

EM Basic- Procedural Sedation Part 1

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Procedural sedation- sedation, analgesia, and/or amnesia to accomplish procedures in the ED (fracture reductions, I and D, chest tubes, etc.)

History and Physical and NPO status

Medical history- heart disease, afib, hypertension, sleep apnea, medication allergies, reactions to anesthesia in the past or known difficult airway

NPO status- last food or drink

- Standard OR practice- NPO after midnight- not practical
- Institutional practices vary- follow guidelines
- No great evidence for 2 hours vs. 4 hours vs. 6 hours
- Reasonable approach- large meal prior to ED stay- 2 hours, liquids only 1-2 hours

Physical exam- focus on airway exam- any predictors of difficult airway? Restricted mouth opening, short neck, etc.

Final decision- take all of the above into account and make a decision as to whether ED procedural sedation is appropriate vs. the OR

PEARL- some institutions limit ED procedural sedation to certain ASA classes- follow your institutional guidelines with all of this

Example- Athletic 17 year old male with shoulder dislocation (good)
85 year old obese male with afib, hypertension, sleep apnea with hip dislocation (bad- multiple co-morbidities and need for deeper sedation)

Depth of sedation- not important to memorize levels but can help you decide on which medication to use

Minimal sedation (anxiolysis)- Patient is drowsy but maintains cardiovascular and respiratory status

Example- Laceration repair on an anxious patient with a few milligrams of midazolam (Versed), Abscess packing change in groin with fentanyl

Moderate Sedation- The level of sedation we usually aim for- depressed level of consciousness but responds to verbal or light tactile stimulation. Cardiovascular and respiratory status maintained

Example- Shoulder reduction using etomidate

Deep sedation- Depressed level of sedation but can't be easily aroused but can respond purposefully after repeated rounds of painful stimulation

PEARL- Deep sedation is a dirty word in the ED at some institutions, just about any procedural sedation medication can achieve deep sedation but it is needed sometimes to get the procedure done

Example- Hip reduction using propofol (Diprivan)

General anesthesia- only time we do this in the ED is RSI

Dissociative sedation- a trance-like state of profound amnesia and analgesia with maintenance of airway reflexes and spontaneous respirations- unique to the drug ketamine

Preparation for procedural sedation

Consent for procedure- consent for the sedation and/or the procedure (if a consultant is doing the procedure). Consent usually not necessary for minimal sedation but for moderate sedation it is REQUIRED
Sample script reviewing sedation, risk, benefits, and alternatives:

We would like to give you sedation to do this procedure. We will give you a medication so that you shouldn't remember what is going on. It's possible that you may wake up a little bit during the procedure and be aware of what is going on but you won't really care. During this time you will still be breathing on your own and we will watch you very closely. The benefit to this sedation is that you will be nice and relaxed for the procedure and you probably won't remember most of what happens. This is something that we do a lot in the ER and we are very comfortable doing it. However, as with any sedation, there are risks but they are small. The main risk is that you could stop breathing to the point where we have to breathe for you or put a tube down your throat or that something else unexpected will happen. There are also risks of aspiration where you breathe your stomach contents into your lungs but that is rare as well. Much more common is being nauseous or drowsy when you wake up from the sedation. The alternative to this sedation is that we only use local anesthesia or no sedation at all. Do you have any questions?"

PEARL- If using ketamine on a child- warn the parents regarding nystagmus and the possibility of emergence reaction (“David after Dentist” on youtube- that is a mild but hilarious emergence reaction) . Describe it as a bad dream. Can be treated with small doses of versed.

PEARL- High flow does NOT interfere with end-tidal CO2 monitoring

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Equipment preparation- most important step- probably only need pulse ox for minimal sedation but all of this is REQUIRED for moderate sedation and above

Don’t leave anything to chance!

Pneumonic- ABCDE PO

Airway

Breathing

Cardiac Monitor

Drugs

End-tidal CO2

Paralytics

Oxygen

Airway- Airway cart to the bedside, all equipment pulled out and measured- correct handle and blade, correct tube size, stylets, etc.

Breathing- Correct sized bag valve mask with right sized face mask hooked up to oxygen, suction available and working

Cardiac- Full cardiac monitor hooked up to patient to include continuous EKG, pulse ox, and blood pressure monitoring

Drugs- Procedural sedation meds drawn up, double and triple check the dose, make sure weight is accurate and in kilograms

End-tidal CO2- Place an end-tidal CO2 monitor on the patient and make sure you have a good waveform on the monitor

Paralytics- Have the RSI kit with paralytic meds at the bedside and calculate dose ahead of time (have it ready, don’t have to draw it up), always have to be ready for RSI with procedural sedation

Oxygen- Place the patient on high flow oxygen a few minutes before you do the procedure and keep it on during the procedure

EM Basic- Procedural Sedation Part 2

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Oxygen use during procedural sedation

My view- use high-flow oxygen and end-tidal CO₂ on every sedation, lots of literature to say that it prevents desaturation and the need to intervene on the patient's airway. Gives the patient a buffer where they can be apenic but not drop their O₂ sat. Physical exam and observation is NOT sensitive enough to detect apnea- need to use end-tidal CO₂ detector which will tell you the second the patient goes apenic

Other theory- no oxygen during sedation because you "want to know when the patient goes apenic" More commonly practiced when end-tidal CO₂ monitoring wasn't as available. The problem- without that buffer, patient can desat VERY quickly- gets to 95% then next reading may be 85% or lower. Hypoxia is very bad! Can make an argument that if you don't have end-tidal CO₂ you should do this but I disagree

Airway interventions- start at the top and work downwards

Verbal/tactile stimulation- yell the patient's name or do a sternal rub

Reposition the airway- especially if the patient is having snoring respirations- jaw thrust- with both hands, place fingers behind the angle of the mandible and lift up towards the ceiling- double bonus- it hurts!

BVM ventilation- ventilate the patient using the BVM hooked up to oxygen, use one person to hold the mask in place, the other person squeezes the bag- see Reuben Strayer's website for a short video- <http://emupdates.com/2012/01/11/11-minute-screencast-emergency-ventilation/>

PEARL- Ketamine can cause transient laryospasm, usually in kids but its rare (about 1 in 1000), usually responds to BVM ventilation, however you have to be prepared to do RSI if it is persistent or severe

Intubation with RSI- ALWAYS the final step in any patient who is not oxygenating and ventilating. Need to be prepared to do it with every procedural sedation. This is where having the paralytics at the bedside and the equipment measured ahead of time will save you and the patient.

PEARL- Etomidate can cause masseter spasm that may require RSI as well but it is also rare

Procedural sedation medications

Minimal sedation- place patient on a pulse ox while using

Midazolam (Versed)- benzodiazepene, will make patient sleepy and give anxiolysis

Dose- 0.01 to 0.2 mg/kg- 2 to 3 mg/kg IV in an adult
Max 5 mg IV at a time- can cause hypotension and respiratory depression,

Lorazepam (Ativan)- benzodiazepine- similar to versed.

Dose- 0.1 mg/kg- 1 to 2 mg IV in adults, titrate q 5 minutes PRN

Fentanyl- short acting opiate

Dose- 1 mcg/kg IV, can re-dose q 5 minutes PRN- less hypotension and histamine release than morphine

Morphine- longer acting opiate

Dose- 0.1 mg/kg IV, most clinicians use 8mg IV as a max, can cause nausea and vomiting, hypotension

Moderate sedation

Versed/fentanyl- least favorite option- hard to titrate, especially the versed, patients have very variable response to versed. Give usual dose of fentanyl first, then followed by versed at above dose. Versed takes about 3-5 minute to be effective so be patient- will probably sedate the patient for about an hour and they will be drowsy for a while.

Cautions: Combination of versed/fentanyl causes more hypotension and respiratory depression than other agents with a long recovery time.

Moderate sedation (continued)

Etomidate- ultra-short acting non-barbituate sedative.

Dose- 0.1 mg/kg IV- (1/3 RSI dose). Gives sedation for 3-5 minutes but wake up completely alert and oriented. Good muscle relaxation

Cautions- can cause masseter spasm that may require RSI (rare), more commonly causes myoclonus (shaking of extremities) that may be mistaken for a seizure, etomidate has no pain control properties, don't push slowly or full effect won't be realized (push over 10-20 seconds- not 2 minutes)

Deep sedation- any agent can cause deep sedation but propofol is the most commonly used drug

Propofol (diprivan)- sedative hypnotic, quick on/quick off. Unconsciousness within a few heart beats, recovery in 2 to 3 minutes with patient fully awake. Makes it very easy to titrate to correct level of sedation. Can provide excellent muscle relaxation for something like a hip reduction.

Dose- 1 mg/kg IV, can repeat doses of ¼ to ½ of first dose as needed to maintain desired level of sedation

Cautions- very well known to cause hypotension and apnea, however usually transient given how fast propofol is metabolized. As always, be prepared to intervene on the airway all the way up to an RSI. No intrinsic pain control properties

Dissociative sedation- unique to ketamine

Ketamine- PCP derivative- Dissociative agent that provides pain control and amnesia while maintaining airway reflexes. Disconnects the brain from the body. Sedation 20-30 minutes IV, 30-40 minutes IM. Onset of action 30-60 seconds IV, longer for IM

Dose- 1-2 mg/kg IV, 2-4 mg/IM

Cautions- Will cause nystagmus (warn parents of pediatric patients about this), avoid in patients with hypertension and coronary artery disease

(causes hypertension), in theory- avoid in head injury (raises ICP) but this is debatable and mostly debunked, can rarely cause laryngospasm- usually responds to BVM ventilation but may require RSI, can cause vomiting but this is easily treated with Zofran (ondansetron)

Emergence reaction- vivid dreams that occur as the ketamine wears off- mostly good dreams but they can be bad and cause the patient and/or family a lot of distress. More common in adults than kids. Can use guided imagery- before you give the ketamine, have the patient think of a nice memory (keep it PG-13 in the adults so they don't go recounting their sexual exploits). Not evidence based (as far as I know) but relatively well accepted. For a child, ask them what they like and have them think about that as the ketamine goes in. You'll be surprised how often this works and they have a good dream.

Treating emergence reactions- use small doses of versed (midazolam)- probably treats the patient's family and us more than the patient

Ketofol- a combination of ketamine and propofol-theory is that they counter-act the bad things from each other- propofol causes hypotension but is also an anti-emetic, ketamine causes hypertension but also causes vomiting. Most literature I've seen says that it doesn't improve any clinically meaningful outcomes. Make a 1:1 mixture in the same syringe and dose it as you would dose propofol

Example ketofol mixture

Propofol 10mg/ml

Ketamine 100 mg/ml (check this as ketamine can also be 50 mg/ml)

Dilute 1 ml of ketamine (100 mg/ml) in 9 ml of normal saline

Ketamine is now 10 mg/ml (same as propofol)

In 20 ml syringe- 10 ml of propofol and 10 ml of **DILUTED** ketamine
Dose- "average 70 kg adult" at 1 mg/kg of propofol = 70 mg of propofol
70 mg of propofol = 7 ml of ketofol (10 mg/ml)

PEARL- really make sure you double and triple check your dosing for this, get the nursing staff involved and have two different people look over the drug concentrations, drug dose, and mixture ratio