Advanced Patient Monitoring

Nursing Upskill ICU & Critical Care

Pharmacology

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Passion for excellence.
Compassion for people.

Objective

- Describe common uses for medications in the critical care patient population

Vasopressors

Norepinephrine
(Levophed)

- Elevates Heart Rate
- Elevates Blood Pressure
- Increases Cardiac Output

- Dose Titratable
  - 0.025-3 mcg/kg/min

- Monitoring
  - BP
  - Rate, Rhythm
  - Injection Site

- Risk
  - Dysrhythmia
  - HTN
  - Urine Output

Vasopressin

- Elevates Blood Pressure
- Retains Water

- Dose Titratable
  - 0.01-0.1 units/min

- Monitoring
  - Effect on BP
  - Signs of Fluid Overload

- Risk
  - Rhythm Changes
  - Hyponatremia

Phenylephrine

(Neo-Synephrine)

- Elevates Blood Pressure
- Minimal effect on Rate or Inotropy

- Dose Titratable
  - 0.125-9 mcg/kg/min

- Monitoring
  - Blood Pressure
  - Rhythm

- Risk
  - Dysrhythmia
  - HTN
  - MI
  - Pulmonary Edema

Epinephrine

- Elevates Heart Rate
- Elevates Blood Pressure
- Increases Cardiac Output

- Dose Titratable
  - 0.005-0.2 mcg/kg/min

- Monitoring
  - Rate, Rhythm
  - BP
  - Signs of increased perfusion
  - Injection site
- Risk
  - Dysrhythmia
  - Pulmonary Edema
  - HTN

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Dopamine
(Inotropin)

- Elevates Heart Rate
- Elevates Blood Pressure
- Increases Cardiac Output

- Dose Titratable
  - 0.125-20 mcg/kg/min

- Monitoring
  - Heart Rate
  - BP
  - Injection Site

- Risk
  - HTN
  - Arrythmias
  - Dyspnea

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Dobutamine

(Dobutrex)

- Elevates Heart Rate
- Increases Cardiac Output

- Dose Titratable
  - 0.125-20 mcg/kg/min

- Monitoring
  - Heart Rate
  - Blood Pressure
  - Rhythm

- Risk
  - HTN
  - Arrhythmias
  - Dyspnea

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Antihypertensives

Nitroglycerin

- Decreases Blood Pressure
- Could increase or decrease Cardiac Output

- Dose Titratable
  - 0.125-200 mcg/min

- Monitoring
  - BP
  - Neurologic Status

- Risk
  - Hypotension
  - Dizziness, Headache

Clevidipine

- Decreases Blood Pressure
- Decreases systemic vascular resistance

- Dose Titratable
  - 2-16 mg/hr

- Monitoring
  - BP
  - Rate
  - Rhythm

- Risk
  - Hypotension
  - A-fib
  - Renal failure

Nicardipine

- Decreases Blood Pressure
- Relaxes vascular smooth muscle

- Dose Titratable
  - 0.5-15 mg/hr

- Monitoring
  - BP
  - Rate, Rhythm
  - Rotate IV site (phlebitis)

- Risk
  - Hypotension
  - Tachycardia
  - N/V

Nitroprusside

- Elevates Heart Rate
- Decreases Blood Pressure
- Decreases Cardiac Output

- Dose
  - 0.05-10 mcg/kg/min

- Monitoring
  - BP
  - Heart Rate and Rhythm
  - Injection Site

- Risk
  - Hypotension
  - Metabolic Acidosis

Antiarrhythmic

Amiodarone

- Decreases Heart Rate
- Decreases Blood Pressure
- Increases Cardiac Output

- Dose Protocol Based
  - 1 mg/min x 6 hrs then 0.5 mg/min x18 hrs
  - Physician may order bolus of Amiodarone

- Monitoring
  - Heart Rate and Rhythm
  - Blood Pressure
  - GI
  - Use In-line filter

- Risk
  - Hypotension
  - N/V
  - Dysrhythmia

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Digoxin

- Decreases Heart Rate
- Elevates Blood Pressure
- Increases Cardiac Output

- Dose
  - 0.125-0.5mg

- Monitoring
  - Rate
  - Rhythm
  - BP

- Risk
  - Bradydysrhythmias
  - Hyperkalemia
  - N/V
  - Confusion

Diuretics

- Loop – 1st choice
  - Dose-related response
  - Vasodilation
  - Monitor K and Mg
    - MUST fix Mg to fix K!
- Fluid overload and other agents
  - Tolerate other drugs better if fluid balanced
  - Titrate diuretic to tolerate ACE/ARB
- Furosemide
  - Twice daily w/↓ renal fxn
  - Slow infusion
  - BP
- Torsemide (Demadex)
- Bumetanide
  - ACHINESS with drips!

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Pain Medications

Pain Medications

- It is important to recognize that these patients have at least some pain-if only from being intubated

Drug	Loading Dose	PRN Dose	Infusion Rate
Fentanyl	25-50 mcg q 15" PRN x3 doses max in 1 hr	25-50 mcg q 30-60" PRN	100-200 mcg/hr OR 0.5-2 mcg/kg/hr
Hydromorphone	0.2-0.5mg q 5" PRN x3 doses max in 1hr	0.5-1mg q 30-60" PRN	0.2-1mg/hr
Morphine	2-4 mg q 5" PRN x3 doses max in 1 hr	2-10mg q 30-60" PRN	1-10mg/hr

Pain Monitoring

- Is patient able to communicate pain level?
  - Hold up fingers to indicate pain level

- Unable to indicate pain level?
  - —Use CPOT (Critical Care Pain Observation Tool)
    - —Facial Expression
    - —Body Movements
    - —Muscle Tension
    - —Assess ventilator compliance

Pain Monitoring

- Consider that all vented patients have some pain
- Treatment of pain is first line care
- Score of 2 or more calls for treatment
    - —Facial Expression
        - —Relaxed (0), Tense (1), Grimace (2)
    - —Body Movements
        - —No movement (0), Protection (1), Restless (2)
    - —Muscle Tension
        - —Relaxed (0), Tense (1), Rigid (2)
    - —Assess ventilator compliance
        - —Tolerates vent (0), Coughing (1), Fighting (2)

Treating Pain

- Consider adjunctive therapy
  - APAP-general aches and pains
  - Gabapentin-neuropathic pain (DM)
  - Ketamine-to decrease opiate usage especially in high opiate doses

- Does patient take pain medication at home?
  - What kind, how often?

Sedation

Sedatives

- Commonly administered sedatives to be used in conjunction with pain medication:

Drug	Loading Dose	PRN Dose	Infusion Rate
Ativan	0.5-1 mg	Bolus w/rate increase	0.5-10mg/hr Consider intermittent/PRN
Versed	1-4 mg	Bolus w/rate increase	1-20 mg/hr Consider intermittent/PRN
Propofol	none	none	5-70mcg/kg/min
Precedex	1mcg/kg (from bag)	none	0.1-1.5mcg/kg/hr

Sedation Monitor

- BIS monitor
  - Monitors for EMG/EEG activity
  - Goal is 40-60
  - If patient is paralyzed it is a good guide
  - Remember that pain medication sedates also
  - Watch for pressure related skin issues under BIS sensor
  - RASS Richmond-Agitation Sedation Scale
    - —From +4 (combative) to -5 (unarousable) 0=alert/calm
    - —Goal: -2 to -5 depending on condition

Sedation Assessment

- Complication/Risk
  - Over-sedation:
    - Long term cognitive problems even after going home
    - longer intubation times if over-sedated
  - Under-sedation:
    - PTSD is correlated with ICU stays, esp. intubated pts
    - self extubation

REMEMBER: They can still hear you!!

Have a positive attitude while you provide cares for these patients

Paralytics

Paralytics

- Cause paralysis (NMB)including the diaphragm arms and legs as well as facial muscles. Patient MUST be vented.

Drug	Loading Dose	PRN Dose	Infusion Rate
Rocuronium	0.1-1.2 mg/kg	None	10-12mcg/kg/min
Cisatracurium	0.15-0.2mg/kg	Bolus from bag 0.15 mg/kg	1-6mcg/kg/min
Vecuronium	0.08-0.1mg/kg over 1 minute	Bolus from bag .02 mg/kg	0.2-2.5mcg/kg/min

Paralytic Monitoring

- Purpose of paralytic here, is to assure ventilator compliance, especially in ARDS/respiratory distress
  - Watch for ventilator synchrony
    - If “fighting the vent” or coughing need more paralytic
  - Glabellar taps
    - Tap on forehead between the eyebrows watching for flinching or blink reflex (should not be present)
    - —TOF-train of four, not our current practice, equipment delivers 4 electrical stimuli to electrodes applied to the skin causing twitches of the associated muscle via the nerve pathway

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Paralytic Monitoring

- Complication/Risks:
  - Caution: Patients must be intubated to receive NMBs if not they will respiratory arrest
- Goal is to maintain paralysis with as low a dose as possible to minimize metabolite build up
- Rule of thumb is that each day of paralysis requires 2 days of rehab for patient to achieve prior level of mobility and strength