



Chapter 4: procedural sedation and analgesia

Procedural Sedation

Welcome back! this episode is about....PSAA

Here's a sneak preview of the questions we'll be answering:

1. What are the depths of procedural sedation?
 - a. Describe the continuum of procedural sedation
2. Describe the recommended personnel and monitoring during PSA?
3. What are contraindications for PSA in the ED?
4. What agents can be used for procedural sedation and analgesia?
5. Describe ASA classification system
6. Describe appropriate discharge instructions for patients post-procedural sedation
7. List 8 complications / side effects of Ketamine and how some can be treated?
8. list 4 situations when ketamine may be contraindicated
9. List 4 side effects of propofol in procedural sedation

Wise questions:

What are CAEP, Acep guidelines for PSAA?

How to choose the right drug?

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1.What are the various depths of procedural sedation?

There are some key Terms that we should be familiar with:

- anxiolysis: decreased apprehension about a procedure where their level of awareness doesn't change
- analgesia: pain going bye bye
- dissociation: trance-like state : where protective reflexes are maintained such as respiration
- sedation: controlled reduction of environmental awareness
- procedural sedation and analgesia: idea is to decrease LOC **without inhibiting oxygenation, airway control.**

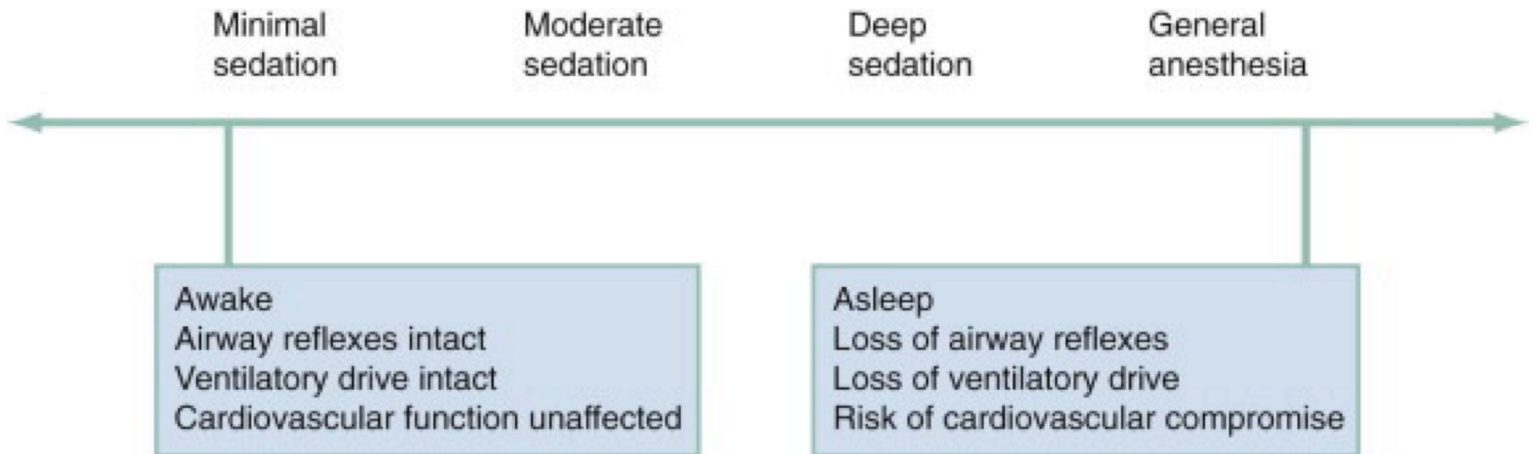
There are five traditional groups on the continuum: of procedural sedation:

<---1---2-----3-----4-----5----->

- 1) **minimal** sedation = : anxiolysis
- 2) **moderate** sedation "conscious sedation": drug induced depression where people are purposefully responding to commands when stimulated. All reflexes and hemodynamics are preserved
- 3) **Dissociative** sedation: profound analgesia, amnesia, with protective airway and resp. reflexes maintained. CV stability maintained
- 4) **Deep sedation**: depression of LOC where patients cannot be roused unless by very painful stimuli. usually require assistance to maintain an

airway and help with ventilation, but airway reflexes would kick in with intubation

- 5) **general anesthesia**: loc with no rousability even despite painful stimuli. REquires full support with ventilation and cardiovasc. support usually needed. no airway reflexes.



2. Describe the recommended personnel and monitoring during PSA.

personnel, supplies and equipment

- Minimum: ERP & nurse/RT as a support person
- supplies ready for:
 - allergic reaction,
 - oversedation,
 - resp. depression,
 - arrest
 - airway emergency (consider having the stanford airway emergencies book nearby)
- oxygen, suction, pt. monitoring (spO₂, ecg, BP, CO₂ detector, vascular access, resus. drugs), airway equipment, monitor, ACLS supplies,
- **area of controversy**: supplemental O₂ may delay rapid recognition of resp. compromise and hypercarbia when capnography isn't used
 - <--> although transient hypercarbia is less concerning than transient hypoxia!!

monitoring:

- visual obs of the patient is the best monitoring (i.e. their colour, breathing, response to pain, etc)
 - vitals, ETcO₂ (but no evidence showing affected clinical outcomes)
 - Bispectral index monitoring the frontal lobe of the brain is used in the OR...but not in the ED



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- highest risk times are when the patient is not longer receiving a painful stimulus or when in the MRI scanner,

3. What are contraindications for PSA in the ED?

- No absolute CI: Rosen's includes a discussion of avoiding it in high risk patients:
 - the bearded truck driver who just ate a steak dinner and has a buttocks abscess...can probably wait
 - use the airway mnemonics to help risk stratify your patients

The bottom line is that its a risk - benefit judgement call! e.g. the higher risk patient should get their joint reduced ASAP!

4. What agents can be used for procedural sedation and analgesia?

There are numerous agents available for PSAA....we'll post a table on our website, but we'll go through some of the most common agents here....rosen's goes through a bunch that are rarely used!

yeah, when did you last see methohexital used??

ultimately the choice of agent is complex must consider: route, risks/benefits, patient status, need for analgesia/anxiolysis/sedation/amnesia or all, and ****provider comfort/experience**** etc..

stay tuned, because we'll talk about this in the wise cracks corner section!

- the five agents you should know about are:
 - Fentanyl
 - Midazolam

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<u>AGENT</u>	Starting Dose	onset	duration	advantages	adverse effect.
Fentanyl (opiates) "get that pain undercontrol!"	1 mcg/kg IV 2 mcg/kg Intranasal**	1-2 mins 10 mins	30-40 mins 60-120 mins	rapid onset, short dur. no histamine release and minimal CV effects	resp. depression and RIGID chest syndrome (>5-7mcg/kg)
Midazolam best choice for seizures and anxiolysis	0.05 mg/kg IV 0.2 mg/kg IN* 0.5 mg/kg Rectl 0.1 mg/kg IM	1-2 mins 10-15 mins 10-30 mins 10-15 mins	30-60 mins 45-60 mins 60-90 mins 60-120 mins	rapid onset, short duration, multiple routes	1% of kids <5 have a paradoxical agitated and excited reaction (treated with flumazenil); Resp. depression esp. with opiates
Ketamine: great in kids *@\$	1-2 mg/kg IV 4-5 mg/kg IM 6 mg/kg IN	1 min 5 mins 5-10 mins	15 mins 15-30 mins 30-120 mins	airway reflexes maintained; no resp depression, predictable, relaxes airway smooth muscle	emergence phenomenon (15%)\$; emesis; 0.4% laryngospasm@
Propofol be aggressive in kids, gentle in the elderly	0.5-1mg/kg IV	<1 min	10 mins	rapid onset, short duration, antiemetic, cerebral protective	resp. depression, hypotension, injection pain%.
Etomidate generally safe if given slowly..	0.1mg/kg IV	1 min	5-10 mins	rapid onset, short duration, cerebral protective, minimal CV effects	resp. depression, myoclonus , adrenal suppression; N/V; HARD to titrate perfectly
Keta-fol	not shown to be clinically superior to either agent alone	maybe slightly higher patient satisfaction			
Nitrous oxide	inhaled 30-70%	1-2 mins	3-5 mins	rapid onset, short dur. min. CV effects	expansion of gas filled structures + emesis{

- Ketamine
- Propofol
- Etomidate

lets go through them briefly one by one

A couple caveats to know about!

- *IN midaz. is painful and irritating to the nose: so kids should have nebulized lidocaine before being given midaz. IN
- **when giving intranasal need to give Less than 1 ml of total volume per nostril and add **0.1 ml of volume for the "dead" space in the atomizer.**



- ideally give analgesic agent 30 mins before procedure so that you need less of the sedation drug and thus avoid hypotension and synergistic resp. depression
- % = for propofol painful injections give 1-2 mls of lidocaine through the IV on a tourniquet'ed arm
- propofol is very safe and predictable in kids
- { } NO = can theoretically worsen pneumothoraces, SBO's, decompression sickness, and COPD, and lead to N/V

5. Describe what you should have before starting PSAA as well as the ASA classification system?

- a full set of vital signs; mental status assessment ; Airway and CV assessment
 - use LEMON/MOANS
- a focused anesthetic history with ASA grading is adequate
 - ASA III/IV may need an anesthetic consult
 - ASA grading

Table 1. ASA Physical Status Classification.

- I. Healthy patient
 - II. Mild systemic disease—no functional limitation
 - III. Severe systemic disease—definite functional limitation
 - IV. Severe systemic disease that is a constant threat to life
 - V. Moribund patient not expected to survive without the operation
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preprocedural fasting:

- standard recommendations by ASA have no evidence with PSA&A (e.g. 6 hrs from solid ingestion)

vomiting and loss of airway reflexes is VERY rare in PSA&A, unless the airway is manipulated

- thorough discussion about risks and benefits should take place (with signed consent)

6.. Describe appropriate discharge instructions for patients post-procedural sedation?

recovery and discharge:

- must be back to baseline
- *should not drive for 12-24 hrs*
- should be supervised for at least 4-8 hrs post procedure



simple rule of thumb: don't leave the bedside until the patient is able to vocalise

7. List 8 complications / side effects of Ketamine + and how can the first four be managed?

1. hypersalivation / increased secretions
2. emesis
3. **laryngospasm**
 - a. treatment not addressed in rosen's:
 - i. PPV with BVMpeep
 - ii. Jaw thrust
 - iii. Paralysis and intubation
4. emergence reactions
 - a. \$ = only give pre-ketamine benzo's for mitigating pre-procedural anxiety, not for everyone prophylactically; treat if you have a pt. with post-ketamine emergence reaction
 - i. giving ketamine at a slow rate helps limit the transient apnea, laryngospasm, and emesis/nausea
5. transient apnea (if given quickly)
6. ? increased IOP
7. worsening psychosis (hallucinogenic effects)
8. catecholamine surge phenomenon
9. Historic thought that it increased ICP

8. List 4 situations when ketamine may be contraindicated?

laryngospasm concerns

1. infants < 3 months
2. children with ongoing URTIs

Relative Contraindications to ketamine

3. Psychosis (acute or even well controlled!)
4. globe rupture (increasing IOP)
5. significant CAD (catecholamine surge..)

9. List 4 side effects of propofol for in procedural sedation?

1. resp. depression,
2. hypotension,
3. injection pain%.
4. loss of airway reflexes

Wise Cracks corner:

In this section we want to cover four helpful clinical things:

1. How to choose the best drug for PSAA
2. What are the official EM organizations saying about PSAA
3. Touch on various reversal agents
4. Mention some pearls about PSAA in kids



How to choose the best drug

Drug selection and administration:

- questions to answer:
 - painful or NOT (e.g. fentanyl vs midazolam)?
 - length of procedure (e.g. IM ketamine for a long peds. facial lac vs. IV propofol for a short reduction)?
 - anxiolysis vs. immobility (e.g. NOT etomidate)?

What are the official EM organizations saying about PSAA

- **What are CAEP, acep guidelines for PSAA?**
 - CAEP has no official policy on PSAA
 - ACEP: (from <http://www.acepnow.com/acep-revises-clinical-policy-procedural-sedation-analgesia-emergency-department/>)
 - **Critical Questions and Recommendations**
 - does preprocedural fasting demonstrate a reduction in the risk of emesis or aspiration?
 - Do not delay procedural sedation in adults or pediatrics in the ED based on fasting time.
 - Preprocedural fasting for any duration has not demonstrated a reduced risk of emesis or aspiration for PSAA
 - does the routine use of capnography reduce the incidence of adverse respiratory events?
 - Capnography—may be used as an adjunct to pulse oximetry and clinical assessment to detect hypoventilation and apnea earlier than pulse oximetry and/or clinical assessment alone in patients undergoing procedural sedation and analgesia in the ED.
 -
 - what is the minimum number of personnel necessary to manage complications?
 - the provider performing the procedure, a nurse or other qualified individual should be present for continuous monitoring of the patient during procedural sedation and analgesia.
 -
 - in the ED can ketamine, propofol, etomidate, dexmedetomidine, alfentanil, or remifentanil be safely administered?
 - YES
 - **Level A recommendations:** Ketamine can be safely administered to children and propofol can be safely administered to both children and adults for procedural sedation and analgesia in the ED.
 - **Level B recommendations:** Etomidate can be safely administered to adults for procedural sedation and analgesia in the ED. A combination of propofol and ketamine can be safely administered to both children and adults for procedural sedation and analgesia.
 - **Level C recommendations:** Ketamine and alfentanil can be safely administered to adults, and etomidate can be safely administered to children for procedural sedation and analgesia in the ED.



Touch on various reversal agents

Reversal and rescue agents:

- usually excessive sedation can be mitigated by airway maneuvers and BVM prn
- REversal of opiates and benzo's are not recommended as a routine but if you absolutely must here are your options: narcan and flumazenil.
- Narcan: narcan
 - competitive antagonist of opioids
 - half life of 45 mins
 - those with large doses of fentanyl or heroin may be sedated after one dose
 - IV, IM, SC, or ET all are fine
 - usually 0.2 mg IV prn
 - titrate to resp. rate
- Flumazenil
 - NOT effective for reversing the resp. depression induced by benzos
 - onset of 1-2 mins, duration 30-90 mins
 - ***effective at reversing the paradoxical excitement in kids who are given benzo's***
 - same doses as narcan!
 - 0.1 - 0.2 mg IV q 1--2 mins prn
 - max dose 1 mg
 - in kids: 0.02 mg/kg (atropine dose!)
 - USE EXTREME CAUTION in those with chronic benzo. dependence or a history of seizures:
 - may lead to life threatening status epilepticus

Mention some pearls about PSAA in kids

special considerations for peds. populations

- use distraction as much as possible (child life, parents telling stories)
- **ketamine and propofol are both very safe**
 - don't pee your pants just cus its a kid!
 - ****PEARL the **pre-ketamine discussion** with patients and family**** warning them about secretions, and optimizing how the room is layed out..
- use of EMLA or LET when possible
- calculate the drug doses carefully! and make sure backup equipment is handy
- don't use Chloral hydrate: it has a very poor safety record!
 - prolonged recovery time, delayed onset, etc.
 - treat overdoses with beta blockers!