Procedural sedation

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Case scenarios

- We need to rule out acute meningitis in a young man with delirium tremens. LP must be performed. The patient is markedly agitated and uncooperative. It is impossible to tell or force him to lie in proper position.

- We want to do head CT in an middle-aged woman with agitation and confusion. She does not stay still in the CT table.

Case scenarios

- We want to reduce a shoulder dislocation in a traumatic man at ER.

- We need to stitch the sutures of a foot laceration with active bleeding in a combative, intoxicated muscular man.

Patient Evaluation

- History/ Physical exam
- Airway evaluation
- Abnormalities of the major organ systems
- Previous adverse experience with sedation
- Drug allergies, current meds,potential interaction
- Focused physical exam- vital signs, auscultation of heart and lungs, evaluation of the airway
- NPO status
- Lab data

Patient Evaluation

- Airway abnormalities
- Morbid obesity
- Sleep apnea
- Previously failed sedation
- Major allergy or anaphylactic reaction
- Complex procedure
- Prolonged sedation needed
- Unusual position
- Unusual location

Pre procedure preparation

- Informed consent (both for procedure and PSA)

- Pre-procedural fasting (in case of non-emergent)
  - Clear liquids 2h
  - Light meal 6h
  - “Heavy” meal (oily, meats) > 6h

Equipments

- Self-inflating bag and mask
- Oxygen – 2 outlets
- Suction
- Pulse oximeter, ECG monitor, BP Monitor
- Capnometer?
- Drugs, pharmacologic antagonists
- Emergency equipment – airway kit, crash cart, defibrillator

Monitoring and Documentation

- **Pre-procedure**
  - V/S, SpO_2
- **Procedure**
  - Continuous SpO_2, E.C.G.
  - V/S q 5 min.
  - Level of consciousness q 5 min
- **Post Procedure**
  - Continuous SpO_2
  - V/S q 5 min. for 15 min., then q 15 min. X 1 hour until stable (see below)
  - Beware of vomiting/aspiration/fall

Level of sedation used in PS

- Ramsay sedation scale

Level 1: Fully awake.

Level 2: Drowsy.

Level 3: Apparently asleep but arousable by normal speech.

Level 4: Apparently asleep but responding to standardized physical stimuli (e.g. glabellar tap).

Level 5: Asleep, but not responding to physical stimuli (comatose).

Level of sedation used in PS

- ASA classification

- Minimal sedation
- **Moderate sedation**
- Deep sedation
- General anesthesia

Level of sedation used in PS

	Minimal Sedation ("Anxiolysis")	Moderate Sedation / Analgesia ("Conscious Sedation")	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 stimulus
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous Ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular Function	Unaffected	Usually maintained	Usually maintained	May be impaired

ASA continuum of sedation	Modified Observer's Assessment of Alertness/Sedation Scale	Modified Ramsay Sedation Scale
Minimal sedation/anxiolysis: a drug-induced state during which patients respond normally to verbal commands	5—Responds readily to name spoken in normal tone	1—Awake and alert, minimal or no cognitive impairment
Moderate sedation/analgesia ('Conscious sedation'): a drug-induced depression of consciousness during which patients respond purposefully* to verbal commands, either alone or accompanied by light tactile stimulation	4—Lethargic response to name spoken in normal tone 3—Responds after name called loudly or repeatedly or both 2—Responds only after mild prodding or mild shaking	2—Awake but tranquil, purposeful responses to verbal commands at a conversational level 3—Appears asleep, purposeful response to verbal commands at a conversational level 4—Appears asleep, purposeful responses to commands but at a louder than conversational level, requiring light glabellar tap, or both
Deep sedation/analgesia—purposeful* response after repeated or painful stimulation	1—Responds only to painful stimulation	5—Asleep, sluggish purposeful responses only to loud verbal commands, strong glabellar tap, or both 6—Asleep, sluggish purposeful responses only to painful stimuli
General anaesthesia—a drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation	0—No response to painful stimulation	7—Asleep, reflex withdrawal to painful stimuli only 8—Unresponsive to external stimuli, including pain
Note: *Reflex withdrawal from a painful stimulus is NOT considered a purposeful response.	Note: MOASS is the responsiveness component of the Observer's Assessment of Alertness/Sedation Scale[12]	Original Ramsay Sedation Scale is a 6-item scale developed to assess ICU sedation[14]

Personnel

The minimal numbers

1. The operator(s) (perform the procedure)

2. The monitor (administers drugs, monitors airway and vital signs) who has been credentialed

under the supervision.

“always separate team”

Training of Personnel for PSA

- Understand the pharmacology of agents
- Ability to recognize complications
- Ability to estabilishing a patent airway and positive pressure ventilation
- ACLS certified

Principles of doing PSA

- **Patient and procedural evaluation**
- **Preparation and monitoring (Pre-intra-post)**
- **Proper drug(s) and doses**

“Start low, go slow”

Drugs

Drugs commonly used for procedural sedation

Morphine

Fentanyl

Ketamine

Diazepam

Midazolam

Propofol

Etomidate

Dexmedetomedine*

Reversal agents

Naloxone (Narcan)

Flumazenil (Anexate)

Drugs commonly used for procedural sedation

Drug	Pharmacologic Class	Onset (min)	Duration (min)	Initial Dosing: Intermittent	Initial Dosing: Continuous Infusion	Repeat Dosing/ Titration	Side effects
						Tier 1*	
Midazolam (IV)	Benzodiazepine	1-3	30-80	0.02 mg/kg IV (2 mg IV increments)	NA	May repeat every 3-5 minutes (max 0.2 mg/kg IV total)	Hypotension, respiratory depression, paradoxical agitation
Fentanyl	Opioid	0.1 mg (100 mcg)	1-2	30-60 min (duration prolonged with higher doses)	0.5-1 mcg/kg IV	NA	May repeat every 15-30 minutes (consider using lower ¼ to ½ of initial dose)
Morphine	Opioid	10 mg	5-10	2-4 hrs	0.05-0.1 mg/kg IV or 2-4 mg IV	NA	May repeat every 15-30 minutes (max 15 mg)

Drugs commonly used for procedural sedation

Drug	Pharmacologic Class	Onset (IV) (min)	Duration (min)	Initial Dosing: Intermittent	Initial Dosing: Continuous Infusion	Repeat Dosing	Side effects
Tier 1*							
Propofol	Sedative hypnotic	1	5-10	0.5-1 mg/kg IV	NA	0.5-1 mg/kg IVevery 5 min	Pain at injection site, hypotension, myocardial depression, bradycardia, apnea, hypersensitivity reaction (allergy to eggs or soy), hypertriglyceridemia
Tier 2*							
Etomidate	Sedative hypnotic	1	5-15	0.1 mg/kg IV	NA	1-2 mg IV every 10 min	Emergence nausea/vomiting, adrenal suppression, myoclonous/seizure activity
Ketamine	Dissociative anesthetic	0.5	5-10	1-2 mg/kg IV	NA	0.2-0.5 mg/kg IV every 10 min	Emergence delirium, increased systemic and pulmonary pressures, intracranial and intraocular pressures, laryngospasm, hypersalivation, tachycardia

Administration and Doses of Reversal Agents

Drug	Bolus Dose	Administration	Onset	Duration	Other
Flumazenil (Romazicon)	0.2 mg IV	Administer the dose over 15 sec; may repeat every 1 min up to max dose of 1 mg. No more than 3 mg is recommended in any 1-hour period	0.5-1 min	60 min	May precipitate seizures in patients chronically treated with BDZ. May cause cutaneous vasodilatation, sweating, flushing, arrhythmias, HTN.
Naloxone (Narcan)	0.1-0.2 mg IV	Administer 0.02-0.04 mg IV every minute till the desired degree of reversal is achieved. The large bolus (0.2-0.4 mg IV) should be reserved for emergency reversal of profound respiratory depression.	1 min	15-30 min	Caution must be utilized when administering to patients with preexisting cardiac disease or patients with known or suspected physical dependence to opioids.

Recommendations for reversal agents.

- Assure that specific antagonists are immediately available in the procedure room whenever opioid analgesics or benzodiazepines are administered for moderate procedural sedation/analgesia, regardless of route of administration.
- If patients develop hypoxemia, significant hypoventilation or apnea during sedation/analgesia: (1) encourage or physically stimulate patients to breathe deeply; (2) administer supplemental oxygen; and (3) provide positive pressure ventilation if spontaneous ventilation is inadequate.
- Use reversal agents in cases where airway control, spontaneous ventilation or positive pressure ventilation are inadequate.

Reversal agents

- Naloxone/flumazenil should be available
- Routine use is strongly discouraged, use only if airway control and non-invasive ventilation is inadequate.
- Longer observation in recovery (at least 2 hrs.) if reversal agents are used.

Recovery care

Recommendations for recovery care.

- Following sedation/analgesia, observe and monitor patients in an appropriately staffed and equipped area until they are near their baseline level of consciousness and are no longer at increased risk for cardiorespiratory depression.
- Monitor oxygenation continuously until patients are no longer at risk for hypoxemia.
- Monitor ventilation and circulation at regular intervals (*e.g.,* every 5-15 min) until patients are suitable for discharge.
- Design discharge criteria to minimize the risk of central nervous system or cardiorespiratory depression following discharge from observation by trained personnel.§§§§§§

Discharge criteria

- Return to baseline level of assessment
- **Ramsay Sedation Scale ≤ 2**
- **Aldrete Recovery Score ≥ 8**
- If Aldrete Recovery Score < 8 or Ramsay Sedation Scale > 2, stay with the patient
- Should be discharged with family members
- Discharge instructions

Aldrete Recovery Score

		Score
Activity ▪ Able to move voluntarily or on command	4 extremities =	2
	2 extremities =	1
	0 extremities =	0
Respiration	Able to deep breathe and cough freely =	2
	Dyspnea or limited breathing =	1
	Apneic =	0
Circulation	BP ± 20% of Pre-anesthetic level =	2
	BP ± 20 – 50% of Pre-anesthetic level =	1
	BP greater than or equal to 50% of Pre-anesthetic level =	0
Consciousness	Fully awake =	2
	Arousable on calling =	1
	Not responding =	0
Colour	Pink =	2
	Pale, dusky, blotchy, jaundiced, other =	1
	Cyanotic	0
	TOTAL SCORE	

Expert consultation

- Co-morbidities (esp. heart and lung)
- Predicted difficult airway
- Morbid obesity
- Prolonged, unusual procedural position
- Lack of knowledge/expertise

“The very first requirement in a hospital is that it should do the sick no harm”

Florence Nightingale

Question?