

Managing Pain for the IR Patient

Terry Brady, M.D.

Intro:

- Studies have shown that under sedation increases stress, leads to accidental disturbance of vital lines and tubes and may result in *hypertension, tachycardia and hyperventilation* as well as other hemodynamic disturbances.
- Prolonged or chronic pain results in adverse effects on *protein synthesis, cell division and cellular immunity*, which may affect healing and put patients at greater risk for morbidity and mortality.

“I’ve been using versed and fentanyl for 20 years, what else is there to know?”

- Unfortunately, there is a lot to know. Pain and sedation management is performed effectively when a team approach is chosen working in concert with nurses, technologists and other physicians. Stringent JCAHO guidelines require that minimum standards are maintained along with accurate record keeping.
- In addition, all drugs have adverse reactions and contraindications; in addition, dosing and monitoring adjustments are necessary for pediatric and elderly patients.

Definitions/ Terminology:

- **Conscious sedation**, also known as **moderate sedation** is defined as a medically controlled state of depressed consciousness in which the protective reflexes are maintained and there is the ability to maintain a patent airway independently. By definition the patient should respond appropriately to light tactile stimulation and verbal commands, such as, “Open your eyes”.
- **Anxiolytic**: Decreases anxiety.
- **Sedative**: Decreases activity, moderates excitement, and calms the patient.
- **Hypnotic**: Produces drowsiness, and facilitates the onset and maintenance of an EEG “normal” state of sleep- Easily arousable
- **Analgesia**: Insensitivity to pain without loss of consciousness

Getting Started:

- Conscious sedation is not for everyone and should involve a strict evaluation process. Probably the best accepted classification system and also required documentation by JCAHO is the American Society of Anesthesiologists (ASA) classification scale.
- The *American Society of Anesthesiologists* recommends that moderate sedation be used primarily for ASA classes 1 and 2 and that ASA 3 may require an anesthesia consult. ASA levels 4 and 5 in an adult and level 3 in a child *must* have a written anesthesia consult at our hospital prior to administering conscious sedation.

ASA Classification

ASA Classification	Description	Examples
1	A normal, healthy patient, without organic, Physiologic, or psychiatric disturbance	Health with good exercise tolerance
2	A patient with controlled medical conditions without significant systemic effects	Controlled hypertension, controlled diabetes mellitus without systemic effects, cigarette smoking without evidence of COPD, anemia, mild obesity, age less than 12 months to greater than 70 years, pregnancy, chronic bronchitis, heart disease that only slightly limits physical activity
3	A patient having medical conditions with significant systemic effects intermittently associated with significant functional compromise	Controlled CHF, stable angina, old MI, poorly controlled hypertension, morbid obesity, bronchospastic disease with intermittent symptoms, chronic renal failure, heart disease that limits activity, diabetes mellitus with vascular complications, immunosuppressed, asthma under treatment
4	A patient with a medical condition that is poorly controlled, associated with significant dysfunction and is a potential threat to life	Unstable persistent angina, symptomatic COPD, symptomatic CHF, active myocarditis, hepatorenal failure, organic heart disease showing marked signs of cardiac insufficiency, advanced pulmonary or endocrine insufficiency.
5	A patient with a critical medical condition that is associated with little chance of survival with or without the surgical procedure, moribund patient not expected to survive 24 hours	Multiorgan failure, sepsis syndrome with hemodynamic instability, hypothermia, poorly controlled coagulopathy, cerebral, trauma, pulmonary embolus, uncontrolled hemorrhage as from a ruptured abdominal aneurysm.
6	A patient who is brain dead and undergoing anesthesia care for the purpose of organ donation	
E	This modifier is added to any of the above classes to signify a procedure that is being performed as an emergency and may be associated with a suboptimal opportunity for risk modification	

Notes:

- A conscious sedation policy is *not* in effect when medicines are given at or below dosages for premedication and anxiolysis.
- Pain medication should be used anytime pain may be elicited even when an amnestic agent such as versed is given. The patient may not remember his pain but your nurses and technologists will.
- Reduce the dosage in elderly patients and those patients with renal and hepatic insufficiency.
- Allow adequate time between doses. A good indication of adequate sedation is *slurred speech*.

Nursing Responsibilities:

- Complete health history form.
- Verify that a responsible adult is present to drive the outpatient home.
- NPO status
- Baseline vital signs
- Baseline SaO2 level
- Baseline Aldrete score
- Reviewing any patient education needs
- Uninterrupted observation and monitoring of the patient from the time of initiation of moderate sedation until time of discharge into care of responsible adults
- Provision and assistance with the delivery of emergency resuscitative efforts as necessary

NPO Requirements:

	Solids & Non clear Liq.	Clear Liquids	Breast Milk
Adults	6 hrs or NPO p. MN	2 hrs	N/A
Children > 36 mos	6 hrs	2 hrs	4 hrs
Children 6-36 mos	6 hrs	2 hrs	4 hrs
Children < 6 mos	6 hrs	2 hrs	4 hrs

Aldrete Scoring System:

		Score
Activity Able to move voluntarily or on command	4 extremities =	2
	2 extremities =	1
	0 extremities =	0
Respiration	Able to deep breath and cough freely =	2
	Dyspnea, shallow or limited breathing =	1
	Apneic =	0
Circulation	BP \pm 20mmHg of pre-sedation level =	2
	BP \pm 20-50 mmHg of pre-sedation level =	1
	BP \pm 50 mmHg of pre-sedation level =	0
Consciousness	Fully awake =	2
	Arousable on calling =	1
	Not responding =	0
Color	Normal =	2
	Pale, dusky, blotchy, jaundiced, other =	1
	Cyanotic =	0
TOTAL SCORE		

All patients undergoing moderate sedation require the following:

- Discussion of benefits, alternatives and risks (BAR) / Informed consent
- History and physical examination:
- Pre-Anesthesia Assessment
- ASA Classification
- Anesthesia history
- Allergies & drug history (assessment of whether or not the patient is on and *MAOI*, which may necessitate the avoidance of opioid medications)
- Heart sounds.
- Lung sounds
- Airway assessment
- The patient is assessed for potential problems which may make intubation difficult in case the need should arise on an emergent basis.
- NPO status
- Lab values, as appropriate
- Pregnancy status
- Pregnancy testing should be done on all females of child bearing age unless there is an indication not to do so, such as, the patient has had a hysterectomy, or if the patient is known to be pregnant.
- Plan – determination of appropriateness to proceed with moderate sedation and analgesia.
- Ordering of the medications(s), dosage and route of administration
- Dictation of the operative note into the patient's permanent medical record immediately upon completion of the procedure.

Discharge Criteria:

- Patients may be discharged from the recovery area upon the order of the physician or upon meeting these discharge criteria:
- Aldrete score of 9-10 (or comparable to pre-procedure level). A physician order for discharge is required for a lower score.
- Swallow, cough and gag reflexes are present.
- Minimal nausea and dizziness.
- Able to move consistent with age and development.
- At least 2 hours have passed since the last administration of reversal agents, if administered.
- Outpatients are given written discharge instructions regarding post-procedure diet, medications, activity level, precautions and a telephone number to use in case of emergency.

Minimum Equipment:

- Pulse oximetry
- BP
- Cardiac monitoring: Only required with history of significant cardiovascular disease or if dysrhythmias are anticipated or detected, as found with: pulmonary angiograms ICA stenting and use of Angiojet near the heart.
- IV site
- Crash cart easily accessible
- Reversal agents available

Pharmacology, in brief- Classifications: *Selection choices*

General Anesthetics:

- Propofol
- Ketamine
- *Benzodiazepams:*
 - Valium
 - Versed
 - PO meds: Valium, Xanax, Ativan, etc
- *Opioid Narcotics:*
 - Morphine sulfate (MS)
 - Fentanyl
 - Alfentanil
- *Barbiturates:*
 - Replaced by benzodiazepams
- *Other Agents:*
 - Butyrophenomes (Haldol)
 - Anticholinergics
 - Antihistamines (Benadryl)
- *Alpha-2 Adrenoceptor agonists:*
 - Clonidine
 - Dexmedatomindine (Precedex)
- *NSAIDS:*
 - Toredol

- *Patient controlled analgesia (PCA)*
 - SQ fentanyl, IV MS
 - Long pain duration
 - Arterial & venous thrombolysis
 - Solid organ embolization
 - UFE
 - Some biliary and GU procedures

Preoperative Meds*:

- Anxiolysis
 - Benzodiazepams
 - Valium
 - Ativan
 - Xanax

*This is not considered conscious sedation

Suggested Guidelines for Adult Procedural Sedation:

Drug	Normal Dose	Onset of Action	Mechanism of Action	Indications	Adverse Reactions	Contra-indications	Comments
Versed (midazolam)	0.1-4 mg bolus, titrate in increments of 0.5-1mg to desired effect. Elderly and/or debilitated 0.5-1.5mg bolus, titrate in increments of 0.5mg. More than 5mg is not usually necessary. Do not give rapidly May give IM	Onset: 1-5 minutes Duration up to 2 hours	Benzodiazepine-CNS depressant that binds to receptor sites	Pre-op sedation IV moderate sedation	Fluctuations in VS apnea, headache, N/V, coughing, over-sedation, drowsiness, amnesia (pos effect)	Hyper-sensitivity, narrow-angle glaucoma, May use in open angle glaucoma if patient on appropriate therapy	3-4 times more potent than Valium. If narcotic used Prior, decrease dose By 30%. Increased Hypoten with Demerol
Valium (diazepam)	2.5-5mg bolus, titrate in increments of 1.5mg to desired effect. Elderly and/or debilitated 1.25-2.5mg bolus, titrate in increments of 1mg	Onset: 2-5 minutes Duration beyond 3 hours	Benzodiazepine-CNS depressant that binds to Benzodiazepine receptor sites	Anxiety acute alcohol withdrawal anticonvulsant	Blood dyscrasias, thrombophlebitis, sedation, hypotens, bradycardia, respir distress, seizures	narrow-angle glaucoma	Do not mix with any other drug or IV solution. Should not come in contact with PVC bags/IV sets
Morphine (morphine sulfate)	2-5mg	Onset: 3-10 minutes Duration: 3-4 hours	Narcotic agonist	Severe pain	Hypotension, respir depression, pruritis, flushing	Hyper-sensitivity, acute bronchial asthma, or airway obstruction	May initiate histamine release
Demerol (meperidine)	25-100mg may repeat to desired effect. Should avoid in renal failure patients due to risk of CNS toxicity	Onset: 5-10 minutes Duration: 1-2 hours	Narcotic agonist	Moderate to severe pain	Hypotension, respir depression, seizures, pruritis	Hyper-sensitivity, MAO inhibitors	Do not use with MAO inhibitors
Fentanyl (sublimaze)	50-100 mcg bolus, titrate in increments of 25 mcg to desired effect	Onset: 2-3 minutes Duration: 30-60 minutes	Narcotic agonist	Severe pain adjunct to anesthesia	Hypotension, resp depression, truncal rigidity, seizures	Hyper-sensitivity	
Narcotic Antagonist Narcan (naloxone) *reversal agent	0.1-0.4mg, repeat after 3 minutes if resp rate < 12 or level of consciousness remains depressed	Onset: 3 minutes Duration: 45-60 minutes	Pure narcotic antagonist- compete for narcotic receptor sites	Complete of partial reversal of narcotic depression. Diagnosis of suspected acute opioid overdose	N/V, sweating, tachycardia, hypertension, excitement, hypotension, ventricular tachycardia, and fibrillation, pulmonary edema	Hyper-sensitivity	Only reverses opioids: reverses sedation, hypotension, & resp. depression. Resedation may occur when Narcan wears off
Benzodiazepine Antagonists: Romazicon (Flumazenil) *reversal	0.1-0.2mg for partial antagonism 0.4-1mg for complete	Onset: 1-3 minutes Duration: 45 minutes	Benzodiazepine receptor antagonist	Benzodiazepine reversal	Convulsions, dysrhythmia, headache, sweating, fatigue,	Hyper-sensitivity to Flumazenil or benzodiazepines. Patient	

agent)	antagonism				bradycardia, N/V, dizziness, agitation, blurry vision	showing signs of serious tri- cyclic antidepressant overdose	
--------	------------	--	--	--	--	--	--

Suggested Guidelines for Pediatric Procedural Sedation:

Drug	Normal Dose	Onset of Action	Mechanism of Action	Indications	Adverse Reactions	Contra-indications	Comments
Versed (midazolam)	0.05 mg/kg bolus, titrate in increments of 0.1-0.15 mg/kg to desired effect. PR: 0.3-0.5 mg/kg	PO: 0.5-0.75 mg/kg	IV 1-5 min duration 20-30 min up to 2 hours	Onset: 20-30 min (PO or PR)	Benzodiazepine – CNS depressant that binds to receptor sites	Pre-op sedation IV moderate sedation	Fluctuations in VS, apnea, headache, N/V, coughing, oversedation, drowsiness, amnesia (pos effect)
Valium (diazepam)	0.04-0.1 mg/kg bolus, titrate in increments of 1-2 mg to desired effect (IM very painful)	Onset: 5-10 min duration: 2-3 min	Benzodiazepine – CNS depressant that binds to benzodiazepine receptor sites	Anxiety, acute alcohol withdrawal anticon-vulsant	Blood dyscrasias, thrombophlebitis, sedation, hypotens, bradycardia, respir distress, seizures	Hyper-sensitivity, acute bronchial asthma, or airway obstruction	May initiate histamine release
Morphine (morphine sulfate)	.05-0.1mg/kg slowly over 4 min.	Onset: 3-5 minutes Duration 3-4 hours	Narcotic agonist	Severe pain	Hypotension, respir depression, pruritis, flushing	Hyper-sensitivity, acute bronchial asthma, or airway obstruction	May initiate histamine release
Demerol (meperidine)	1mg/kg, titrate to desired effect max: 100mg	Onset: 3-10 minutes Duration 2-4 hours	Narcotic agonist	Moderate to severe pain	Hypotension, resp depression, truncal rigidity, seizures	Hyper-sensitivity, MAO inhibitors	Do not use with MAO inhibitors
Fentanyl (sublimaze)	1-2 mcg/kg slowly over 2 min, titrate to desired effect 10x more potent than morphine	Onset: 2-3 minutes Duration 2-4 hours	Narcotic agonist	Severe pain adjunct to anesthesia	Hypotension, resp depression, truncal rigidity, seizures	Hyper-sensitivity	
Narcotic Antagonist Narcan (Naloxone)	<5yo 0.1mg / kg >5yo 2mg dose for complete reversal	Onset: 3-5 minutes Duration: 30-45 minutes	Pure narcotic Antagonist-competes for narcotic receptor sites	Complete or partial reversal of narcotic depression. Diagnosis of suspected acute opioid overdose	N/V, sweating, tachycardia, hypertension, excitement, hypotension, ventricular tachycardia & fibrillation, pulmonary edema	Hyper-sensitivity	Only reverses opioids: reverses sedation, hypotension and resp. depression. Resedation may occur when Narcan wears off
Benzodiazepine Antagonists: Romazicon (Flumazenil) *reversal agent)	<20kg:0.01mg/kg dose titrate 0.01mg/kg every minute to total of 0.04 mg/kg >20 kg:0.2 mg over 15 sec, if level of consciousness desired not obtained after 1 min, titrate 0.2 mg and repeat dose every minute to effect or total dose of 1mg.	Onset: 2-3 minutes Duration 45 minutes	Benzodiazepine receptor antagonist	Benzodiazepine reversal	Convulsions dysrhythmia, headache, sweating, fatigue, bradycardia, N/V, dizziness, agitation, blurry vision	Hyper-sensitivity to Flumazenil or benzodiazepines Patient showing signs of serious tricyclic antidepressant overdose	

Allergies and Options:

- Allergic to Fentanyl
 - Use morphine sulfate or Dilaudid
- Allergic to benzodiazepams
 - Increase dose of Fentanyl or morphine sulfate

Non-pharmacologic adjuncts:

- Also known as “*Behavioral Intervention*” or “*Structured Attention*”
- This form of non-pharmacologic anxiety and pain management is modeled on naturally empathic behavior. Recommendations are that the health care giver adapt verbal and nonverbal communication patterns to those of the patient and provide the patient with the perception of control. Use of attentive listening and positive suggestions along with encouragement, imagery and self-hypnotic relaxation combined with the avoidance of negative suggestions should lower the pharmacologic requirement.

References:

Practice Guidelines for Sedation and Analgesia by Non-Anesthesiologists. A Report by the American Task Force on Sedation and Analgesia by Non-Anesthesiologists. *Anesthesiology* 1996;84:459-71.

Kost, M. *Manual of Conscious Sedation*. Philadelphia, W.B Saunders Company, 1998.

Joint Commission on Accreditation of Healthcare Organizations (JCAHO). *Comprehensive Accreditation Manual for Hospitals: The Official Handbook*. Oakbrook Terrace, IL JCAHO; May 2000.

Patient Care in Interventional Radiology, Fairfax, VA SIR, 1999