Anne Arundel Medical Center

Adult Moderate Sedation Self Learning Packet

Revised 2016-2017 Edition

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I. MODERATE SEDATION SELF-LEARNING PACKET
Course Learning Objectives

At the end of this module, the participant will be able to:

- Describe components of the pre-procedural assessment and preparation, intra-procedural patient monitoring, and post-procedural recovery management according to AAMC standards.
- Discuss ASA (American Society of Anesthesiologist) scoring, Aldrete scoring, fasting protocol, transfer/discharge criteria and documentation criteria within AAMC.
- Apply age specific knowledge to management of patients receiving moderate sedation.
- List and demonstrate techniques to maintain patient airways, support airway monitoring and deliver oxygen during moderate sedation.
- Describe and select appropriate interventions to manage adverse reactions to specific moderate sedation agents.
- List the most commonly used IV moderate sedation agents, indications for their use, onset and duration of action, dosages, adverse effects and contraindications.
- Identify commonly used reversal agents and their application with moderate sedation.

ANNE ARUNDEL MEDICAL CENTER
II. MODERATE SEDATION/ANALGESIA POLICY & DEFINITIONS

UNITS OF CARE: Units/nurses/physicians at AAMC who have been approved to perform Moderate Sedation according to AAMC policy (GNP14.4.01, p.3) include Interventional Radiology, Cardiac Catheterization Lab, Critical Care Unit, Emergency Room, Endoscopy, and Short Stay Pre-op Unit. Moderate sedation may also be performed in the Procedural Care Unit by Interventional Radiology and Cardiac Catheterization Lab nurses and credentialed physicians.

GENERAL INORMATION: The standards for sedation and anesthesia care apply when patients receive, in any setting, for any purpose, by any route, moderate or deep sedation as well as general, spinal or other major regional anesthesia. Consent risks, benefits and alternatives to sedation/analgesia should be discussed with all patients and informed consent obtained by the physician before any medications are administered.

The **Registered Nurse must REPORT when he or she has refused to administer medication and/or monitor the patient** to the supervisor of the unit. The registered nurse must document all circumstances of the refusal by calling 4PTS or documenting the incident in the RL6 reporting system.

Equipment: (age appropriate sizes must be available)
Pulse Oximeter
End Tidal CO2
EKG/BP monitor
Ambu Bag and Source for 100% Oxygen
Suction Equipment and Machine
Airway and Intubation Equipment
Defibrillator/Code Cart/ Emergency Medications
Reversal Agents
Supplemental Oxygen and Appropriate Delivery Equipment
Functioning IV Site and IV Fluids

Phases of Patient Care (see AAMC Policy: GNP14.4.01 for details)

- **Pre-procedural Assessment:**
  - ✓ Establish physiologic baseline including, but not limited to; vital signs, temperature, cardiac rhythm, oxygen saturation, level of consciousness, pain rating, and END TIDAL CO2
  - ✓ Ride home if patient is being discharged
  - ✓ The ability of the patient to maintain required positioning for the procedure
  - ✓ Verify consent for the procedure and sedation
  - ✓ Medical and surgical history
  - ✓ Verify NPO status, H & P, ASA, and airway assessment are recorded
  - ✓ Height and weight
  - ✓ Allergies and sensitivities to medications

- ✓ Pregnancy status
- ✓ Current prescription medication status, over the counter medicines, and supplements
- ✓ Ensure pre procedure education is complete
- ✓ Acknowledge orders in the patient record, and obtain and prepare sedation medication
- ✓ Participate in a pre-procedural "time out". Refer to policy # GNP14.6.01 – Pre-Procedure Verification Process For Preventing Wrong Site – Procedure – Person Surgery/Procedure

- **Intra-procedural Patient Care :**
  - ✓ The registered nurse monitoring the patient for moderate or deep sedation may not leave the patient unattended or engage in uninterruptible tasks that would compromise continuous monitoring.
  - ✓ Monitor the physiologic status of the patient continuously and record the following every five minutes or more frequently depending on level of sedation provided:
    - ❖ Blood pressure, heart rate, respiratory rate, pulse oximetry, end tidal CO2
    - ❖ RASS (Richmond Agitation Sedation Scale) score (*see next page for details*)
    - ❖ Medication and dosage administered
    - ❖ Follow ACLS guidelines for cardiac or respiratory emergencies or complications.
    - ❖ Initiate Code Blue/Resource Nurse procedures as necessary.

- **Post-procedural Patient Care :**

  The moderate sedation patient is fast-tracked from Phase I to Phase II when the following standards are met and include documentation of:

  - ✓ Monitoring, assessing, and documenting the patient's physiological status as well as documenting vital signs, oxygen saturation, temperature, level of consciousness, and pain.

  Fast-tracking of patients requires the patient to demonstrate an Aldrete score of $\geq$ 8. See criteria below.

  Aldrete score requirements for transfer to inpatient status or phase II are as follows:

  Activity: a score of 2 is required unless the patient has pre-existing motor limitations. Patients recovering from spinal anesthesia may be transferred with a score of 1 if there is a touch/pressure sensation either inferior extremity

  Respiration: a score of 2 is required

  Circulation: a score of 2 is required

  Level of consciousness: a score of 1 or 2 is acceptable

  Color: a score of 2 is required

  Any parameter not met has been reported to or checked by the anesthesiologist or procedural physician and waived by him/her (for a score of <8 exceptions must be recorded in the progress notes).

  SaO2 must be at least 94 or at baseline. Transfer to inpatient or Phase II with O2 as ordered by physician.

- **Phase I:** Implementation of nursing care to provide a safe transition from the anesthetized/sedated patient until

  Phase I discharge criteria are met.

- **Phase II:** Before transfer to Phase II, patient should meet all phase I discharge criteria and receive an Aldrete score

Fast Track: When a post-procedure patient receiving moderate sedation bypasses Phase I level of care and transfers directly to the Phase II level of care.

III. Richmond Agitation Sedation Scale / RASS

Used to assess the patient's response to sedation during a procedure and documented at a minimum of every 5 minutes

Score	Term	Description
+4	Combative	Overtly combative or violent; immediate danger to staff
+3	Very agitated	Pulls on or removes tube(s) or catheter(s) or has aggressive behavior toward staff
+2	Agitated	Frequent nonpurposeful movement or patient–ventilator dyssynchrony
+1	Restless	Anxious or apprehensive but movements not aggressive or vigorous
0	Alert and calm	Spontaneously pays attention to caregiver
-1	Drowsy	Not fully alert, but has sustained (more than 10 seconds) awakening, with eye contact, to voice
-2	Light sedation	Briefly (less than 10 seconds) awakens with eye contact to voice
-3	Moderate sedation	Any movement (but no eye contact) to voice
-4	Deep sedation	No response to voice, but any movement to physical stimulation
-5	Unarousable	No response to voice or physical stimulation

IV. ASA CLASSIFICATION SCALE:

Each patients receiving moderate sedation must be assessed by the sedation credentialed physician and given an ASA score prior to sedation administration.

- **ASA I:** A normal, healthy, patient. A healthy Individual with no systemic disease, undergoing elective surgery. Patient not at extremes of age.

  Examples: Fit patient with inguinal hernia
  Fibroid uterus in an otherwise healthy woman

- **ASA II:** A patient with mild, systemic disease. An individual with one system well controlled disease. Disease does not affect daily activities. Other anesthetic risk factors, including mild obesity, alcoholism and smoking can be incorporated at this level.

  Examples: Non-limiting or slightly limiting organic heart disease
  Mild diabetes, essential hypertension or anemia

- **ASA III**: A patient with severe, systemic disease. An individual with multiple system disease or well-controlled major system disease. Disease status limits daily activity.
  However, there is no immediate danger of death from any individual disease.

  Examples: Severely limiting organic heart disease
  Severe diabetes with vascular complications
  Moderate to severe degree of pulmonary insufficiency

- **ASA IV:** A patient with severe systemic disease which is a constant threat to life. An individual with severe, incapacitating disease. Normally, disease state is poorly controlled or end-stage. Danger of death to organ failure is always present.

  Examples: Organic heart disease with persistent angina, cardiac insufficiency, active myocarditis; Advanced pulmonary, hepatic, renal or endocrine insufficiency

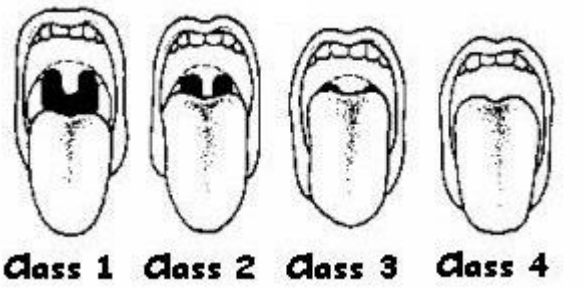
- **ASA V:** A moribund patient who is not expected to survive with or without the operation/procedure. A patient who is in imminent danger of death. Operation deemed to be a last resort attempt at preserving life. A patient not expected to live through the next 24 hrs.

  Examples: Ruptured abdominal aneurysm with profound shock
  Major cerebral trauma with rapidly increasing intracranial pressure
  Massive pulmonary embolus

V. AIRWAY CLASSIFICATION

All patients receiving moderate sedation must be assessed by the sedation credentialed physician and given a Mallampati score prior to sedation administration.

- **Airway Assessment (Mallampati):**



Class I = Visualization of the soft palate, fauces, uvula, anterior and posterior pillars
Class II = Visualization of the soft palate, fauces, and uvula.
Class III = Visualization of the soft palate and base of the uvula.
Class IV = Soft palate is not visible at all.

VI. NPO STATUS

Sedation reduces protective reflexes of the airway. Therefore, pulmonary aspiration of gastric contents may possibly occur if a patient has recently ingested food.

For elective moderate sedation cases, patients must be NPO for a **minimum** of **4 hours** with nothing by mouth to eat or drink except a sip of water to swallow oral medications.

Certain radiological procedures may require the ingestion of oral agents for imaging. The risk of aspiration must be considered and weighed against the administration of sedation medications when screening the patient.

Emergency procedures: When fasting cannot be assured for emergent cases, risk of sedation/aspiration must be considered and weighed against its benefits.

VII. PEARLS of WISDOM FOR CONSIDERATION

- The **type of procedure** being performed: invasive vs. non-invasive, need for complete immobility, and imaging requirements influence sedation needs.
- The **length of the procedure** being performed: short acting medications vs. long-acting medications
- The **positioning** required of patient during procedure: awkward position or face-down positions
- **Allergies**: A patient with multiple allergies is at increased risk.
- **Current Medications**: *What medications is patient receiving? When was the last dose of each medication?* (i.e. - last dose of antihypertensive, last does of hypoglycemic insulin, last dose of anti-anxiety, etc…).
- **Pregnancy**: Note date of last menstrual period.
  Prior to sedation, if pregnancy status is unknown, a pregnancy test should be performed per physician order. Consultation with anesthesia should be considered when sedating a pregnant patient.
- Consultation with a **lactation** consultant should be considered when sedating a lactating patient.
- **Age**: **Elderly** patients, over 70 years of age, are generally sensitive to sedation and doses should be reduced accordingly.
  Pediatric patients should be dosed according to weight. However, pediatric patients metabolize narcotics and sedatives at a rapid rate depending on age.
- **Lab results**: Dependent on type of procedure being performed (CBC, CH7, Coags)
- **Social history**: **Smokers** (increased respiratory risks)
  ETOH (may have developed a tolerance for narcotics/sedatives. When was the last drink?)
  Drug abuse (frequent narcotic use/abuse, may increase tolerance)
- **Surgical history**: Recent surgeries, anesthesia problems
- **Medical history is an especially important feature of patient selection:** The following list is a review of problems that may increase the patient's risk of receiving sedation/analgesia:

Cardiac: Recent MI, uncontrolled angina, poorly controlled hypertension, left heart failure, right heart failure

Pulmonary: Emphysema, COPD, asthma, smoking history, recent pneumonia or bronchitis, sleep apnea

Hepatic: Ascites (restricts pulmonary function), portal hypertension, coagulopathies

Renal: Renal failure predisposes patients to decreased clearance of most sedative analgesic

Neurological: Patients with a seizure disorder are at risk for seizures if the receive reversal agents.

Endocrine: Diabetic patients are at risk for hypoglycemia from being NPO or hyperglycemic from stress. Patients with hypothyroidism are generally sensitive to sedatives/analgesics and may experience respiratory depression and/or central nervous system depression.

Body Habitus: Obesity or short neck can cause airway obstruction

- **Sedation Medication absorption:** There is an extreme variation from patient-to-patient with respect to medication absorption rates and drug responses. Titrating drugs to achieve the desired effect is of utmost importance. Patients of ALL ages must receive medication in titrating doses as some may tolerate only the low end of recommended doses, while others may require higher doses to achieve a successful sedation effect.
- **EVALUATE THE PATIENT"S RESPONSE AFTER EACH DOSE; monitor for changes in vital signs. Patients can still experience pain even though they appear sedated and relaxed. They may still need pain medication even though they don't need a sedative.**
- **The use of multiple drugs** may increase the risk of adverse effects including but not limited to respiratory depression, airway obstruction, and apnea. When combining medications, each drug dose may require 25-33% reduction during administration.

VIII. CAPNOGRAPHY

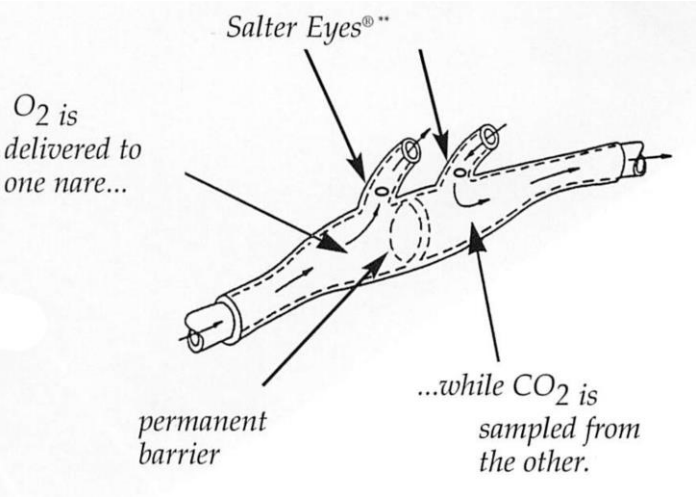
The use of capnography is standard for all procedural sedation performed at Anne Arundel Medical Center. “Capnometry” refers to the measurement and display of the concentration of exhaled carbon dioxide either as a percentage (%) or as a partial pressure in millimeters of mercury (mm Hg).

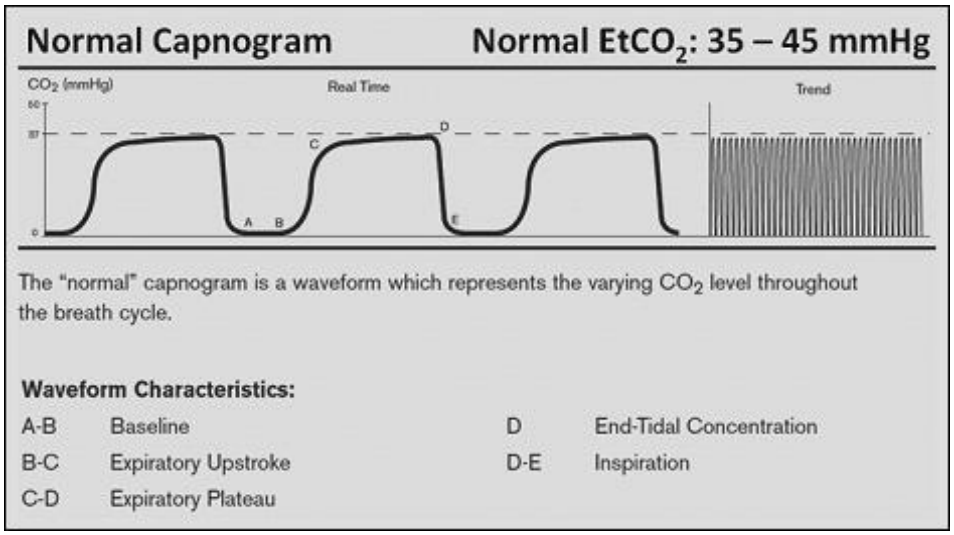
End Tidal Co2 (ETCO2) monitoring allows acute hypoventilation episodes to be detected earlier than standard SpO2 monitoring. A saturation % on a pulse oximeter will continue to read within normal limits up to 5 minutes after a patient has experienced a respiratory event. ETCO2 captures a respiratory event immediately and is able to be visualized on the monitor via the capnogram (waveform). Removal of carbon dioxide from the alveoli is the normal drive to breathe, however, this action can be impaired by relaxed muscle tone, impaired airway, or other respiratory diseases and complications.

ETCO2 refers to the maximum concentration of carbon dioxide at the end of exhalation just prior to inhalation. This monitoring capability is especially beneficial when administering medications that can cause respiratory depression.

- End Tidal CO2 can be measured through either nasal cannula or mechanical ventilation via a ventilator tubing connector. Both of these connect to the bedside monitor for ease of viewing with other vital signs.
- Capnography is a beneficial adjunct to airway management during procedural sedation.
- Earlier detection of respiratory depression allows the sedation provider to intervene prior to a hypoxic event rather than rescue a patient from an event.
- Normal ETCO2 values are 35-45 mmHg

A continuous real time measurement of end tidal CO2 is provided on the patients monitor in the form of a capnogram. This waveform provides insight into the patient’s quality of breathing by displaying the entire respiratory cycle. The waveform appears opposite of the standard respiratory waveform on the monitor as when inspiration begins the waveform dips to a zero baseline due to the absence of carbon dioxide. As the level of carbon dioxide increases, so does the waveform on the capnogram. It peaks at the end of exhalation immediately prior to inspiration of the next breath.



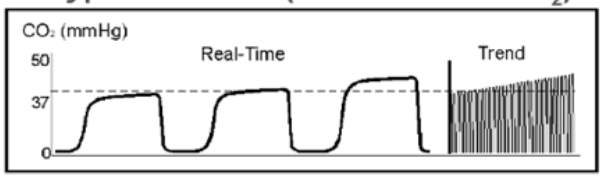


NORMAL ETCO2 Capnograms show Inspiration (A to B) – Expiration (C to D) – Inspiration (D to E)

ABNORMAL Capnogram examples on the following page:

- If a patient has an obstruction the CO2 value will increase, the waveform won't change.
- If a patient has decreased ventilations the CO2 value will increase.
- Prolonged transition between phases is indicative of chronic lung disease. There is usually a gradual increase between end of inspiration and expiration (B-C above) instead of the usual steep upslope.
- A slow drop in the alveolar phase of expiration is indicative of a pneumothorax. The plateau (C-D above) of the normal waveform is "cut off"

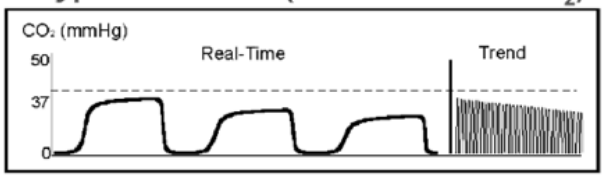
Hypoventilation (Increase in $ETCO_2$)



Possible Causes:

- Decrease in respiratory rate
- Decrease in tidal volume
- Increase in metabolic rate
- Rapid rise in body temperature (hyperthermia)

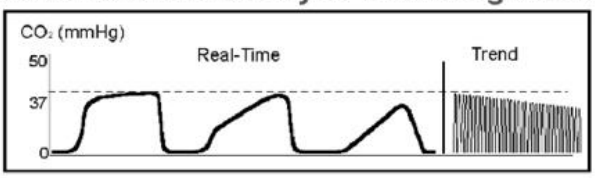
Hyperventilation (Decrease in $ETCO_2$)



Possible Causes:

- Increase in respiratory rate
- Increase in tidal volume
- Decrease in metabolic rate
- Fall in body temperature

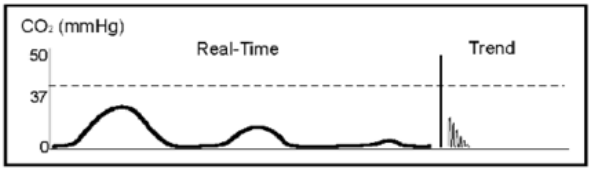
Obstruction in Airway or Breathing Circuit



Possible Causes:

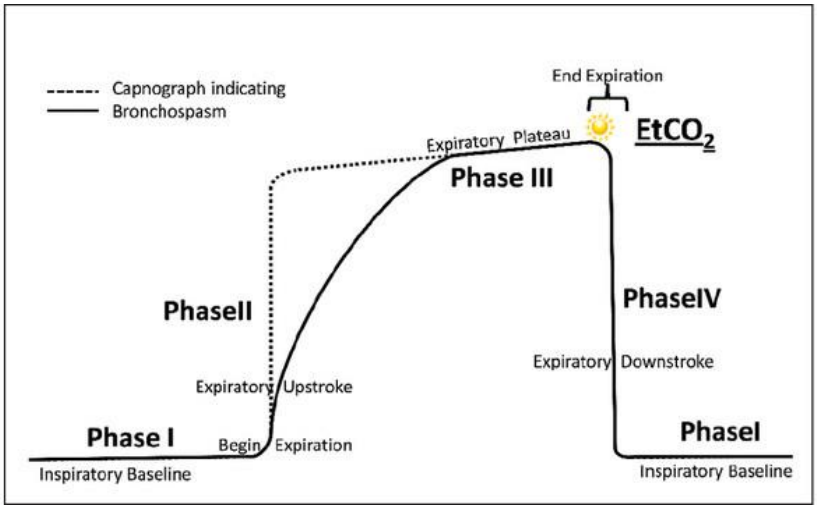
- Partially kinked or occluded artificial airway
- Presence of foreign body in the airway
- Obstruction in expiratory limb of breathing circuit
- Bronchospasm

Endotracheal Tube in Esophagus



Possible Causes:

- Missed intubation
- A normal capnogram is the best evidence that the ET tube is correctly positioned
- With ET tube in the esophagus, little or no CO_2 is present



IX. Supplemental Oxygen

All patients having sedation/analgesia should receive supplemental oxygen during their procedure.

1. **<u>Oxygen Delivery mechanisms</u>** help to prevent hypoxia, hypoventilation and respiratory depression.

a. Nasal Cannula

- Nasal cannulas are appropriate for most patients unless they are uncomfortable or not practical for physical reasons (i.e., tracheostomy)
- Low flow oxygen administration system.
- Increases patient's inspired oxygen concentration.
- Allow nasopharynx to serve as oxygen reservoir.
- Not recommended for flow rates > 4L/min.

b. Oxygen Face Mask

- Permits delivery of inspired oxygen of 40% to 60%.
- Inspiration rate depends on oxygen flow rate, patient's inspiratory flow and mask fit. Select as appropriate for age and size.

c. Non-Rebreathing Mask:

- Oxygen face mask with reservoir bag allows up to 100% oxygen when tight face seal is obtained; rebreathing diminished.
- For hypoventilation and hypoxia; Providing the patient with 100% oxygen via a rebreather enables them to intake 5 times as much oxygen versus breathing room air.

d. Humidified Oxygen:

- Indicated in presence of increased pulmonary secretions, increased viscosity and mobilization of secretions.
- Goal: Decrease viscosity and mobilize secretions by increasing water content in alveoli.
- Requires high flow rate to convert water to vapor state.

e. Bag Valve Mask

- Select proper mask size for patient.
- Snug fit between bridge of patient's nose, chin and all medical aspects of face.
- Effective seal between skin of face and mask.
- Use 3rd and 4th and 5th fingers to place on mandible to elevate the jaw and base of tongue off the posterior pharyngeal wall.
- Resuscitator bag is self-inflating coupling with non-rebreathing valve.
- Oxygen flows directly into self-inflating bag when the refill valve opens.
- Extend the *variable volume reservoir tubing* to its maximum length to get maximum O2 concentration

- Oxygen flow rate should be 10 to 15 L in adult patient.
- Grasp self-inflating bag in middle; apply firm pressure and depress bag to deliver effective ventilation.
- After delivery of first positive pressure ventilation, chest rise and fall should be present with breath sounds and no air escaping around mask. If patient remains apneic, ventilation should ensure rate equal to 16 to 20 breaths/minute.
- If patient is not completely apneic, the delivery of manual ventilation should be synchronized with inspiratory phase of patient.

➢ **Complications of Oxygen Delivery**

- Can be related to mechanical valve failure: Re-breathing of expired gases and decreased FIO2.
- Gastric insufflations secondary to attempted ventilation through non-patent airway.

X. Pulse Oximetry

- Non-invasive device to measure arterial hemoglobin oxygen saturation and pulse rate.
- Portable or bedside models are easy to use.
- **Is not the first line of defense** in detecting hypoxemia; **ETCO2 monitoring is much more accurate in early detection of hypoxemia.**
- Vigilant physical assessment of the patient's respiratory effort and the use of pulse ox allow for rapid identification and treatment of respiratory compromise.

Factor That May Interfere with Accurate Pulse Oximeter Readings:

- Anemia- Severe anemia will provide unreliable readings.
- Patient movement; **Restlessness NOT RELATED TO HYPOXEMIA** - Move pulse ox probe to another site (ear, nose).
- Low perfusion **NOT RELATED TO HYPOXEMIA** (Cold extremity, peripheral vascular disease, hypovolemia and hypotension) Try another site
- Tachycardia or Arrhythmia - Move probe to another site (nasal sensory),
- Edema- Move probe to non-edematous site (earlobe, nasal sensor)
- Nail Polish- Especially blue, green, black-Place probe sideways on finger so light doesn't have to pass through polish or remove polish.
- Hypothermic patients attempt to warm an extremity to promote circulation

Key Points to Remember:

- Oxygen saturation should be maintained within 2 - 4 points of pre-op oxygen saturation.
- Patient may normally be able to compensate, but benzodiazepines depress ventilatory response to CO2.
- The patient may have good oxygen saturation via pulse oximetry and increased CO2 levels, which increase the sedative effect and can potentially lead to RESPIRATORY ARREST. This is especially true in patients with COPD.

XI. Aldrete Scoring System

The Aldrete Scoring System is an objective method of evaluating oxygenation, respiratory, circulation, consciousness and activity levels for patients that have received anesthesia or conscious sedation.
Each of the five categories is scored on an actual patient response or parameter.
Fifteen minutes after the last dose of sedation has been administered, place a score in the ADM box for each category. The number corresponding to the response/parameter is placed in each box and then added for a total score at the bottom. Scoring is completed every fifteen minutes thereafter until the patient is transferred to the next recovery phase (Phase II). Patients may be recovered in any area (including the patient's room) where proper monitoring and resuscitation is available.
Some patients qualify for "fast-tracking immediately from the procedure to Phase II". Please refer to the moderate sedation policy for further description of this specific transfer criteria.

Time	Score
Activity	
Able to move 4 extremities voluntarily or on command	2
Able to move 2 extremities voluntarily or on command	1
Unable to move extremities voluntarily or on command	0
Respiration	
Able to breathe deeply and cough freely	2
Dyspnea or limited breathing	1
Apneic	0
Circulation	
Blood pressure±20% of pre-anesthetic level	2
Blood pressure±20% to 49% of pre-anesthetic level	1
Blood pressure±50% of pre-anesthetic level	0
Consciousness	
Fully awake	2
Arousable on calling	1
Not responding	0
O_2 Saturation	
Able to maintain O_2 saturations >92% on room air	2
Needs O_2 inhalation to maintain O_2 saturations >90%	1
O_2saturation <90% even with O_2 supplementation	0
Total score	10

XII. Post Anesthesia Discharge Scoring System (PADSS)

The PADSS is a phase II tool used to assess the patient's condition and home readiness prior to discharge to home. Discharging the patient to home is based on readiness instead of a specific time frame unless indicated by the procedure and it's limitations. Perform a screening upon admission to the phase II area and periodically to determine readiness. For example, a more sedated patient following a lengthy procedure may require a longer stay in the phase II area due to a lower blood pressure or activity score. Whereas, a patient requiring less sedation and a shorter procedure duration may score a 11 but be required to recover for 1 ½ hours due to the type of procedure. Both patients may be ready to be discharge at the same time. However, a patient receiving a lighter amount of sedation and a minimally invasive procedure may be ready for discharge shortly after arriving on the unit. Therefore, upon noting the appropriate score, the nurse can then provide discharge education and progress toward discharging the patient.

Post- Anesthesia Discharge Scoring System (PADS) for Determining Home Readiness

A patient has completed Phase II of recovery when total score from the following categories equals 9 or 10.

VITAL SIGNS (*Vital signs must be stable for 1 hour and consistent with age and preoperative baseline)*			**NAUSEA AND VOMITING** (*The patient should have minimal nausea and vomiting before discharge)*		
	BP and pulse within 20% of preoperative baseline	2		Minimal: successfully treated with PO medication	2
	BP and pulse 20 - 40% of preoperative baseline	1		Moderate: successfully treated with IM	1
	BP and pulse > 40% of preoperative baseline	0		Severe: continues after repeated treatment	0
SURGICAL BLEEDING (*Postoperative bleeding should be consistent with expected blood loss for the procedure)*			**ACTIVITY LEVEL**		
	Minimal: does not require dressing change	2		Steady gait (no dizziness for 15 min or meets preoperative level)	2
	Moderate: up to 2 dressing changes required	1		Requires Assistance	1
	Severe: more than 3 dressing	0		Unable to Ambulate	0
PAIN (*The patient should have minimal or no pain before discharge. The level of pain that the patient has should be acceptable to the patient. Pain should be controllable by oral analgesics. The location, type and intensity of pain should be consistent with the anticipated postoperative discomfort)*					
	Minimal	2			
	Moderate	1			
	Severe	0			

Some patients will be unable to score 9 or 10 due to a pre-anesthetic deficit. These patients must return to their baseline prior to discharge

A score of 0 in any category excludes eligibility for discharge unless approved by a physician.

XIII. MANAGEMENT OF ADVERSE EFFECTS

A. AIRWAY MANAGEMENT

Airway issues are the most common cause of complications resulting from sedation. Airway obstruction and hypoventilation can rapidly decline to hypoxemia and hypercarbia. ***HYPOXEMIA IS A LATE SIGN OF AIRWAY OBSTRUCTION AND HYPOVENTILATION.***

The administration of sedation drugs can cause airways to become depressed, reduce muscle tone, and create airway obstruction. Laryngeal muscles lose muscle tone, cartilage and tissue collapse, and cause obstruction. An inability to open the mouth, large tongue, large tonsils and adenoids, and soft tissue inflammation also contribute to a difficult airway and possible obstruction.

Airway obstructions can also be the result of secretion build-up, bronchospasm, laryngospasm, or foreign bodies. Ask the patient if they snore or use CPAP at home, have asthma, use inhalers, or have ever had oral or airway surgery of any type. Hypoxemia can also develop slowly without any obvious signs until decompensation has already begun.

All patients receiving sedation/analgesia should receive supplemental oxygen. If possible, the patient's head should be maintained in the neutral position. If the airway becomes impaired, the following positions should be utilized:

- Neutral Position with the head slightly elevated on a blanket or small pillow to align the neck (mouth, pharyngeal and tracheal axes to promote good air passage)
- Sniffing Position
- Chin Lift Techniques / Lateral Head Tilt Maneuver / Jaw Thrust
- Place a small blanket or sheet roll behind the shoulders to promote the sniff position which opens the airway.

Airway adjuncts-**nasopharyngeal airways** - may be utilized to assist in keeping the tongue from obstructing the airway (they are usually better tolerated than an oral airway which may precipitate the gag reflex in many patients). .

If the patient begins to present signs of an airway obstruction, the provider should work their way through the airway positions. If these maneuvers fail to prevent SaO2 desaturation, the patient should be placed on non-rebreather mask @ 100% oxygen using the jaw thrust technique, if the patient's inspiratory effort is adequate. Otherwise, manually ventilate the patient with a bag valve mask and consider using a reversal agent if not contraindicated.

Signs and Symptoms of Airway Obstruction:

- Partial Airway Obstruction: weak, ineffective cough, high-pitched noise while inhaling, uncoordinated attempts at ventilation, and cyanosis.
- Complete Airway Obstruction: movement of air is absent; cyanosis and hypoxia will result rapidly if not treated.
- Loud sonorous breathing or a low SaO2
- SNORING
- Tongue may be displaced posteriorly occluding the airway at the pharynx level. In the unconscious patient, the tongue is the most common cause of airway obstruction.
- Epiglottis and /or tongue can also occlude the entrance of the trachea.

NOTE: **The importance of early recognition of inadequate respiratory function is essential to prevention of an adverse outcome. The majority of problems encountered in sedation are preceded by inadequate respiratory status.**

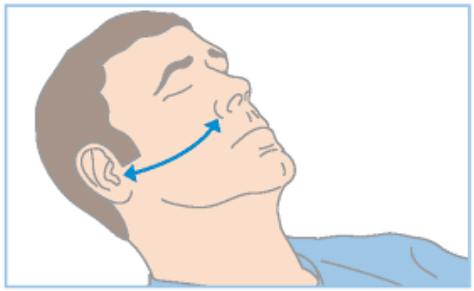
B. AIRWAY RESCUE:

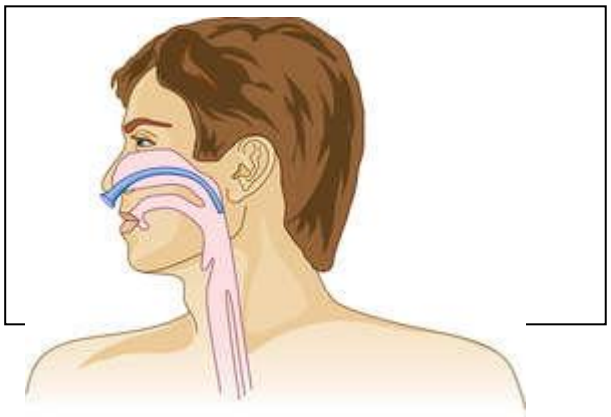
1. NASAL AIRWAY:

- Generally tolerated better than oral airway (oral airway will stimulate gag reflex resulting in vomiting or Laryngospasm in lightly anesthetized patients.
- *Risks associated with nasal airway:*
    - Epistaxis: results in blood in oropharynx, which can stimulate laryngospasms or bronchospasm.
    - Hypertension
    - Difficult placement in patients (i.e., with nasal deformity).

INSERTION OF NASAL AIRWAY:

- Various sized: 6.0 mm, 6.5 mm, 7.0 mm (size indicates internal diameter in millimeters; the larger the internal diameter, the longer the tube).
- Approximate length is measured from the tip of the nose to lobe of ear.
- Must be long enough to displace the base of the tongue away from the posterior pharyngeal wall.
- Insertion must be perpendicular to face. Measuring from the entry of the nose to the bottom of the angle where the jaw and earlobe meet should individualize the size. Lubricate and insert the airway with the bevel against the nasal septum; slide the airway against the bottom of the nasal passage to allow it to conform to the natural path. If you meet resistance, try twisting the airway slightly one way or the other. If you still meet resistance, DO NOT FORCE IT TO PASS, remove and attempt using the other side. Secure when the flange meets the outside edge of the nostril.





2. **ORAL AIRWAY:**

- Provides mechanical passage for airflow by displacing tongue off the posterior pharyngeal wall.
- *Side effects:*
    - May stimulate vomiting through gag reflex.
    - Bradycardia secondary to vagal stimulation.
    - Retching with resultant hypertension and tachycardia
    - Laryngospasm
    - Dental damage
    - Pharyngeal or lip lacerations

INSERTION OF AN ORAL AIRWAY:

- Measure from the corner of the patient's ear to the corner of their jaw
- Carefully open patient's mouth
- Clear the mouth and pharynx of secretions, blood, or vomit using a rigid pharyngeal suction tip (Yankeur)
- Slide airway upside down into the side of the mouth
- As you approach the posterior pharynx, rotate the airway into the proper position
- Verify tongue and lips have not been inadvertently positioned between the oral airway and the teeth

- Most adverse events can be avoided with careful monitoring.
- The main life-threatening problems associated with IV moderate sedation are:
    - Airway Impairment/Obstruction resulting in Hypoventilation/hypoxia
    - Aspiration
    - Laryngospasm
    - Bronchospasm
    - Negative Pressure Pulmonary Edema
    - Hypotension
    - Arrhythmias (see ACLS protocols)

C. BRONCHOSPASM

Definition:

With bronchospasm, increased bronchial smooth muscle tone results in small airway closure.

Causes:

- Aspiration
- Tracheal and pharyngeal suctioning
- Intubation
- Histamine release
- Allergic response
- COPD

Treatment:

- Decrease airway irritability
- Pharmacologic bronchodilation
- Humidified oxygen

D. ASPIRATION

- Aspiration is the most common cause of DEATH with IV Moderate Sedation. Complications arise from aspiration of gastric contents.
- May consist of only bronchospasm leading to hypoxia.
- Complications arising from aspiration of gastric contents may range from bronchospasm, pneumonitis, and hypoxia to multiple organ failure.
- With excess IV moderate sedation, protective reflexes may be impaired or absent.
- Opioids can induce regurgitation because they stimulate the regurgitation centers in the medulla.
- Patients at high risk for aspiration:
    - Children
    - Obese patients
    - Patients with a history of nausea/vomiting with sedation

- Patients with a history of motion sickness
- Patients with increased GI secretions and decreased motility.

Prevention and Treatment:

- To prevent nausea/vomiting, the level of sedation should be VIGILANTLY ASSESSED.
- Anti-emetics are most effective if given pre-procedure, but this MAY INCREASE SEDATION.
- If the patient begins to vomit, TURN him/her to the SIDE and SUCTION.
- Commonly used Anti-emetics: Reglan, Phenergan, Inapsine, Zofran and Compazine.

E. LARYNGOSPASM

Definition:

Spasm of the laryngeal musculature initiated by mucus, blood or saliva irritating the vocal cords resulting in complete or partial closure of the vocal cords and patient's inability to ventilate.

Symptoms: rocky abdominal respiration with no air exchange.

Initial Treatment: Positive pressure with ambu bag and 100% oxygen (secure mask fit is required to generate positive pressure to break spasm). Patient may need Versed. Immediately notify anesthesia provider.

F. HYPOTENSION

Causes:

- Sedation causes decreased peripheral vascular resistance.
- Narcotics cause vasodilation
- Combined sedation + narcotic = increased effect.
- Hypovolemia may be due to length of time being NPO, medications taken, bowel prep done or recent dialysis.

Effects:

- Untreated hypoxia will compound vasodilation as the body tries to compensate to deliver oxygen to the cells.
- Vasodilation caused blood pooling in the vasculature causing decreased cardiac output. If severe, may cause cell ischemia and necrosis.

Compensation:

- Heart rate and force of contraction increases.
- Patients with cardiovascular disease have decreased compensation.
- Careful titration of benzodiazepines and opioids can prevent or minimize the hypotensive effect.

Interventions:

- If blood pressure is low but the patient is asymptomatic:
    - Reposition the cuff.
    - Check with manual cuff.
    - Check pressure on the other arm.
    - Stimulate the patient and recheck pressure.
- If hypotension persists or patient is symptomatic:
    - Stop or suspend the procedure.
    - Assess other possible cause (s) of hypotension: transient?, vasovagal reaction?, pain related (i.e., holding breath because of pain) ?
    - Place the patient in the FLAT position
    - Apply oxygen and stimulate patient.
    - Treat as needed.
    - Fluid challenge with NS if appropriate
    - Consider Reversal Agents

XIV. USE OF REVERSAL AGENTS

Some patients may see more or prolonged sedative effect than anticipated during and after the procedure. Patients who do not respond to physical stimulation and airway adjustment and management may warrant the administration of reversal agents. Consider the behavior presented and discuss with the procedural physician to determine which agent would be best to administer first.

Paradoxical reactions can manifest as agitation and restlessness after benzodiazepine administration; especially in patients who currently take benzodiazepines or psychotropic medications.

- The nurse must monitor the patient for an **additional hour** after the administration of a reversal agent. Reversal agents have a shorter half-life than the sedation medication and additional monitoring is required to ensure that the patient does not relapse. Patients may experience a rebound effect after the reversal agent is worn off because the sedative is still in the patient's system.
- Administration of Romazicon can precipitate seizures
- Should be given with CAUTION to patients who are also taking medication for seizures or other neurological disorders.
- **MUST REPORT ANY REVERSAL TO 4PTS HOTLINE (X4787)**

Please refer to the medication administration table on the following pages for detailed information about all medications including indications and use of Narcan and Romazicon.

MEDICATION REFERENCE TABLE

Medication	Adult Dosing	Pediatric Dosing (for patients ≥ 14 y/o or ≥ 50 kg, use adult dosing)	Onset of Effects (minutes)	Peak Effect (minutes)	Duration Of Effect (hr)	Potential Adverse Reactions	Reversal Agent
BENZODIAZEPINES: *amnestic & sedative effects*						* Benzodiazepines may potentiate the effects of other CNS depressants including opiate analgesics, other sedative and anesthetics ** Patients who are tolerant to benzodiazepines may require higher doses.	
Diazepam (Valium®)	IV 1-5 mg over 2 -3 minutes **	IV: 0.04-0.2 mg/kg/dose over 2-3 minutes**	3-5	8	6-8	Respiratory depression, amnesia, drowsiness, slurred Speech, thrombosis/phlebitis at site of injection, skin rash, bradycardia, hypotension, over sedation, apnea, headache	Flumazenil (Romazicon) ***see next page for dosing
		PO: 0.02-0.3 mg/kg/dose**	30-60	30-90	6-8		
Midazolam (Versed)	IV: 0.5-2 mg Over 2 minutes repeated Q2-3 minutes, Usually 2.5-5 mg	IV: 0.05-0.1 mg/kg; titrate up to 0.4 mg/kg; Maximum total dose: 6 mg	2-3	3-5	1-2	Respiratory depression, amnesia, drowsiness, slurred Speech, thrombosis/phlebitis at site of injection, skin rash, bradycardia, hypotension, over sedation, apnea, headache, hiccoughs	Flumazenil (Romazicon) ***see next page for dosing
		PO: 0.25-0.5 mg/kg single dose; Maximum dose: 20 mg * patients 6 months-5 years may be 0.25-1 mg/kg/dose	10-20	30-45	1-2		
OPIOID NARCOTICS: *analgesic effects*						*Patients who are tolerant to narcotics may require higher doses	
Fentanyl (Sublimaze®)	IV: 25-50 mcg over 2-3 minutes Q10-15 minutes	IV: 0.5-1 microgram/kg given over 3-5 minutes*	0.5-1	3-5	0.5-1	Respiratory depression, apnea, muscular rigidity, bradycardia, hypotension, hypertension, dizziness, blurred vision, nausea, laryngospasm, diaphoresis, convulsions, allergic reaction, suppression of cough reflex	Naloxone (Narcan) ***see next page for dosing
		PO: 10-15 mcg/kg/dose up to total dose of 400mcg/dose (via Oralet)*		20-30	1-3		
Hydromorphone (Dilaudid®)	IV: 0.5-2.0 mg over 2-3 minutes Q 15-20 minutes*	IV: 0.015 mg/kg given over 2-3 minutes* ** Intermittent doses can only be administered in PACU, OR, or ED**	5	30	3-5	Respiratory depression, apnea, hypotension, peripheral vasodilation, dizziness, lightheadedness, drowsiness, tachycardia, bradycardia, headache, nervousness, nausea, vomiting	Naloxone (Narcan) ***see next page for dosing
Meperidine (Demerol®)	IV: 10-20 mg over 2-3 minutes Q 5-15 minutes*	IV: 1-1.5 mg/kg/dose over 2-3 minutes*	5	20	2-4	Respiratory depression, apnea, hypotension, hypersensitivity reaction, peripheral circulatory collapse, cardiac arrest, dizziness, lightheadedness, nausea, vomiting, diaphoresis, tachycardia, bradycardia, weakness	Naloxone (Narcan) ***see next page for dosing
Morphine	IV: 1-5 mg over 2-3 minutes Q 15-30 minutes*	IV: 0.05-0.1 mg/kg over 2-3 minutes*	5	20	3-4	Respiratory depression, apnea, hypotension, nausea, vomiting, burning at injection site, headache, lightheadedness, dizziness, pruritis	Naloxone (Narcan) *see next page for dosing

Medication	Adult Dosing	Pediatric Dosing (for patients ≥ 14 y/o or ≥ 50 kg, use adult dosing)	Onset of Effects (minutes)	Peak Effect (minutes)	Duration Of Effect (hr)	Potential Adverse Reactions	Reversal Agent
ANESTHETIC AGENTS FOR DEEP SEDATION - May only be ordered by and MUST BE ADMINISTERED by Physicians in Anesthesiology, Emergency Medicine, Pulmonology, and Critical Care who have been certified in deep sedation.							
Ketamine (Ketalar®)	IV: 0.5-2 mg/kg over 1 min repeated Q 5-10 minutes	IV: 0.5 – 2 mg/kg. Rate should not exceed 0.5 mg/kg minute. Maximum: 2 mg/kg	1-2	2-3	15-30 minutes	Hypertension, tachycardia, increased intracranial pressure, visual hallucinations, tonic-clonic movements, tremors, respiratory depression, laryngospasm, apnea, vomiting. Hyper-salivation ** *Should be used in conjunction with atropine 0.01mg/kg or glycopyrrolate 5-10 mcg/kg to control secretions*	None available
	IM: 3-4 mg/kg	IM: 3-6 mg/kg	2-5	5-10	15-45 minutes		
Propofol (Diprivan®)	IV: 0.5-0.75 mg/kg over 3-5 minutes followed by 0.5 mg/kg over 1-3 minutes every 5 minutes	Not recommended for pediatric patients ≤50kg; pediatric patients ≥ 50kg: use adult dosing guideline.	0.5	1.5	5-10 minutes	Respiratory depression (especially in conjunction with narcotics), hypotension, cardiac depression, cardiac arrhythmias, pain on injection, allergies Hypersensitivity to egg products/soy products	None available
Etomidate (Amidate®)	IV: 0.2-0.3 mg/kg over 30-60 seconds, repeat 0.05 mg/kg every 5 minute	IV: 0.2-0.3 mg/kg over 30 – 60 seconds in severe shock, especially in cardiac patients *(in children greater than 10 years old)	5-30 seconds Peds: 30 – 60 seconds	1-2	2-10 minutes	Hypoxemia, pain on injection, nausea/vomiting, myoclonus Note: does not alter hemodynamics	None available
REVERSAL AGENTS							
Flumazenil (Romazicon®)	IV: 0.1mg IVP over 30 seconds repeated Q1-2 minutes up to 3 mg in 1 hour	IV: 0.01 mg/kg (max dose 0.2 mg) IVP then 0.005-0.01 mg/kg IVP Q1 min up to 3 mg in 1 hr.	1-3	6-10	40-80 minutes	Nausea, vomiting, seizures, dizziness, injection site pain, agitation, headache, sweating, flushing, fatigue ***Should not be administered to patients receiving chronic benzodiazepines as it will induce a withdrawal syndrome*	--
Naloxone (Narcan®)	IV: 0.04- 0.1 mg IVP every 2-3 minutes	IV: 0.1 mg/kg IVP every 2-3 minutes	1-2	5-15	30-90 minutes	Excitement, hypotension, hypertension, ventricular tachycardia, ventricular fibrillation, pulmonary edema, seizures, nausea, tremor *Administration Guidelines: 0.4 mg Narcan diluted in 9 mL* NS *administered at a rate of 0.5 mL over 2 mintes, dose is titrated based on patient response.*	--

Approved by: Moderate Sedation Committee: 02/09;
P&T Committee: 02/09;
Revised: 9/03, 10/03, 12/2008, 3/2013, 10/2015, 12/2016

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