



Procedural Sedation for Adults

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Purpose

The purpose of this course is to review the fundamental concepts associated with the safe administration of procedural sedation and analgesia.

This course will review the regulation and oversight of sedation, pre-sedation assessment requirements, safe medication use, complications of sedation, and the monitoring and discharge criteria post-procedural sedation.

Note!

- Procedural sedation is known as moderate sedation and was previously known as conscious sedation.

Learning Objectives

After successful completion of this course, you will be able to:

1. Differentiate minimal, moderate sedation/analgesia or procedural sedation, deep sedation, and anesthesia.
2. Describe the desired outcomes of moderate sedation.
3. Describe appropriate pre-procedural, intra-procedural, and post-procedural management of patients receiving procedural sedation.
4. State recommended dosage, rate of administration, onset and duration of action, and adverse effects of sedation agents.
5. Describe the recommended dosage, rate of administration, onset, and duration of action of reversal agents for opiates and benzodiazepines.
6. Demonstrate techniques to maintain a patent airway and adequate oxygenation.
7. Identify potential complications related to sedation.
8. List how and what to monitor during the procedure.
9. State the post-procedural monitoring and discharge criteria.

Introduction

Moderate sedation is a high risk nursing activity that has become common practice in many healthcare facilities. Due to the nature of procedural sedation, protocols for medication usage, monitoring, and documentation standards have been established.

As you review this course, keep in mind that your facility will also have very specific policies and procedures that indicate where and who can perform or assist with procedural sedation. Become familiar with these guidelines and do not assist with procedural sedation unless you have received appropriate training and yearly competency in the delivery of care for patients that undergo procedural sedation.

Why Do We Sedate Patients?

Sedation will decrease anxiety, pain, and discomfort. Sometimes amnesia is possible, minimizing the risk as compared to general anesthesia, and also allows for a more rapid recovery.

The benefit of using moderate sedation is that it can be used in a variety of healthcare settings including, but not limited to, outpatients clinics, inpatient procedural areas, emergency rooms, and operating rooms (Society of Gastroenterology Nurses and Associates [SCNA], 2013).

Why Do We Use Procedural Sedation?

Very commonly, moderate sedation is used in conjunction with many procedures in the GI suite, pulmonary lab, ICUs, EDs, and other clinical locations. According to The Joint Commission (2008), patients covered by sedation policies include:

- Situations that do not require the services of a qualified anesthesia provider (generally relatively non-invasive procedures on healthy patients).
- All non-intubated patients receiving moderate sedation for diagnostic and therapeutic procedures.

Test Yourself

A 24 year old patient is admitted to the emergency room with a fracture that needs dislocation reduction. This patient needs to wait to go to the operating room for this procedure.

- A. True
- B. False

The correct answer is false. With trained physicians, nursing, and respiratory staff, the dislocation reduction can be performed with moderate sedation in the emergency room.

Review of Procedural Sedation

This next section will review the levels of sedation. It is important that healthcare professionals learn and understand that the administration of varying types of procedural sedation and analgesia will result in different levels of sedation.

The response to and effects of procedural sedation medications is directly related to the type of drug administered, the dose, and the individual's own response. The healthcare professional is responsible for being able to recognize the different levels of sedation, ensure patient safety, and assist with patient recovery from sedation.

Dynamic Sedation Level

With the administration of procedural sedation, the patient's level of sedation may be dynamic. Patients may suddenly or gradually experience an increased or decreased awareness that may or may not affect their ability to protect their own airway. In some situations, patients may move into a deeper level of sedation than intended. The best way to safely manage patients undergoing procedural sedation is to be knowledgeable about the types of medications that are administered for procedural sedation, the usual response to the medications, and any potential side effects related to the medication.

Additionally, both The Joint Commission (2008) and the American Society of Anesthesiologists (ASA)(2013) recommend that persons administering or monitoring procedural sedation be trained to administer any advance lifesaving measures if the patient slips from moderate sedation to deep sedation.

Levels of Anesthesia

The Joint Commission (2008) defines four levels of anesthesia:

1. Minimal or light sedation (anxiolytics)
2. Moderate sedation/analgesia or procedural sedation and analgesia (PSA)
3. Deep sedation/analgesia
4. General anesthesia

(Patient Safety Center of Inquiry [PSCI], 2011)

Minimal or Light Sedation (Anxiolytics)

This is defined as a “**trancelike**” cataleptic state. There is profound analgesia and amnesia. There is retention of protective airway reflexes, spontaneous respirations, and cardiopulmonary stability.

Definition of Moderate Sedation

A minimally depressed level of consciousness induced by the administration of pharmacologic agents in which a patient retains the ability to independently and continuously maintain an open airway and a regular breathing pattern, and to respond appropriately and rationally to physical stimulation and verbal commands. Conscious sedation may be induced by parenteral or oral medications or a combination thereof. Drugs, dosages, and techniques utilized are not intended to produce loss of consciousness.

(SCNA, 2013)

Did You Know?

When sedating a patient for a procedure, it is called procedural sedation and analgesia (PSA). The goal is to place a patient in a moderate sedation and analgesia level. This was previously known as conscious sedation (Frank, 2013).

Goals or Objectives of Procedural Sedation

When sedating a patient for a procedure, the primary desired outcome is a patient who is sedate and cooperative.

The other goals include:

- Amnesia-absence of awareness or recall is desired but not required, analgesia-reduced pain perception, and anxiolysis—decreased anxiety.
- Patient will likely experience slurred speech, nystagmus (indicates desired effect), but at no time should patient lose consciousness.

(Frank, 2013)

Levels of Anesthesia

Clinical Characteristics of Moderate Sedation

- Maintenance of protective reflexes (e.g., ability to control secretions, avoid aspiration, and breathe without assistance)
- Independent and continuous maintenance of a patent airway
- Appropriate response to physical stimulation and/or verbal command
- Easy arousal and responds to verbal or light tactile stimulation
- Cardiovascular status is usually maintained

(Frank, 2013)

Deep Sedation/Analgesia

Deep sedation/analgesia is a drug-induced depression of consciousness during which the patient cannot be easily aroused, but responds purposefully following repeated or painful stimulation.

Independent ventilatory function may be impaired. The patient may require assistance to maintain a patent airway. Spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained.

(Frank, 2013)

Clinical Characteristics of Deep Sedation

- Not easily aroused
- May require repeated or painful stimulation to elicit a response
- Partial or complete loss of protective reflexes
- Loss of ability to maintain a patent airway
- Cardiovascular function usually maintained

(Frank, 2013)

General Anesthesia

A drug-induced loss of consciousness during which the patient is not arousable, even to painful stimuli. The ability to maintain independent ventilatory function is often impaired. Assistance is often required in maintaining a patent airway. Positive pressure ventilation may be required due to depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function may be impaired.

(Frank, 2013)

Levels of Sedation: Modified Ramsay Scale

The goal of moderate sedation is to have the patient at level 2 or 3 on the sedation scale where the patient is tranquil and able to respond to commands.

Observation	Score
Patient is anxious, agitated, or restless	1
Patient is cooperative, oriented, and tranquil	2
Patient responds to commands only	3
Patient responds to gently shaking	4
Patient responds to noxious stimulus	5
Patient has no response to firm nail bed pressure or other noxious stimuli	6

Review of the Levels of Sedation

1. No sedation
2. Light Sedation
3. Moderate Sedation
4. Deep Sedation
5. General Anesthesia

(American Society of Anesthesiologists, 2013)

Light Sedation

- Normal respirations
- Normal eye movement
- Able to communicate
- Decreased level of anxiety
- No memory loss from the medications

Moderate Sedation

- Responds to directions either by a verbal stimulus or verbal stimulus plus minimal touch
- Maintains an intact airway and breathes normally
- Cardiovascular system is generally not affected

Deep Sedation

- Not easily awakened
- Repeated painful stimulation may produce a minimal response
- Ventilations may be impaired and interventions must be taken to maintain an adequate airway; positive pressure ventilation is often needed
- Cardiovascular status is usually unaffected

General Anesthesia

- Assistance to maintain the airway
- Ventilation is impaired
- Unarousable to painful stimuli
- Cardiovascular status may be impaired

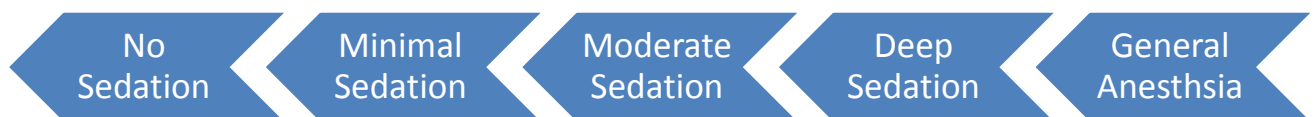
Clinical Characteristics of Different Levels of Sedation

	Minimal Sedation (Anxiolysis)	Moderate Sedation & Analgesia	Deep Sedation & Analgesia	General Anesthesia
Responsiveness	Normal response to verbal stimulation	Purposeful response to verbal or tactile stimulation	Purposeful response following repeated or painful stimulation	Unarousable even with painful stimuli
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous Ventilation	Unaffected	Adequate	May be adequate	Frequently inadequate
Cardiovascular Function	Unaffected	Usually maintained	Usually maintained	May be impaired

Levels of Sedation

The non-anesthesia provider should be knowledgeable about the differences in the sedation levels and be able to determine when the patient is approaching deep sedation or general sedation. It is not always possible to predict a patient's response to sedation. Practitioners should be able to rescue a patient who moves to an unintended level of sedation.

The Sedation Continuum:



Test Yourself

The sedation level of a patient who responds only to painful stimulation but displays adequate spontaneous ventilation is best described as:

- A. Moderate sedation
- B. Deep sedation
- C. General anesthesia

The correct answer is B, deep sedation.

Regulation and Oversight of Sedation

The requirements for safe administration of medications and safe practice of procedural sedation are defined by The Joint Commission, the Board of Registration in Medicine, individual states, and individual hospital policies. Practitioners should review and understand their scope of practice with procedural sedation as they will need to follow the policy for their patient safety and to ensure regulatory compliance.

From the nursing standards, states will have their own Nurse Practice Act. This act will provide regulations and guidelines on the role of the RN during procedural sedation.

(Frank, 2013)

Joint Commission Standards

According to The Joint Commission (2008), the following are required for the administration of procedural sedation and will be reviewed in detail:

1. Procedural sedation is provided by qualified individuals. Qualified individuals have competency-based education, training, and experience. Sufficient numbers of qualified personnel are present in addition to the licensed independent practitioner performing the procedure.
2. A pre-sedation or pre-anesthesia assessment is performed for each patient before beginning procedural sedation induction.
3. Each patient's procedural sedation care is planned.
4. The patient's physiological status is monitored during sedation.
5. Discharge standards are followed.

Procedural Sedation Provided by Qualified Individuals

The first standard set by The Joint Commission (2008) is the requirement of trained healthcare providers during procedural sedation. During procedural sedation, someone needs to be the operator and someone needs to be the monitor. With some procedures, such as a bronchoscopy, a respiratory therapist may be required.

Operator	Monitor
Generally the MD	Generally the RN
Trained in the safe administration and monitoring of sedating medication and "rescue" training	Trained in the safe administration and monitoring of sedating medications and "rescue" training; RN able to recognize complications of moderate sedation and able to establish a patent airway and positive pressure ventilation (bag valve mask)
Healthcare provider with prescriptive authority determines drug, dosage, and route of administration (MD, NP, PA)	The monitor must have no other responsibilities and cannot be the circulating nurse

Test Yourself

Rescue training is the ability to recognize and support a compromised airway should over-sedation occur.

- A. True
- B. False

The correct answer is true.

Pre-Sedation/Pre-Anesthesia Assessment

The Joint Commission's (2008) second requirement is a pre-sedation or pre-anesthesia assessment for each patient before beginning procedural sedation induction. It is performed for each patient before beginning procedural sedation induction. This includes a standard history and physical. It must also include:

- A sedation plan and orders.
- Informed consent for the sedation: Sedation and its options and risks are discussed with the patient and family.
- A functioning IV.
- An escort home.
- Appropriate equipment for care and resuscitation is available. Appropriate patient selection and pre-sedation assessment is completed.
- Proof that the patient is NPO at least two hours for clear liquids and six hours for solids. This is hospital-specific so refer to the individual hospital's policy and procedure.

(PCSI, 2012)

Pre-Sedation/Pre-Anesthesia Assessment: Equipment and Supplies

Blood pressure device	Stethoscope	Pulse oximetry	Oxygen	Oxygen delivery devices	EtCO ₂ monitoring (hospital policy-specific)
Bag and mask device	Telephone or call device immediately available	Code cart agents*	Suction device	Oral and nasal airways	Intubation supplies
Suction source	IV access	IV solution (500mL NS or LR)	Cardiac monitor and electrodes	Defibrillator	Reversal agents**

*According to hospital policy, some institutions require the RN to have the code cart at the bedside.

**According to hospital policy, some institutions require the RN to have these drugs at bedside.

(Frank, 2013)

Procedural Sedation Plan

The third regulatory requirement set by The Joint Commission (2008) is that each procedural sedation care is planned.

During the pre-sedation assessment, a plan is developed from the healthcare provider. Since deep sedation and anesthesia carry a high level of risk, the administration of procedural sedation needs to be carefully planned. The plan should include proper identification of significant co-morbidities that might influence the response to sedation and orders for appropriate medications (The Joint Commission, 2008).

Physiological Status Monitoring During Sedation Administration

The fourth requirement from The Joint Commission (2008) is physiological status is monitored during sedation or anesthesia administration.

- Most policies require the documentation of vital signs (blood pressure, pulse, respiratory rate, oxygen saturation, pain score, and sedation score) every five minutes.
- Some hospitals require ETCO₂ monitoring.
- Standard sedation forms should be available in the healthcare setting.

Always refer to the individual hospital or clinic for their policy on procedural sedation.

Discharge Standards

The fifth and final regulatory requirement set by The Joint Commission (2008) is patient's post-procedure status, which is assessed on admission to and before discharge from the post-sedation or post-anesthesia recovery area. A qualified licensed independent practitioner must discharge the patient from the post-sedation recovery area. Refer to hospital policy on the standard discharge criteria.

In Summary of Regulatory Requirements

The Joint Commission sets the standards that hospitals must meet. These regulatory requirements help to keep our patients safe.

The next section will go over the procedural sedation in more detail.

Pre-Sedation Assessment Requirements

As previously reviewed, it is The Joint Commission (2008) standard to complete the pre-sedation assessment. This section will review the components of the pre-sedation assessment in more detail including:

- History and physical
- Specific pre-sedation information
- Important co-existing diseases
- American Society of Anesthesiologists (ASA) status
- Airway exam

History and Physical

The healthcare provider ordering the sedation must complete a history and physical on the patient. This assessment criterion may include the patient's medical history, medications, allergies, NPO status, and the history examination (AORN, 2008).

History and Physical

Past Medical History

- Height, weight, allergies, medications
- History of receiving sedation or anesthetics, any problems noted
- Indication for procedure
- Use of tobacco, ETOH, other drugs/OTC/alternative medications
- Significant co-morbidities:
 - Severity, stability, recent changes in condition
 - Relative contraindications to procedural sedation (may vary slightly for urgent vs. elective procedures)
 - Severe, untreated hypertension
 - Hemodynamic instability
 - Decompensated heart failure
 - Unstable angina
 - Acute dyspnea
 - Recent PO intake
 - Significant dysrhythmia or electrolyte disturbance
 - Documented or high suspicion of intoxication from prescribed medications, legal or illicit substance use, or high risk of withdrawal syndrome
 - Altered mental status or other inability to cooperate during procedure

(PSCI, 2011)

History and Physical

Focused Physical Exam

- Baseline vital signs (BP, HR, RR, SpO₂, height, weight, BMI)
- Heart, lungs, mental status, body habitus
- Airway exam
- Physical restrictions to positioning required for procedure
- Other physical findings as relevant to intended procedure

Pre-Procedure Testing/Consultations and Documentation

- As indicated by history and physical exam
- No “routine” laboratory testing indicated (rarely changes management and does not improve outcome)
- Consent, evaluation notes

Summary: ASA Classification

- This method of categorizing a patient’s physical status prior to surgery is a useful and simple method to summarize the patient’s condition.
- When making this assessment, one should be considering risk for procedural sedation and intended procedure (rather than risk for anesthesia and surgery).
- Severely ill and medically-compromised patients will almost always be ASA Class III or IV.

(PSCI, 2011)

Specific Pre-Sedation Information

- NPO status: Confirm with the patient the NPO status.
 - Solids: Six hours
 - Clear liquids: Two hours
- Sedation plan and orders: Discussion with patient, licensed healthcare provider, and RN administering the medication. This plan should include the type and amount of medication(s). This sedation plan should be documented (AORN, 2008).
- Informed consent for sedation: Licensed healthcare provider doing the procedure needs to obtain consent for the procedure and procedural sedation.
- Functioning IV: The RN administering the medication should check the IV.
- Post-procedure plan: Make sure the patient has a ride home. Patients are not allowed to drive themselves so an escort home needs to be confirmed.

Informed Consent

- Informed consent will need to be obtained by all patients undergoing procedural sedation
- Consent will be obtained by the physician
- Options for care will be discussed
- Explanation of risks involved in administration of procedural sedation

Test Yourself

The licensed healthcare provider should:

- A. Complete a pre-procedural history and physical examination
- B. Perform a pre-sedation assessment
- C. Obtain sedation consent
- D. All of the above

All of the above are correct.

ASA Physical Status Classification

The Physical Status Classification by the ASA is used for examination and documentation, as required by many hospitals. This should be done as part of the pre-sedation requirements.

I	Normal healthy patient
II	Patient with mild systemic disease without significant impact on daily activity and small risk of impact on anesthesia or surgery (Examples: Controlled hypertension, mild asthma, AODM, stable (mild) CAD)
III	Patient with significant or severe systemic disease that affects daily activities and will likely have an effect on anesthesia or surgery (Examples: CAD, COPD, compensated CHF)
IV	Patient with severe systemic disease that is a constant threat to life and requires intensive therapy and will have a major impact on anesthesia or surgery (Examples: Unstable CAD, end-stage renal failure, severe CHF/COPD, long-standing IDDM with end-organ involvement)
V	Moribund patient who is not expected to survive 24 hours with or without surgery (Examples: Ruptured AAA, gunshot wound, severe sepsis)
VI	Brain dead organ donor

*Adding E indicates emergency procedure

(American Society of Anesthesiologists, 2013)

Test Yourself

The licensed healthcare professional does not have to perform the ASA classification until the induction of medications.

The correct answer is false. The ASA classification must be done by the licensed healthcare professional in the pre-assessment.

ASA Classification and Appropriateness for Procedural Sedation

ASA Classification	Appropriateness for Moderate Sedation
ASA I or ASA II	Always appropriate for RN administered procedural sedation
ASA III	Assessed on an individual basis and may be appropriate
ASA IV or ASA V	<i>NOT</i> appropriate for procedural sedation; in critical care environments, these patients may have procedural sedation at the discretion of the multidisciplinary team

Test Yourself

The ASA does not allow procedural sedation to be done with emergent, life-saving procedures.

- A. True
- B. False

The correct answer is false.

Airway Assessment

The final section for the pre-sedation assessment is the airway assessment. Respiratory compromise is the most common complication of sedation. The ability to rescue from over-sedation (by mask ventilation or intubation) is influenced by patient's anatomy. An understanding of the anatomic variations that could increase the difficulty with rescue will help to change practice decrease the chance of over-sedation.

Airway Exam

When performing an airway examination, the healthcare professional should examine the following components of the pre-operative airway to ensure that there are no red flags:

Airway Component	Red Flag/Area of Concern
Length of upper incisors	Relatively long incisors
Jaw alignment/jaw closure at rest	Prominent overbite/underbite
Uvula visibility	Uvula not visible when patient protrudes tongue in sitting position
Shape of palate	Palate highly arched or very narrow
Length and thickness of neck	Short/thick neck
Range of motion	Limited – unable to extend neck or touch the top of the chin to the chest

(Modified from Anesthesiology, 2003)

Did You Know?

Did you know the risk of the difficult airway and why it is important to assess prior to initiation of procedural sedation?

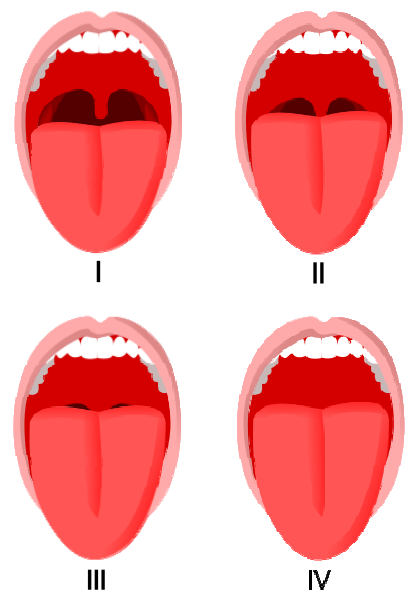
A combination of impossible BVM ventilation and impossible intubation will lead to hypoxia... then brain injury... then death.

Mallampati Class

The licensed healthcare provider will need to note the Mallampati Class on their history and physical.

I	Can see Tonsillar pillars
II	Can see ½ of Tonsillar pillars and most of the uvula
III	Can see only the base on the uvula
IV	Cannot see any of the soft palate

(Mallampari, et al., 1985)



Mallampati score. Image courtesy of Wikipedia.org, accessed July 10, 2013.
http://en.wikipedia.org/wiki/Mallampati_score.

Other Risk Factors for Difficult Mast Airway

Three common risk factors for a maintaining an airway with the BVM are:

1. Beard: A beard causes an air leak and may hide a receding chin and thus difficult intubation.
2. Edentulous (having no teeth): Difficult fit and air leak.
3. Sleep apnea or large tongue: Oropharyngeal obstruction. May need to be treated with oral/nasal airway or LMA.

Co-Existing Diseases and Sedation

Patients respond to sedation differently. The literature shows that the health status of the patient will change their response to medications given during procedural sedation. It is imperative for all healthcare professionals to understand how diseases can affect the use of sedatives. This section will review the significance of specific co-existing diseases.

Risk Factors and Diseases that May Affect the Response to Sedatives

The following section will review a variety of risk factors and diseases that may affect the use of sedatives.

- Age
- Hypertension
- Congestive heart failure
- Aortic stenosis
- Pulmonary disease
- Sleep apnea/obesity
- Dementia
- Pregnancy
- Chronic pain
- Specific drugs with sedation implications

Age

The very young and the very old are at risk when giving procedural sedation because there is increased sensitivity to sedatives.

The elderly have a delayed recovery and paradoxical agitation is common. These patients may need to be reversed after the procedure is completed.

When giving sedation medication to the elderly or children, the medication doses should be small and the RN should push the medication slowly.

Hypertension

When a patient has hypertension, there is a decreased intravascular volume. The blood pressure is often dependent on the arterial and venous tone. Patients with hypertension require a higher BP to maintain normal organ perfusion.

How does hypertension affect the use of sedatives?

There will be a decreased initial volume of distribution. There can be more hypotension with vasodilation especially with sedation drug combinations of fentanyl and midazolam.

Congestive Heart Failure

When a patient has a history of heart failure, the patient may have a decreased systolic function, increased SVR slow circulatory time, and a decreased response to catecholamines.

How does this affect the use of sedatives?

With CHF patients, give the doses of sedation slowly since these patients may become hypotensive with sedatives. Also, orthopnea may limit positioning for certain procedures.

Risk Factors and Diseases that May Effect the Response to Sedatives

Aortic Stenosis

Patients with aortic stenosis have limited ability to increase cardiac output and have increased LV end-diastolic pressure thereby needing increased preload and their cardiac perfusion pressure is dependent on diastolic blood pressure.

How does this affect the use of sedatives?

Venodilation or vasodilation may lead to vicious spiral of hypotension, cardiac ischemia, more hypotension, and more ischemia. If these patients become hypotensive, they will need to be aggressively treated with pressers such as phenylephrine. With patients with severe aortic stenosis, consider anesthesia involvement since their ASA physical status classification will put them at a level III.

Pulmonary Disease

With pulmonary disease, its physiology depends on the specific disease. With most pulmonary diseases, there is a decreased alveolar ventilation, rapid CO₂ retention, and hypoxia.

How does this affect the use of sedatives?

These patients are at an increased risk of a rapid desaturation. The sedatives may decrease respiratory rate which will further increased their CO₂ (hypercarbia). The hypercarbia may lead to acidosis and arrhythmia.

Sleep Apnea/Obesity

Patients with obstructive sleep apnea (OSA) or obesity have a decreased functional residual capacity which makes them prone to rapid hypoxia. These patients are sometimes difficult to provide BVM ventilation and to intubate. These patients are a high risk population to provide procedural sedation because they have increased sensitivity to sedatives, higher incidence of apnea or obstruction during sedation, and have rapid desaturation during even brief periods of apnea.

How does this affect the use of sedatives?

Patients with OSA and/or obesity may require high FiO₂ during the procedure. The licensed healthcare provider should dose the sedation medications based on ideal body weight. The RN should give sedation slowly and cautiously as rescue could be difficult (Villegas, 2003).

Dementia

Patients with dementia are also a risk factor when giving procedural sedation. This population has an increased sensitivity to sedatives and may have a delayed recovery. Due to their disease, paradoxical agitation is common.

How does this affect the use of sedatives?

Give all medications in lower doses. When the RN is administering the medication, she or he should push the medications slowly.

Risk Factors and Diseases that May Affect the Response to Sedatives

Pregnancy

When a woman is pregnant, there is additional concern on the utero-placental circulation and the fetal well-being as well. Aortocaval compression happens at 20 weeks gestation and is a common problem for pregnant woman. This is when a woman experiences some degree of inferior vena cava compression by the uterus; she may become hypotensive, bradycardic, and/or nauseous. At term, physiological consequences and symptoms vary due to alternative routes of venous return, such as the epidural venous plexus.

How does this affect the use of sedatives?

When a pregnant woman needs procedural sedation, it should be a team approach with additional staff members from OB, NICU, and anesthesia. The baby should be monitored with uterine and fetal monitors during and after the procedure. Some research suggest to avoid benzodiazepines in first trimester.

Chronic Pain

A patient with chronic pain is a risk factor to giving procedural sedation. This is due to the tolerance to sedatives as well as psychosocial issues.

How does this affect the use of sedatives?

Chronic pain should be carefully reviewed when constructing the pre-procedure plan as these patients may require a high narcotic dose. With patients on baseline opioids, naloxone (Narcan) is often contraindicated.

Specific Drugs with Sedation Implications

When a healthcare provider is reviewing the patient's home medications or hospital medications, there are specific medications that should be flagged since several medications associated with co-existing disease can have implications for sedation. They are:

- **Cytochrome P450 inhibitors:** Cimetidine, erythromycin, diltiazem, verapamil, ketoconazole, itraconazole. These drugs decrease the metabolism of benzodiazepines; thereby, they can have prolonged effect.
- **Narcotics:** Patients on narcotics have a synergistic central nervous system and respiratory depression. These patients are at risk for further hypotension.
- **Protease inhibitors:** Indinavir, Ritonavir, Saquinavir, Nelfinavir, Tipranavir, Amprenavir. Sedation medications may have a prolonged and increased effect due to decreased metabolism.
- **MAO inhibitors:** These patients are at risk for a hypertensive crisis with meperidine (Demerol). They can have an exaggerated response with indirect vasopressors.
- **Anti-hypertensives:** Patient taking these medications may have an exaggerated hypotension with sedatives, especially with calcium channel blockers, β -blockers, and Clonidine.

Nursing Implications of Pre-Procedure Assessment Findings

If assessment shows:	Nursing consideration is:
Patient smokes	Prepare for complications associated with bronchospasm, cough, increased airway irritability
Patient is a substance abuser (alcohol, prescriptive, or illicit drugs)	Increased requirements of sedatives or analgesics may be needed
Hepatic or renal problems (impaired drug metabolism/excretion)	Reduced amount of medication may be required
Prior adverse outcome with use of sedation or general anesthesia	Prepare for complications
Cardiovascular or pulmonary disease	Reduced amount of medication to reduce risk of respiratory depression

Ask about:

Seizure History

- Long-term benzodiazepines are often used to treat seizures.
- If the patient has been taking these agents, benzodiazepines would be contraindicated for the procedure because the reversal agent, flumazenil, may precipitate seizures if used.

Cardiovascular Problems

- Assess for cardiovascular problems that may occur during the procedure.

Respiratory Problems

- Many drugs used to induce moderate sedation cause respiratory depression. Those individuals that are already compromised in this area may be at greater risk for complications. This includes patients with COPD, emphysema, and asthma.
- Patients with COPD, chronic bronchitis, and emphysema should have oxygen carefully delivered to prevent respiratory depression from over delivery of oxygen. A Venturi mask can accomplish this due to its precise titration ability.
- Asthmatic patients should have their medications they normally use in an asthma attack immediately available during the procedure.
- If a patient has a history of cardiovascular or pulmonary problems, it may be beneficial to have someone from anesthesia involved in the pre-procedural assessment.

Liver Disease

- Many medications used in moderate sedation are metabolized by the liver; therefore, it is useful to evaluate any history of liver disease.
- Patients with liver disease may have deeper levels of sedation due to this decreased capacity for the liver to metabolize these drugs.

Nursing Implications of Pre-Procedure Assessment Findings

Renal Disease

- Patients with renal disease may excrete specific drugs more slowly than patients with normal, healthy kidneys.
- Specifically, benzodiazepines and opioids should be used with caution in these patients.

Thyroid Disorders

- Thyroid crisis may be precipitated when certain medications such as atropine or analgesics with epinephrine are administered.
- Patients taking hypothyroidism medications may metabolize either more slowly or quickly.

Substance Abuse

- Patients with a history of substance abuse may not reach moderate sedation via ordinary means.
- An anesthesiologist should be available for back-up induction in certain cases.

Allergies

- Assess for allergies and attempt to identify true allergies.
- Often patients say they are allergic to certain medications when in fact they only experience unwanted side effects when they are taken such as nausea, vomiting, or itching.

Current Medications and Herbal Remedies

- Certain cardiovascular medications, diuretics, insulin, hypoglycemic agents, and MAO inhibitors place patients at greater risk.
- The physician or advanced practice nurse should have a thorough knowledge of your patient's medications and which ones are most likely to increase the risk of complications during moderate sedation.

Fasting Status

- Clear liquids can be consumed up to two hours prior to moderate sedation and a light meal up to six hours prior to moderate sedation (ASA, 2002).
- Failure to adhere to these guidelines may place your patient at risk for aspiration.

Presence of Piercing

- Piercings that are not removed prior to moderate sedation may be a potential hazard if the patient becomes confused or if a more secure airway is needed.
- A piercing may interfere if it is close to the procedural site.

Anesthesia History

- Review any anesthesia history or past experience with anesthetic drugs.

Roles of the Providers

When sedating a patient, there is a minimum of two people involved; the physician performing the procedure and credentialed in procedural sedation and the RN. If it is a respiratory procedure, a respiratory therapist will attend. A brief review of the roles of MD and RN will be discussed.

Physician: Criteria and Role

- The physician is credentialed for procedural sedation through each facility's medical staff office.
- MD is currently BLS and ACLS certified (depends on the state and facility).
- Performs the pre-procedure assessment.
- MD writes the order for sedation.
- Performs the treatment or procedure.
- Demonstrates understanding of the pharmacology and side effects of medications.
- Trained in basic monitoring techniques and basic airway management.
- Make sure there are means for notifying additional support staff services such as respiratory therapy and "Code Blues" if needed.

Nurse: Criteria and Role

- Competent in airway management.
- Current BLS and ACLS certification (depends on the state and facility).
- Competent in recognizing and administering treatment for cardiac arrhythmias.
- Trained in the administration and titration of medications used for procedural sedation. Most hospitals have an annual competency (Thompson, Andrews, & Christ-Libertin, 2012).
- The nurse monitoring the care of the patient shall not have other significant responsibilities that would leave the patient unattended or compromise continuous monitoring.
- Demonstrate understanding of the pharmacology and side effects of medications.
- Trained in basic monitoring techniques and basic airway management.
- Make sure there are means for notifying additional support staff services such as respiratory therapy and "Code Blues" if needed.

Duration of Responsibility

One of the two defined staff members will be available to the patient from the time of administration of medications until recovery is complete or until the patient is transferred to personnel performing recovery care.

Test Yourself

A staff nurse in the ICU has two patients, a patient with a GI bleed getting sedation for a colonoscopy and an s/p (status post) trauma patient requiring a blood transfusion. The nurse monitoring the care of the patient getting sedation will be able to leave the patient for a short period of time to check on the other patient's blood transfusion.

- A. True
- B. False

The correct answer is false. The nurse monitoring the care of the patient shall not have other significant responsibilities that would leave the patient unattended or compromise continuous monitoring.

Safe Medication Use

To provide safe delivery of medication, all personnel need to understand the pharmacology, dosages, and side effects of sedation medication. They also need to know the pharmacology, dosages, and side effects of reversal agents. This section will review these medications.

What Are the Goals?

There are goals when healthcare providers give medications for procedural sedation. These goals are safety, a cooperative patient, analgesia, amnesia, anxiolytics, stable hemodynamics, and rapid recovery.

Did You Know?

Knowing how to give medications is as important as knowing what to give!

The Basics of Administering Sedation Medications

Welliver (2010) states the importance for practitioners to understand each drug's ADME. ADME stands for absorption/administration, distribution/dosage, metabolism/mechanism of action, and elimination/effect. So before giving any medications, the RN should review that information along with the basics:

1. The patient has an IV that is flushed and patent.
2. The sedation plan is discussed with the patient to give the patient some control.
3. There is understanding of the procedure so he or she can anticipate painful portions and dose medications accordingly.
4. There is understanding of the medications so he or she can administer the right drug. For example, give narcotics for pain, sedatives for anxiety, and anti-emetic for nausea.
5. The RN is monitoring the effects of the medications with the sedation scale, speech, respiratory rate, and O₂ saturation.

Did You Know?

The key to safe, effective sedation is the administration of drugs in a manner that allows for the peak effect to take affect before administering additional doses. This means the main constraint is time and sedation should never be rushed (Welliver, 2010).

Essential Medications

The three medications needed in conjunction with sedatives are:

- IV fluids: The MD will order either lactated ringers or 0.9% normal saline. Fluids should be running at a rate to ensure there is delivery of medications. The RN will need to monitor the total volume infused.
- Oxygen: The patient will need to have oxygen delivered during procedural sedation. Take caution in the COPD patient.
- Local anesthetics: Local anesthetics will be discussed in further detail.

Local Anesthetics

Sedation is only adjunct to local anesthetics. The patient will need to be numbed if the procedure requires it. The RN must know toxic doses. Early symptoms of toxicity include: tinnitus, peri-oral numbness, and metallic taste. Hypotension from vasodilation occurs at sub-toxic doses.

A Review of Common Anesthetics:

Lidocaine

- Maximum dose of Lidocaine without epinephrine: 3-5 mg/kg; not to exceed 300 mg total dose
- Maximum dose of Lidocaine with epinephrine: 5-7 mg/kg

(Medscape Drug Reference, 2013)

Bupivacaine

- Max dose: 2.5 mg/kg
- More cardio-toxic than lidocaine
- ~1 cc/kg of 0.25% lidocaine
- Without epinephrine: 2.5mg/kg; not to exceed 175 mg total dose
- With epinephrine: Not to exceed 225 mg total dose

(Medscape Drug Reference, 2013)

Commonly Used Sedation Medications

The following types of medications will be reviewed:

- NMDA receptor antagonist
- Benzodiazepines
- Narcotics
- Hypnotic/sedative
- Reversal agents

Medications *Generally* Associated with Certain Levels of Sedation

- Dissociative sedation
 - Ketamine (Ketalar)
- Procedural sedation
 - Midazolam (Versed)
- Fentanyl (Sublimaze) when intent is for sedation
 - Etomidate (Amidate)
- Deep sedation
 - Propofol (Diprivan) (not reviewed in this course)

NMDA Receptor Antagonist: Ketamine (Ketalar)

- Dissociative agent can be used alone or as adjunct to other agents; when combined with other agents purpose is to provide analgesia and sedation
- Onset of action: 30 seconds
- Duration: IV 5-10 minutes
- Analgesia: Provides analgesia
- Contraindications: Hypersensitivity to ketamine or any components of the formulation; conditions in which an increase in BP would be hazardous
- Side effects/adverse reactions: Tachycardia, hypertension, laryngospasm, nausea/vomiting, CNS depression, respiratory depression, hypersalivation, emergence reactions (up 20%)

Emergency Reaction

Emergence reactions include vivid dreams, hallucinations, frank delirium, confusion, irrational behavior, erythema, rash, pain at injection site, tonic clonic movements, increased salivation, and nausea and vomiting.

- Minimize sensory stimulation during and immediately after procedure
- Prophylactic benzodiazepines should be considered for adults to prevent emergent reactions

Ketamine: Nursing Considerations

- Continuous monitoring of all vital signs (BP, RR, HR), including oxygen saturation
- When used for procedures monitor sedation score
- Monitor for emergent reactions
- Ketamine is a controlled substance that must be wasted and discarded like any controlled substances

(Adams & Darvay, 2012; Medscape Drug Reference, 2013)

Benzodiazepines: Midazolam (Versed)

- Onset: 1-2 minutes
- Effect: Clinical effect lasts 30-60 minutes
- Administration: Push over 2 minutes
- Half-life: Elimination half-life 1-4 hours
- Extra: Little accumulation of active metabolites
- Antidote: Romazicon (flumazenil)
- Anxiolytics
- Anti-seizure: Precaution against seizures from local anesthetics
- Muscle relaxation
- Respiratory depression
- Paradoxical excitation especially in children and elderly
- Max dose: Total dose of 5 mg is usually not needed; additional doses are sometimes needed (Example: During lengthy procedures).
- The decision to give additional doses of sedation medications beyond the recommended maximum require an explicit order from the MD; the dosing interval may be shortened at the discretion of the MD (Example: During a very brief procedure)
- 3-4 times as potent as Diazepam

Midazolam Dosing: Healthy Adults <60 Years of Age

1. Start with 0.5-1 mg IV then wait 2 minutes to evaluate
2. Titrate in 0.5-1 mg increments at 2 minute intervals
3. Max Dose: total dose of 5 mg is usually not needed; additional doses are sometimes needed (Example: During lengthy procedures)

Midazolam Dosing: Elderly Adults >60 Years of Age, Debilitated or Chronically Ill

- 0.25 mg: 1 mg IV over 5 minutes then wait 3 minutes to evaluate
- Titrate in 0.5 mg increments at 2-3 minute intervals
- Total dose of 3.5mg is usually not needed

Midazolam: Drug Interactions

- Narcotics: Synergistic CNS and respiratory depression; hypotension
- Protease inhibitors such as Indinavir, Ritonavir, Saquinavir, Nelfinavir, Tipranavir, Amprenavir: Prolonged and increased effects due to decreased metabolism; respiratory depression
- Cytochrome P450 inhibitors: Cimetidine, erythromycin, diltiazem, verapamil, ketoconazole, itraconazole: Prolonged effects

Benzodiazepines: Midazolam (Versed)

Midazolam: Precautions

As previously reviewed, the following patients need careful administration of Midazolam:

- Diseases which slow circulatory time such as CHF, aortic stenosis, and hypovolemia
- Obesity, sleep apnea, airway obstruction
- Age > 60
- Limited pulmonary reserve
- Hepatic failure
- Acute narrow angle glaucoma
- Pregnancy

(Adams & Darvay, 2012; Medscape Drug Reference, 2013)

Benzodiazepines: Diazepam (Valium)

- Rarely used secondary to pain on injection
- Midazolam works faster, shorter duration
- Diazepam dosing:
 - 2.5 - 10 mg IV over 30 second at 5 minute intervals
 - Total dose 0.1 - 0.2 mg/kg
- Onset/peak: 1-5 minutes
- Duration: 15-60 minutes
 - Stays in body for several days

(Adams & Darvay, 2012; Medscape Drug Reference, 2013)

Benzodiazepines: Lorazepam (Ativan)

- Not commonly used because of its long duration
- Onset 1-5 minutes
- Duration is longer than other benzodiazepines if multiple doses given; up to 24 hours
- Usual dose range 0.5-2 mg IV, may repeat at 5-10 minute intervals

(Adams & Darvay, 2012; Medscape Drug Reference, 2013)

Test Yourself

Because of its quick acting and short half life, the most commonly used benzodiazepine for procedural sedation is:

- A. Fentanyl
- B. Ativan
- C. Versed
- D. Valium

The correct answer is C, Versed.

Opioid: Fentanyl (Sublimaze)

- Onset: Initial immediate within 1-2 minutes
- Peak: 5-7 minutes
- Duration: 30-60 minutes
- Half-life: 2-4 hrs
- Administered: Pushed over 3-5 minutes
- Very lipid soluble; rapid red-distribution into fatty tissue and inactive sites
- Large side effect profile
- Antidote: naloxone (Narcan)
- 100 times more potent than morphine
- Vagotonic may produce bradycardia

Fentanyl: Dosing

- Initial: 25-50 mcg slow IV push
- Titrate in increments of 25mcg every 3-5 minutes to desired response
- Total dose 1-3 mcg/kg; usually total dose does not exceed 150 mcg

Fentanyl: Effects and Side Effects

Effects:

1. Analgesia
2. Sedation

Side Effects:

- Respiratory depression
- Dysphoria
- Nausea/vomiting
- Bradycardia
- Pruritus
- Urinary retention
- Hypothermia
- CNS excitation
- Constipation
- Muscle rigidity

Fentanyl: Drug Interactions

- Benzodiazepines: Synergy with sedatives will lead to sedation, respiratory depression, and hypotension
- Hypotension: Calcium channel blockers, β -blockers, and Clonidine
- Protease inhibitors: These drugs decrease metabolism

Opioid: Fentanyl (Sublimaze)

Fentanyl: Precautions

The following patients should be given Fentanyl cautiously:

- Elderly and debilitated
- Pulmonary dysfunction
- Increased ICP
- Bradycardia
- Hepatic failure
- MAO inhibitors

(Adams & Darvay, 2012; Medscape Drug Reference, 2013)

Morphine (Opiate)

- 1-3 mg IVP at 2 min. intervals
- Total dose: 0.1-0.15 mg/kg
- Onset: Less than 1 minute
- Long peak and duration time: Up to 4-5 hours, average about 2 hours
- Analgesia, relief of pulmonary congestion
- Histamine release (itching)

(Adams & Darvay, 2012; Medscape Drug Reference, 2013)

Etomidate: Hypnotic/Sedative

- Etomidate is often given to achieve sedation for intubations
- Onset of action: <1 minute
- Duration: (dose dependent): 3-5 minutes
- Analgesia: Provides sedation but NO analgesia
- Contraindications: Seizure disorder relative contraindication; adrenal insufficiency
- Side effects: Twitching or myoclonus which can be confused for seizure activity; certain formulations may produce pain at injection site
- Advantages: Negligible cardiovascular effects!!

Etomidate: Dosing

- For procedures: 0.15 mg/kg IV over 30-60 seconds
- For intubation : 0.3 mg/kg IV
- May be administered by nurse

(Alexander & Susia, 2012; Medscape Drug Reference, 2013; Adams & Darvay, 2012)

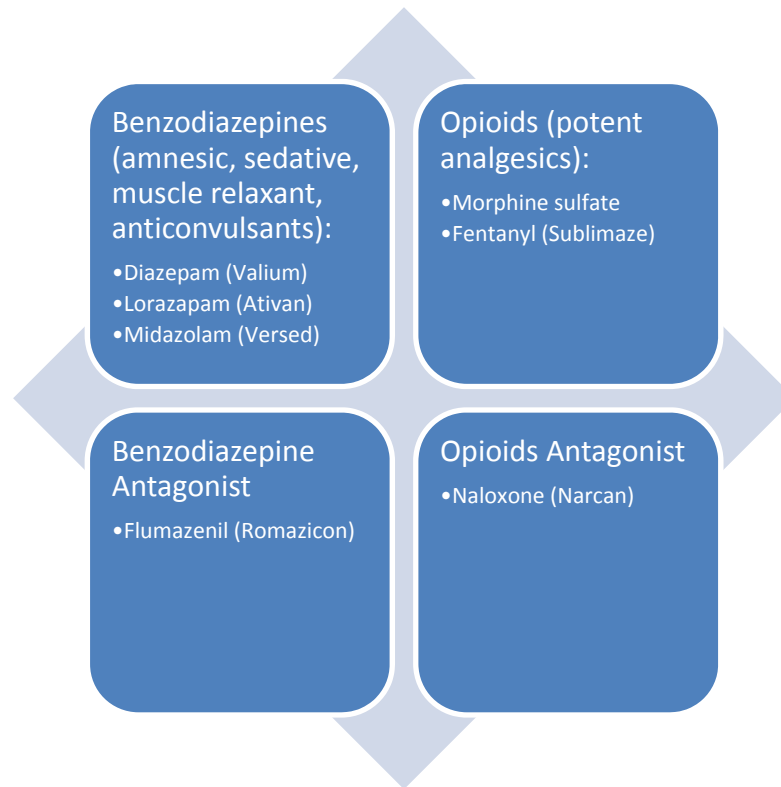
Did You Know?

The most commonly given opioid is Fentanyl and practice is moving away from Demerol. Amongst many reasons, the half-life of fentanyl is shorter, recovery time is less, and the effect is rapid. Using Benadryl for procedural sedation is also becoming uncommon practice (Alexander & Susia, 2012).

Finally, the controversial use of Propofol for procedural sedation is no longer practice without anesthesia. In 2008, the Perioperative Standards and Recommended Practices stated that only persons trained in administering general anesthesia should administer Propofol for moderate sedation and analgesia. Therefore, this course will not review Propofol since the target audience is the bedside RN.

(Ogg & Burlingame, 2008; ASA, 2008)

Review of the Reversal Agents



Reversal Agents

Welliver (2011) states the importance of understanding the reversal agents when giving procedural sedation especially when giving both narcotics and benzodiazepines. If a patient exhibits signs and symptoms of respiratory depression or compromised airway, supportive measures need to be initiated and reversal of sedation drugs needs to be considered.

1. **Flumazenil (Romazicon)** reverses benzodiazepines. Adequately reverses sedation but may not be effective if respiratory depression is present due to opiates.
2. **Naloxone (Narcan)** reverses opiates and may result in pain, hypertension, tachycardia, or pulmonary edema.

Reversal Agent: Flumazenil

- Trade name is Romazicon
- Antidote for benzodiazepines such as Midazolam
- Competitive benzodiazepine receptor antagonist
- Onset: within 1-2 minutes
- Peak: 6-10 minutes
- Duration: Dose dependent about 45-100 minutes

Flumazenil: Dosing

- Initial dose 0.2mg IV over 15 seconds
- Titrate to effect: May repeat 0.1-0.2 mg q 1-3 minutes to a max of 3mg
- May give medication up to 3 mg
- More than 1 mg rarely needed

Flumazenil: Effects

- May reverse some effects of benzodiazepines
- Respiratory depression may not be reversed!!
- Dizziness
- Panic attacks
- Re-sedation
- Seizures
- Withdrawal in chronic users

Reversal Agent: Flumazenil

Flumazenil: Precautions

- RE-SEDATION! RE-SEDATION! RE-SEDATION!
- Benzodiazepine may outlast the reversal effects of flumazenil
- ***Must monitor for at least 2 hours after last dose to assess re-sedation***

The following patients should be given Flumazenil cautiously:

- Chronic benzodiazepines users
- Benzodiazepine is life-saving (Example: For patients with status epilepticus)
- Tricyclic overdose: Seizures
- Liver disease

Flumazenil: Contraindications

- Known hypersensitivity
- Patients who are on benzodiazepine therapy for life-threatening conditions (status epilepticus, control of ICP)
- Patients showing signs of serious tricyclic antidepressant overdose
- Administer cautiously in patient who is chronically dependent upon benzodiazepines, may precipitate withdrawal

(Medscape Drug Reference; 2013, Welliver, 2011)

Reversal Agent for Benzodiazepines: Flumazenil (Romazicon)

- Benzodiazepine antagonist
- 0.2 mg IVP- over 15 seconds and repeat 0.2 mg at 1 min for total of 5 doses
- Total dose 1 mg IV
- Onset: 1-2 min., peak 6-10 min.
- Duration varies with plasma concentration of benzodiazepine
- Side effects: Seizure, hypoventilation, benzodiazepine withdrawal
- Flumazenil antagonizes the sedative effects of benzodiazepines
- It does not antagonize the respiratory depression of benzodiazepines as effectively
- Respiratory depression should be treated with supplemental O₂ and if necessary positive pressure ventilation with an Ambu bag

(Medscape Drug Reference; 2013, Welliver, 2011)

Opioid Reversal Agent: Naloxone (Narcan)

- Opioid mu receptor antagonist
- Onset: Rapid, dose-dependent 1-5 minutes
- Duration: 15-30 minutes, longer after IM administration
- Metabolized by liver
- Antidote for Fentanyl or morphine
- Sedation may return when naloxone wears off

Naloxone: Precautions

- Re-sedation since the duration of Narcan is $\frac{1}{2}$ the duration of Fentanyl and $\frac{1}{4}$ the duration of Morphine
- Must monitor *at least* 2 hours after last dose
- Chronic narcotic abuse: Withdrawal
- Cardiac disease: Tachycardia, hypertension

Naloxone: Dosing

- Initial dose of 0.2-0.4 mg IV over 15 seconds, as needed to increase respiratory rate and alertness
- Repeated dosing may be necessary
- Total dose 0.4 mg IVP

Naloxone: Effects

- Reversal of narcotic effects and this includes analgesia
- Hypertension, tachycardia, pulmonary edema, myocardial infarction have been described
- Nausea/vomiting

(Medscape Drug Reference; 2013, Welliver, 2011)

Complications of Sedation

Complications can occur when giving procedural sedation. Some of those complications are:

- Airway issues
- Hemodynamic instability
- Agitation
- Anaphylaxis
- Drug reactions

Airway Complications

Hypopnea/Apnea from Over Sedation

- To prevent this, vigilance is key
- Oxygen desaturation is late sign, about 2-3 minutes

What do we do?

- Provide supplemental oxygen
- Keep supine
- Stimulate patient, encourage deep breathing
- Head tilt/chin lift or jaw-thrust maneuver
- Airway adjunct (nasal or oral airway)
- Provide positive pressure ventilation; bag/mask ambu
- Administer appropriate reversal agents
- Intubation

Obstruction

- Know the risk factors: obesity, OSA
- Know the signs
 - Snoring: early obstruction
 - No condensation on O₂ mask
 - Paradoxical respiratory movements

What do we do about it?

- Provide supplemental oxygen
- Keep supine
- Stimulate patient, encourage deep breathing
- Head tilt/chin lift or jaw-thrust maneuver
- Airway adjunct (nasal or oral airway)
- Provide positive pressure ventilation; bag/mask ambu
- Administer appropriate reversal agents
- Intubation

Complications: Airway

Laryngospasm

A partial laryngospasm often responds to supplemental oxygen, calming measures and having the patient breathe slowly and deeply and try to cough.

What do we do about it?

- If above steps ineffective, low doses of IV Midazolam or lidocaine may be effective
- If condition deteriorates, positive pressure ventilation, 100% O₂, suction
- Small doses of Succinylcholine (0.5 mg/kg IV) and intubation to be done by anesthesiologist or ER physician

Bronchospasm

Bronchospasm can happen from medications such as morphine or could be from pulmonary edema.

Symptoms:

- Audible wheezing
- Tachypnea
- Dyspnea
- Decreased O₂ saturation
- Accessory muscle use
- Restlessness
- Tightness in chest

What do we do about it?

- Pre-treat patients with history of bronchospastic disease with bronchodilators (e.g., Albuterol nebulizer)
- Treat with bronchodilators and humidified oxygen

Vomiting/Aspiration

What do we do about it?

- Suction must be available
- Anti-emetics
- Prevention: Observe pre-operative fasting guidelines
- Observe sedated patient closely for post-operative nausea/vomiting (PONV)
- Remove airway adjuncts as soon as possible to prevent gagging and regurgitation
- Medications may be ordered to decrease gastric secretions (anticholinergic), neutralize gastric secretions (H₂ receptor antagonists), foster gastric emptying (metoclopramide) or reduce n/v
- Treatment includes supplemental O₂ suctioning, CPAP, intubation, antibiotics, bronchodilators, steroids

Hemodynamic Instability

Hypotension

Hypotension is generally due to vasodilation. When managing hypotension, consider the following key actions:

1. Check the airway. Is it intact? If not, establish airway by head tilt/chin lift, airway adjuncts, bag valve mask, or intubation. Consider reversal of sedation.
2. Check ventilation and oxygen saturation. Is there effective ventilation and O₂ saturation? If not, provide ventilatory support, supplemental O₂, and intubate if needed. Consider pulmonary emboli.
3. Check the rhythm. Is it the patient's rhythm at baseline? If not, obtain 12 lead then correct tachycardia, brady arrhythmias, and non-sinus arrhythmias. Does the patient have any signs of MI or ischemia?
4. Give a bolus of fluid. Was it effective? If not, look and treat for causes such as bleeding, anaphylaxis, sepsis, equipment malfunction, or complication of procedure.
5. Start vasopressors.

Bradycardia

First, the practitioner must rule out hypoxia. Bradycardia is usually vaso-vagal secondary to the procedure (bowel or bladder distension, pain, uterine traction).

What do we do about it?

- Increase oxygen if needed
- Stop stimulus and assess rhythm
- Atropine: 0.5-1 mg IV q 3-5 minutes not to exceed 3mg

Tachycardia

Tachycardia is usually from pain. The healthcare providers should consider the cause and co-morbidities of the patient. Sometimes it can be caused from epinephrine given locally.

What do we do about it?

- Fentanyl for pain: Vagotonic properties
- If from the epinephrine, will generally resolve in a few minutes
- β -Blocker if prolonged and problematic, IV push or IV drips (i.e., esmolol)

Hypertension

Hypertension is usually from pain or from the epinephrine. The healthcare providers should consider hypercarbia.

What do we do about it?

- Analgesics as appropriate
- Labetalol: α and β antagonist 5-10 mg IVP
- Hydralazine: Direct vasodilator 5-10 mg IV (wait 10-20 minutes)

Agitation

With agitation, the healthcare providers must rule out hypoxia or hypercarbia. It could also be from a paradoxical drug reaction, especially in elderly.

What do we do about it?

- Give benzodiazepines
- Monitor respiratory status and treat accordingly

Managing Allergic Reactions/Anaphylaxis

Anaphylaxis is most common with opioids but can occur with any drug. With Type I, anaphylactic occurs within 60 minutes, symptoms range from urticarial to bronchoconstriction, laryngeal edema, hypotension, or circulatory collapse. Other reactions include drug fever, vasculitis, serum sickness syndrome, and GI symptoms (abdominal pain, n/v, diarrhea).

What do we do about it?

- For mild reactions, stop offending agent and administer diphenhydramine (Benadryl).
- For severe reactions, O₂, IV crystalloids, epinephrine, and aminophylline.
Diphenhydramine and ranitidine block unoccupied histamine receptors. Hydrocortisone and methylprednisolone also may be administered.

Complications

Complications can occur with procedural sedation. Early recognition is key to decrease morbidity and mortality. Respiratory events make up the majority of complications, but cardiovascular events and allergic and/or anaphylactic reactions may also occur.

Other complications include:

- Local anesthetic toxicity
- Myocardial ischemia/infarction
- Shivering
- Re-sedation

Patient Monitoring: Basic Safety Measures

- The nurse should provide verbal contact with patient throughout the procedure. Talk to the patient and listen attentively.
- Assess the patient's comfort levels.
- Make sure the side rails are up and the wheels are locked.
- Ensure the suction device is set-up and ready.
- Ensure time-out is completed with RN, MD, and patient prior to administering any medications.

Patient Monitoring

Each hospital has their policy and procedure about documentation during procedural sedation. Most facilities require that every five minutes, the following should be documented using the hospital form:

- Heart rate/EKG rhythm
- Respiratory rate
- Blood pressure
- O₂ sats/capnography
- Sedation score: Evaluate patient's response to verbal commands or tactile stimulation (LOC)
- Pain level
- Assess for and treat any unexpected patient reactions
- Dose and timing of medications should be documented

Capnography

More hospitals are using capnography to monitor the concentration of exhaled carbon dioxide in order to assess physiologic status or determine the adequacy of ventilation during anesthesia.

This measurement verifies whether ventilation is occurring and will identify bradypnea, hypoventilation, and apnea much sooner than pulse oximetry (Welliver, 2012).

Carbon Dioxide

Normal CO₂ = 35-45 mm Hg

Hypercarbia:

- 45-55: Acidosis, somnolence, respiratory arrest
- >65: Sedation but when sedation occurs with a sedated patient, the two have an insidious synergy until respiratory arrest occurs

(Welliver, 2012)

Ramsay Sedation Scale (Modified)

Part of the assessment is to state the patient's sedation scale. This will assist in proper medication administration and over sedation.

1	Not sedated
2	Calm and cooperative
3	Drowsy
4	Sleeping/easily aroused
5	Difficult to arouse
6	Unable to arouse

Note!

- Various sedation scales may be used, including the Richmond Agitation Sedation Scale (RASS), the Pasero Opioid-Induced Sedation Scale (POSS), and the Innova Health System Sedation Scale (ISS). Determine which scale your facility uses and become familiar with that particular scale.

Intra-Procedure Documentation

At the completion of the procedure, a procedure note should be written with the following:

- Procedure performed
- Medication administered, dose, time, route, effect
- IV fluid administered
- Documentation of vital signs (BP, HR, RR, O₂ sat, level of consciousness, every 5-10 minutes), EtCO₂ monitoring with each set of vital signs during **deep sedation**
- Complications, if any
- Status of patient at conclusion

- **Post-Procedural Monitoring and Documentation**

After the completion of the procedure, monitoring is not completed. Conscious sedation may extend beyond the conclusion of the procedure. Patients must be observed until they are no longer at increased risk for cardio respiratory depression. The RN will need to monitor the level of consciousness of the patient.

- Monitor until patient returns to pre-procedure state
- Vital signs (BP, HR, RR), pulse oximetry, airway, level of consciousness every 5-10 minutes for a minimum of 30 minutes following last administered dose of IV sedation
- Assess for pain
- After 30 minutes if patient is stable check vital signs (BP, HR, RR) and room air pulse oximetry every 15 minutes for one hour or until patient reaches pre-procedure state
- If **flumazenil or naloxone** have been administered, the patient should be observed for a minimum of one hour to assure that the patient is no longer at risk for respiratory or CNS depression if the patient is staying in hospital
- If the patient is going home, then they must wait two hours

Note!

- The RN should maintain IV access until the patient is fully recovered.

Test Yourself

Patient received too much Fentanyl and stopped breathing during a bronchoscopy. Narcan was given. How does this change the recovery period?

- A. The half life of Narcan is shorter than the Fentanyl and rebound sedation can occur after giving reversal agent; therefore, patient should be observed for a minimum of TWO hours to assure that the patient is no longer at risk for Respiratory or CNS depression.
- B. The half life of Narcan is longer than the Fentanyl and rebound sedation can occur after giving reversal agent; therefore, patient should be observed for a minimum of ONE hour to assure that the patient is no longer at risk for Respiratory or CNS depression.
- C. The half life of Narcan is shorter than the Fentanyl and rebound sedation can occur after giving reversal agent; therefore, patient should be observed for a minimum of 15 minutes to assure that the patient is no longer at risk for Respiratory or CNS depression.
- D. The half life of Narcan is longer than the Fentanyl and rebound sedation can occur after giving reversal agent; therefore, patient should be observed for a minimum of 15 minutes to assure that the patient is no longer at risk for Respiratory or CNS depression.

The correct answer is A. The half life of Narcan is shorter than the Fentanyl and rebound sedation can occur after giving reversal agent; therefore, patient should be observed for a minimum of TWO hours to assure that the patient is no longer at risk for respiratory or CNS depression.

Discharge Criteria Checklist

Some hospitals use checklists where all sections must be checked prior to discharge. The following is an example:

Criteria	Description	(✓)
Activity	Able to move extremities at baseline	
Respirations	Able to breathe deeply and cough	
Circulation	BP +/- 20% pre-sedation level	
Consciousness	Fully alert and able to answer questions <u>or</u> at baseline	
Oxygen saturation	SpO ₂ > 92% on room air <u>or</u> at baseline	
Pain	No pain <u>or</u> pain at acceptable level	
Nausea	No nausea <u>or</u> nausea at acceptable level	
Disposition	(Admit) (Discharge) (To OR)	

Recovery Score

A recovery score evaluates readiness for transfer to inpatient unit or home:

- Documented every 15 minutes until score is met
- Goal score:
 - Outpatient = 10
 - Inpatient = 8-10
- 0-2 points each for 5 separate categories
- Must be ≥ 8 for transfer; all patients should be > 8 on arrival to post-procedure area

Recovery Score: Five Areas Assessed

Score	Activity	Respiration	Circulation	Consciousness	O ₂ Saturation (adult only)
2	Moves all extremities	Able to breath and cough freely	BP 20% of pre-anesthetic level	Fully awake	O ₂ SAT > 92% on room air
1	Moves two extremities	Dyspnea or limited breathing	BP 21-49% of pre-anesthetic level	Arousable on calling/responds to stimuli	O ₂ supplement to maintain O ₂ SAT > 90%
0	Unable to move extremities	Apneic	BP 50% of pre-anesthetic level	Not responding	O ₂ SAT < 90% even on O ₂ supplement

Outpatient Discharge Criteria*

- Recovery score of ten or pre-procedure baseline (at least two hours if reversal agents are used).
- Hydration adequate/able to drink fluids.
- Voided or unable to void but comfortable.
- Patient and/or family given written discharge instructions which will include an explanation of anticipated limitation on activities (e.g., refrain from operating heavy machinery, driving a car), behavior (e.g., deferring important decisions) and diet (e.g., refraining from consuming alcohol for the next 24 hours).
- A 24 hour emergency contact (person/service).
- Completion of the discharge criteria.
- Discharge order written, if applicable.
- Ambulatory patients may not leave the hospital unless accompanied by a competent adult.
- A follow-up phone call is recommended, within 24 hours post-procedure.

(*In addition to the inpatient criteria)

Discharge to a Nursing Unit

- Vital signs are stable.
- Patient can sit unaided if appropriate to baseline and procedure.
- Swallow, cough, and gag reflexes are at baseline.
- Patient is alert and activity level has returned to pre-procedure.
- Nausea and dizziness are minimal.
- Dressing and/or procedure site checked.
- Minimal pain managed by appropriate analgesia.
- Patient is alert.
- Orders written.

Written Discharge Instructions

Written discharge instructions include:

- Explanation of potential or anticipated post-sedation effects and limitations of activities and dietary restrictions.
- 24 hour emergency contact telephone number.
- Explanation of pain management protocol.

Conclusion

Nurses caring for patients that are undergoing procedural sedation should be knowledgeable about the continuum of sedation and be prepared to rescue patients that progress from moderate sedation to deep sedation.

Nurses should be knowledgeable about the pharmacology of the medications and their interactions and synergistic effects.

Additionally, the nurse in attendance during the procedural sedation should have no other responsibilities, other than monitoring the patient. Even though procedural sedation can be dangerous, when armed with the knowledge and skill to perform a thorough pre-procedural assessment, assess and monitor during the procedure, and competently intervene during emergencies, patient outcomes will improve.

Appendix: Drugs Commonly Used for Procedural Sedation

Medication	Action	Dose for IV	Onset for IV	Duration for IV	Side Effects
Ketamine (Ketalar)	Analgesia & sedation	1-4.5 mg/kg	30 seconds	5-10 min.	Tachycardia, hypertension, laryngospasm, nausea/vomiting, CNS depression, respiratory depression, hypersalivation, emergence reactions (up to 20%)
Midazolam (Versed)	Anxiolytics	0.5-1.0 mg (max dose 5 mg)	1-5 min.	30-60 min.	Respiratory depression
Diazepam (Valium)	Anxiolytics	2.5-10 mg (total dose 0.1-0.2 mg/kg)	1-5 min.	15-60 min.	Drowsiness, dizziness, irritable, muscle weakness, nausea constipation, blurred vision
Fentanyl (Sublimaze)	Analgesia & sedation	25-50 mcg IVP (150 mcg)	1-2 min.	30-60 min.	Respiratory depression, dysphoria, nausea, vomiting, bradycardia, pruritus, urinary retention, hypothermia, CNS excitation, constipation, muscle rigidity
Morphine (Opiate)	Analgesia & sedation	1-3 mg IVP	<1 min.	4-5 hours (average 2 hours)	Pruritis, nausea, vomiting, lethargy, respiratory depression
Etomidate (Amidate)	Hypnotic/ sedative	0.3 mg/kg (typical dose 20-40 mg)	<1 min.	3-5 min.	Twitching or myoclonus which can be confused for seizure activity, certain formulations may produce pain at injection site
Flumazenil (Romazicon)	Benzodiazepine reversal	0.2 mg (max dose 3 mg)	1-2 min.	45-100 min.	Resedation, dizziness, respiratory depression, seizures, withdrawal
Naloxone (Narcan)	Narcotic reversal	0.2-0.4 mg (total dose 0.4 mg)	1-5 min.	15-30 min.	Resedation, hypertension, tachycardia, pulmonary edema, nausea, vomiting

(Medscape Drug Reference, 2013)

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