

Sedatives, Analgesics and Paralytics

"I want the one the starts with 'D'"

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Objectives

TLDR: You need to know the drugs you are ordering.

- Analgesics:
 - Hydromorphone, Morphine, Fentanyl
- Sedatives/Anxiolytics:
 - Diazepam, Midazolam, Etomidate, Dexmedetomidine, Propofol, Ketamine
- Paralytics:
 - Succinylcholine, Rocuronium, Vecuronium, Cisatracurium

Analgesics

Hydromorphone (Dilaudid)

- Opiate
- Longer acting than morphine or fentanyl
- Can affect hemodynamics but usually minimally
- Generally dosed 0.25mg-1mg q2-4hr PRN; can do more frequently with appropriate monitoring

Analgesics

Morphine

- Opiate
- Moderate for time of action
- Can affect blood pressure a little more than the others
- Usually dosed 2mg-4mg q1-2hr PRN
- Common choice for comfort measures drip, however most reliant on renal excretion of the three so use caution with CKD/renal failure

Analgesics

Fentanyl

- Opiate
- Shortest acting of the three discussed
- Usually minimal effect on hemodynamics especially when using drip
- Generally dosed 25mcg-50mcg q30min-1hr PRN
- Most common analgesics drip used in our ICU
 - Drip starts often at 50mcg/hr, but can be titrated up fairly often, sometimes 400mcg/hr

Analgesics

Clinical Pain Observation Tool (CPOT)

- Scoring system to titrate analgesics
- Score ranges from 0 to 8
- Generally goal is CPOT<3

Sub-scale	Description	Score
Facial expression	Relaxed, neutral	0
	Tense	1
	Grimacing	2
Body movements	Absence of movements	0
	Protection	1
	Restlessness	2
Muscle tension	Relaxed	0
	Tense, rigid	1
	Very tense or rigid	2
Compliance with ventilation	Tolerating ventilator or movement	0
	Coughing but tolerating	1
	Fighting ventilator	2
Vocalisation (extubated patients)	Talking in normal tone or no sound	0
	Sighing, moaning	1
	Crying out, sobbing	2

Sedatives/Anxiolytics

Diazepam (Valium)

- Benzodiazepine
- Pros:
 - Anxiolytic, mild sedative, antiseizure, muscle relaxant
- Cons:
 - Can precipitate delirium
 - Causes respiratory depression
 - Addictive
 - IV formulation has propylene glycol—> can lead to hyperosmolarity, consider with unexplained anion gap acidosis
- Dose: generally 5mg-10mg q8hr PRN

Sedatives/Anxiolytics

Midazolam (Versed)

- Benzodiazepine
- Pros:
 - Good for deep sedation, long-acting, amnestic!
 - Available as intranasal for procedures- great for peds
- Cons:
 - Can precipitate delirium/hallucinations
 - Causes respiratory depression
 - Hepatically cleared- use caution in ESLD patients
 - Water soluble so will accumulate with longer use and have longer clearance
- Dose: 0.5mg-1mg PRN, can redose q2-3min. Drip should be lowest effective but can go up high ~10mg/hr

Sedatives/Anxiolytics

Etomidate

- Induction agent
- Pros:
 - Rapid on/off so good for intubation and short procedures (shoulder reduction, etc)
 - Generally low effect on hemodynamics but can cause hypotension in tenuous patients
 - Amnestic
- Cons:
 - Causes respiratory depression
 - Adrenal insufficiency- rare but has been observed in patients who receive single dose
- Dose 0.3 mg/kg for induction

Sedatives/Anxiolytics

Dexmedetomidine (Precedex)

- Activates alpha-2 receptors in brain and spinal cord
- Pros:
 - Does not cause respiratory depression, patients can be awake with mild sedation
 - Anxiolytic, short acting, helps insomnia
 - Good for alcohol withdrawal but DOES NOT PREVENT WITHDRAWAL SEIZURES
- Cons:
 - Commonly causes bradycardia, can also cause hypotension
- Dose: Start at 0.2mcg/kg/hr, titrate up as needed up to 4mcg/kg/hr - often 2.5mcg/kg/hr is max given bradycardia/hypotension. Also RN can not titrate above 1.4 mcg/kg/hr so physician titrate a if higher

Sedatives/Anxiolytics

Propofol (Diprivan)

- Inhibits GABA by binding to GABA-A receptors in brain
- Pros:
 - Quick on/off—> short acting. Good induction/moderate sedation agent as well as continuous drip
 - Anti-seizure, amnestic, generally does not cause delirium
 - Can decreased ICP
- Cons:
 - Can significantly affect hemodynamics—> decreased BP, RR and HR
 - Increased fat in infusion—> triglycerides
 - Propofol-related infusion syndrome (PRIS)—> metabolic acidosis, ARF, hyperkalemia, rhabdo, arrhythmias
- Dose: Induction 1.5-2mg/kg. Moderate sedation: 1-2mg/kg. Drip starts at 5-10mcg/kg/min, can increase up to 80mcg/kg/min

Sedatives/Anxiolytics

Ketamine

- NMDA receptor antagonist, induction/sedation agent
- Pros:
 - Dissociative/amnestic, analgesic and anxiolytic properties
 - Not associated with respiratory depression—> good for moderate sedation procedures
- Cons:
 - Sympathomimetic: increases BP (can help in shock patients) and HR, increased IOP, increased salivation
 - Can cause laryngospasm if pushed too quickly
 - Emergence reaction
- Dose: Induction: 2-4.5mg/kg. Moderate sedation: 1-2mg/kg, Drip starts at 0.1mg/min, can increase to 2mg/min

Sedatives/Anxiolytics

Richmond Agitation and Sedation Score (RASS)

- Score used to titrate sedation
- Range from -4 to +4
- Goal often -1 to 0
- Severe ARDS/high ICPs, often -4 to -5

Richmond Agitation-Sedation Scale		
Target RASS Value		RASS Description
+4	Combative	Combative, Violent, Immediate Danger to Staff
+3	Very Agitated	Pulls or Removes Tube(s) or Catheter(s); Aggressive
+2	Agitated	Frequent non-Purposeful Movement, Fights Ventilator
+1	Restless	Anxious, Apprehensive but Movements are not Aggressive or Vigorous
0	Alert and Calm	
-1	Drowsy	Not Fully Alert, but has Sustained Awakening to Voice (Eye Opening & Contact >10sec)
-2	Light Sedation	Briefly Awakens to Voice (Eye Opening & Contact <10sec)
-3	Moderate Sedation	Movements or Eye Opening to Voice (BUT NO Eye Contact)
-4	Deep Sedation	No Response to Voice, BUT has Movement or Eye Opening to Physical Stimulation
-5	Unarousable	No Response to Voice or Physical Stimulation

Paralytics

Succinylcholine

- Depolarizing paralytic, used for RSI
- Pros:
 - Short acting
- Cons:
 - Muscle fasciculations—> increased K
 - Contraindicated >48 hrs from burn/crush injury OR in neuromuscular disease
 - Malignant hyperthermia
- Dose: 1.5 mg/kg IV

Paralytics

Rocuronium

- Non-depolarizing paralytic. Most commonly used in RSI. Sometimes dose given in ARDS/TBI patients
- Pros:
 - Avoids hyperkalemia, no muscle fasciculations
- Cons:
 - Moderately long-acting
 - Variable excretion with renal disease
- Dose: 1 mg/kg IV
- Reverse with sugammadex or neostigmine

Paralytics

Vecuronium

- Non-depolarizing paralytic. Often used in anesthesia.
- Pros:
 - Avoids hyperkalemia, no muscle fasciculations
- Cons:
 - Moderately long-acting
 - Hepatically cleared
- Dose: 0.1-0.2 mg/kg IV for RSI, 0.08-0.1 mg/kg in controlled OR setting
- Reverse with sugammadex or neostigmine

Paralytics

Cisatracurium (Nimbex)

- Non-depolarizing agent, longest acting
- Often used as a drip for patients requiring paralysis in ICU
 - Severe ARDS with vent dyssynchrony despite maximal sedation
 - Severe TBI with refractory elevated ICPs despite sedation/osmotic agents
- If using drip, RASS should be -4 to -5, then FIX sedation. DO NOT TITRATE sedation while paralytic drip is running.
- Can lead to severe muscle/respiratory weakness with prolonged use
- Dose: start at 3 mg/kg, then reduce to 1-2 mg/kg to maintain. Follow train-of-four
- Reverse with neostigmine (sugammadex will not work)

Paralytics

Train-of-Four

- Use of a peripheral nerve stimulator to monitor level of paralysis. Goal is train of 2 out of 4
- Ulnar nerve is preferred, look for thumb twitching
 - Can also use facial nerve, posterior tibial nerve
- Count the number of twitches:
 - 4 twitches—> 0-75% receptors blocked
 - 3 twitches—> at least 75% receptors blocked
 - 2 twitches—> 80% receptors blocked
 - 1 twitches—> 90% receptors blocked
 - 0 twitches—> 100% receptors blocked

Conclusion

- It is important to understand the different uses and doses for the medications we use in the ICU
- Within each category (analgesics, sedatives, paralytics), each medicine has its own pros and cons
- If you are unsure which medication to choose or need help with dosing, ask for help!