

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 larygospasm, 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 1/4 to 1/2 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