiratory depression is most often caused by medications. This patient may have a decreased respiratory rate, shallow respirations and a decrease in oxygen saturation. As the patient becomes more relaxed, the tongue may obstruct the airway. Opening the airway using a head-tilt, chin lift method or by placing an infant's head in the "sniffing" position may be all that's needed to relieve an airway obstruction.

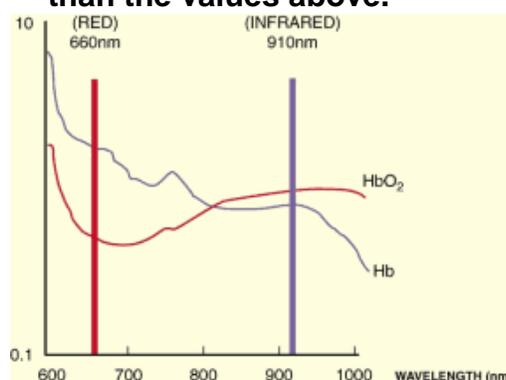
Applying oxygen before the sedation decreases the likelihood that the patient will become hypoxic during the sedation. If not applied before, apply supplemental oxygen at the first sign of respiratory difficulty.

Pulse Oximetry provides a simple, reliable method of monitoring a patient's oxygenation status during sedation. However, the readings may not be reliable if the patient is anemic, edematous, or has a condition that may affect circulation in the extremities, such as peripheral vascular disease or severe hypotension.

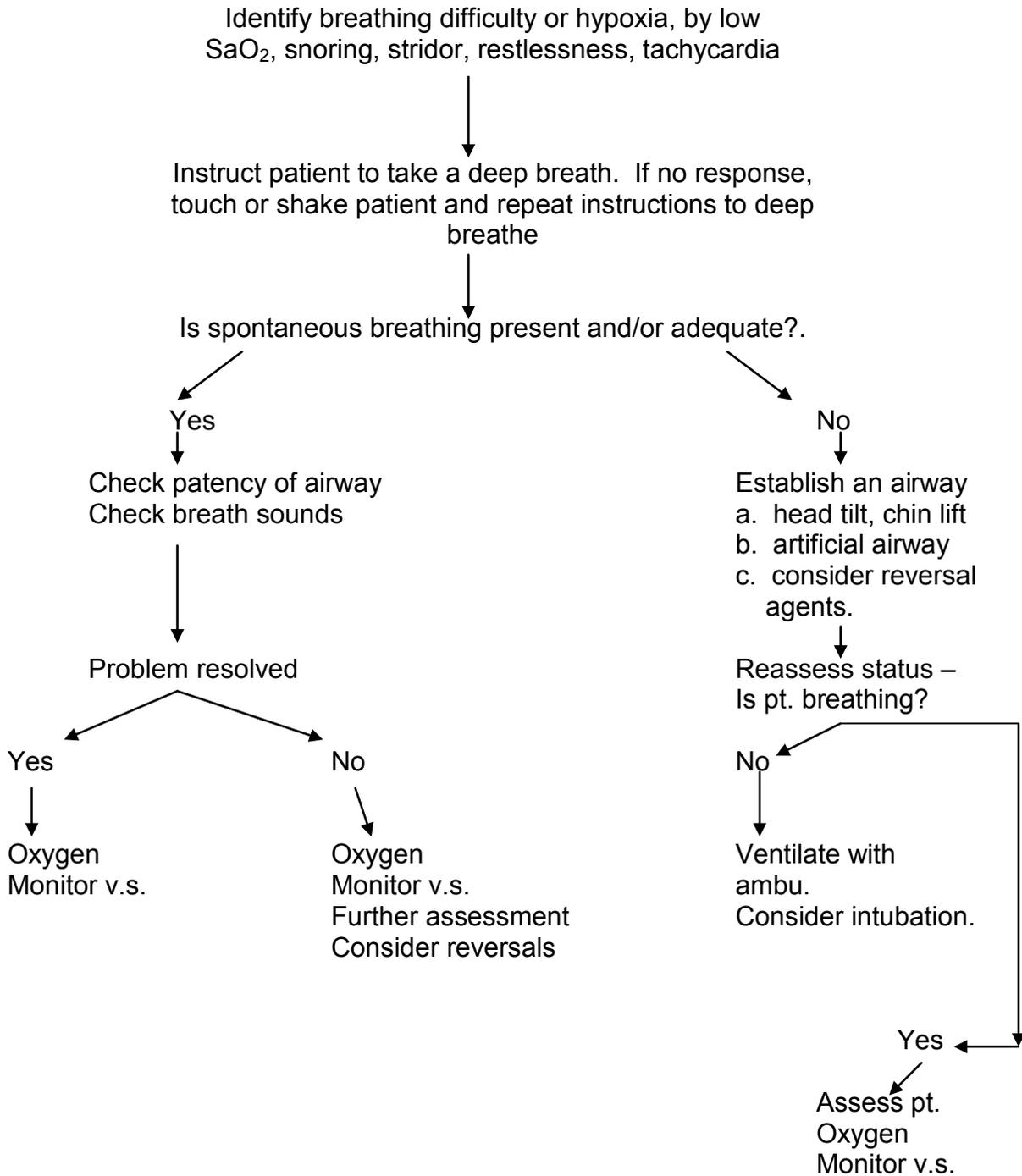
**Normal** oxygen saturation is 92-100% but remember that a **slight fall in Saturation (SaO<sub>2</sub>)** is associated with a **sharp decline in oxygen concentration (PaO<sub>2</sub>)**.

Saturation %	paO <sub>2</sub> (mm Hg)
90% =	60 mm
88% =	55 mm
80% =	50 mm
75% =	40 mm

**NOTE: Cyanosis is usually not observed until SaO<sub>2</sub> falls below 65%, which can be associated with a paO<sub>2</sub> as low as 40 mm Hg!!! In neonates, due to the presence of fetal hemoglobin with the shift of oxygen dissociation to the left, paO<sub>2</sub>s are lower with equivalent saturations than the values above.**



# Managing Respiratory Difficulty



The second most common complication concerns **cardiovascular changes**. These may include:

Signs and Symptoms	Nursing Intervention
A. Hypotension	<ol style="list-style-type: none"> <li>1. Administer IV fluids as ordered</li> <li>2. Consider reversal agents</li> <li>3. Patient's legs may be elevated slightly.</li> </ol>
B. Hypertension	<ol style="list-style-type: none"> <li>1. Ensure proper ventilation, retention of pCO<sub>2</sub> may cause elevated blood pressure.</li> <li>2. Consider need for additional sedation.</li> <li>3. Administer anti-hypertensive medication as ordered.</li> <li>4. Consider stopping procedure.</li> </ol>
C. Bradycardia	<ol style="list-style-type: none"> <li>1. Ensure oxygenation</li> <li>2. Arouse patient</li> <li>3. Administer medications, i.e. Atropine, Robinul as ordered by physician</li> <li>4. If thought to be vagal, consider stopping procedure (common with colonoscopy).</li> </ol>
D. Arrhythmias	<ol style="list-style-type: none"> <li>1. Consider hypoxia as the primary cause.</li> <li>2. Administer or increase oxygen flow.</li> <li>3. Administer anti-arrhythmics, such as Lidocaine, as ordered.</li> </ol>

If the patient is extremely unstable, institute **Basic Life Support** measures, and attend to the **ABC's: AIRWAY, BREATHING, and CIRCULATION**. You may need to initiate the emergency response system.

### **Discharge from the Sedation Level of Care:**

In this instance, "discharge" means that the patient no longer requires such a high level of nursing care and frequency of monitoring and are discharged from sedation care and not necessarily, physical discharge from an area, although that may also happen. A patient who has been "discharged" from moderate sedation no longer requires EKG or pulse oximetry monitoring for effects of the medication and has returned to baseline in terms of vital signs and level of consciousness

Patients may be discharged from sedation protocol once this criteria has been met:

- ❖ Aldrette score of 8 or greater, or return to baseline
- ❖ Patient is awake, alert, oriented or as baseline;
- ❖ Airway is patent, gag reflex is present and no breathing difficulties are noted;
- ❖ vital signs are stable, within acceptable limits, ideally within 20% of pre-procedure level;
- ❖ Skin is warm and dry, color good

- ❖ Pain is controlled
- ❖ Controlled nausea, no vomiting
- ❖ Ability to ambulate, or as baseline
- ❖ Able to tolerate fluids
- ❖ Stable in terms of the procedure, such as dry dressing, no bleeding, etc.
- ❖ Remember that patients who have received reversal agents must be monitored for at least two hours after the dose of reversal
- ❖ Outpatients are to be given written instructions regarding post-procedure diet, activities, etc.
- ❖ Outpatients must be discharged in the company of a responsible adult.
- ❖ **No patient who has received sedation is allowed to drive home.**

You have now completed the course. Please Register to take the Quiz and complete the Course Evaluation tool. Send completed CE Broker Form to Clinical Solutions Medical Education for creation of your certificate of completion.

Thank you !

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## References

American Society of Anesthesiologists. ASA Model Policy. Website:  
[www.asahq.org](http://www.asahq.org).

American Society of Anesthesiologists. Distinguishing monitored anesthesia care ("MAC") from moderate sedation /analgesia (conscious sedation).  
Approved statement by ASA House of Delegates October 27, 2004.  
Amended October 21, 2009.

Association of Operating Room Nurses (2007). Recommended practices for managing the patient receiving moderate sedation/analgesia. 2007 Standards, Recommended Practices, and Guidelines. 467-472.

Association of Operating Room Nurses (2002). Recommended practices for managing the patient receiving moderate sedation/analgesia.  
Association of Operating Room Nurses Journal, 75(3), 642-650.

Joint Commission on Accreditation of Healthcare Organizations. Comprehensive Accreditation Manual for Hospitals (CAMH). The Official Handbook. (2006). Oakbrook Terrace, Ill; JCAHO. Pc41-pc43.

Memorial Health Care System (2010) Moderate Sedation Course

Kost, M. (2004). Moderate Sedation/Analgesia: Core Competencies for Practice. 2<sup>nd</sup> ed. St. Louis: WB Saunders.

Kost, M. (2004). Questions and Answers in Sedation/Analgesia. Specialty Health Education Inc., Blue Bell, PA.

O'Donnell, J.M. (2003). Procedural Sedation, Nursing 2003, 33 (4), 36-44.

Oridion Medical (2005). Strategies for Patient Care: Capnography in the GI Lab.

Wong, D., Hockenberry, M. (2003). Wong's nursing care of infants and children. 7<sup>th</sup> edition. Pp. 1102-1109.

[www.SedationFacts.org](http://www.SedationFacts.org)

