AUTHORIZED PHARMACEUTICALS

Adenosine

Albuterol Sulfate

Amiodarone

Acetylsalicylic Acid (Aspirin)

Atropine (Cardiac)

Atropine (Tox)

Calcium Chloride

Ceftriaxone (Rocephin)

Dextrose

Diltiazem (Cardizem)

Diphenhydramine (Benadryl)

Droperidol

Epinephrine 1:1000 (1mg/ml)

Epinephrine Drip Chart

Epinephrine 1:10,000

Etomidate

Fentanyl

Glucagon

Hypertonic Saline (3%)

Ipatroprium Bromide (Atrovent)

Ketamine

Levetiracetam (Keppra)

Lidocaine

Magnesium

Methylprednisolone (Solumedrol)

Midazolam (Versed)

Naloxone (Narcan)

Nitroglycerin

Norepinephrine (Levophed)

Norepinephrine Drip Chart

Ondansetron (Zofran)

Sodium Bicarbonate

Tranexamic Acid (TXA)

Authorized Pharmaceuticals

ADENOSINE (ADENOCARD®)

Pharmacologic Properties:

Adenosine is an endogenous purine nucleoside that slows conduction time through the AV node and interrupts AV reentry pathways which restores normal sinus rhythm in patients with paroxysmal supraventricular tachycardia (PSVT). The onset of action is variable between 5-30 seconds and the duration of action is also variable but usually < 10 seconds.

Indications:

- PSVT (rate > 150)
- Stable, Regular monomorphic Wide-complex tachycardia (rate >150) (contraindicated in polymorphic and/or irregular wide complex)

Contraindications:

- 2nd or 3rd degree AV block
- Sick sinus syndrome
- Known hypersensitivity
- WPW wide irregular

Precautions:

- Effects of adenosine are antagonized by methylxanthine (theophylline and caffeine)
- Adenosine can provoke bronchospasm and should be used cautiously in patients with reactive airway disease
- Tegretol and Persantine may potentiate the effect of Adenosine
- Adenosine is not effective in converting atrial fibrillation or flutter
- The half-life of adenosine is < 5 seconds - the drug should be administered via a large bore IV or IO in the upper extremity, and at the port closest to the IV hub

Side effects/ adverse reactions:

- Cardiovascular- transient chest pain, transient asystole
- Facial flushing (transient)
- Respiratory- transient dyspnea
- Metallic taste

Dosage/ administration:

- Adult
    - 6 mg rapid IV bolus over 1-3 seconds
    - If inadequate response in 1-2 minutes, administer 12 mg rapid IV bolus over 1-3 seconds
- Pediatric
    - 0.1 mg/kg rapid IV/IO bolus over 1-3 seconds (maximum dose 6 mg)
    - If inadequate response in 1-2 minutes, administer 0.2 mg/kg (maximum dose 12 mg) rapid IV bolus, over 1-3 seconds

ALBUTEROL SULFATE (PROVENTIL, VENTOLIN®)

Pharmacologic Properties:

Albuterol is primarily a beta-2 agonist that produces bronchodilation with limited cardiovascular side effects due to its high specificity for beta-2 receptors. Onset is within 15 minutes; peak effect is in 60-90 minutes. Therapeutic effects may be active for up to 5 hours.

Indications:

- Acute bronchospasm (wheezing)
- Moderate to severe allergic reaction
- Pediatric allergic reaction/ anaphylaxis
- Hyperkalemia (peaked T waves)

Contraindications:

- Known hypersensitivity

Precautions:

- Use cautiously in patients with coronary artery disease, hypertension, hyperthyroidism, diabetes.

Side effects/ adverse reactions:

- Nervousness
- Tremor
- Tachycardia
- Hypertension
- Nausea
- Vomiting

Dosage/ administration:

- Each unit dose delivers 2.5 mg of Albuterol Sulfate in 3 ml total solution in adult and pediatric patients
- Adult
    - 2.5 mg/3 ml administered via nebulization
    - Repeat as needed to maximum total 3 doses
- Pediatric
    - 2.5 mg/3ml administered via nebulization
    - Repeat as needed to maximum total 3 doses

AMIODARONE (CORDARONE®)

Pharmacologic Properties:

Amiodarone is considered a class III antiarrhythmic. It possesses electrophysiologic characteristics of sodium, potassium and calcium channel blockade, as well as alpha and beta adrenergic blocking activity. These properties prolong action potentials and repolarization, stabilizing myocardial membranes.

Indications:

- Ventricular Fibrillation/pulseless Ventricular tachycardia
- Ventricular tachycardia without overt signs of shock (SBP > 90)
- Wide complex tachycardia of unknown etiology
- Pediatric VF/pulseless VT

Contraindications:

- Cardiogenic shock
- Marked sinus bradycardia
- Second or third degree AV block
- Known hypersensitivity

Precautions:

- Solution is extremely viscous, *Do Not Shake*
- Administer the medication slowly
- Use large bore filtered needles, or needless filter straws

Side effects/ adverse reactions:

- Hypotension
- Bradycardia
- Adverse effects can be treated by the following:
    - Slow the rate of drug infusion
    - IVF bolus, pressors, chronotropic agents, or temporary pacing

Dosage/administration:

- Adult cardiac arrest
    - 300 mg, IV/IO bolus
        - If administered undiluted, immediately follow with 10-20 ml bolus of NS
            - For persistent VF/VT repeat 150 mg next cycle if indicated, IV/IO bolus (maximum total dose 450 mg)
- Adult non-cardiac arrest
    - 150 mg (mixed in 100 ml of D5W), IV over 10 minutes
    - Repeat 150 mg IV (over 10 min) every 10-15 min as needed (maximum total dose 450 mg)
- Pediatric cardiac arrest
    - 5 mg/kg, IV/IO bolus (maximum individual dose 300 mg)
    - For persistent VF/VT repeat 5 mg/kg next cycle if indicated, IV/IO bolus (maximum total dose 15 mg/kg or 450 mg)

ACETYLSALICYLIC ACID (ASPIRIN®)

Pharmacologic properties:

Aspirin is a salicylate with anti-platelet activity. It inhibits cyclooxygenase, blocking the synthesis of prostaglandin to interfere with platelet aggregation. This action has been demonstrated to reduce mortality in patients suffering from myocardial infarction. Aspirin also has moderate analgesic and antipyretic effects. The onset of action is 5-30 minutes, and the duration of action is 3-6 hours.

Indications:

- Acute Myocardial Infarction
- Chest Pain/Suspected Myocardial Ischemia/Unstable Angina
- STEMI Alert

Contraindications:

- Known hypersensitivity to this medication
- Active GI Bleeding
- Pregnant (especially third trimester) or a nursing mother

Side effects/adverse reactions:

- Anaphylaxis (if history of hypersensitivity)
- Abdominal discomfort
- Gastrointestinal bleeding (if previous condition exists)

Dosage/ administration:

- 324 mg PO

ATROPINE SULFATE (AS A CARDIAC AGENT)

Pharmacologic properties:

Atropine is a potent parasympatholytic anticholinergic. It inhibits muscarinic receptor activity in the parasympathetic sites in smooth muscle, central nervous system, cardiac and secretory tissue. This reduces vagal tone, increases automaticity of the SA node and increases AV conductions, thus increasing heart rate. Additional effects include drying secretions and slowing motility in the gastrointestinal tract.

Indications:

- Bradydysrhythmias (rate <50) accompanied by hemodynamic compromise, i.e. hypotension (systolic less than 90 mmHg), shock, pulmonary edema, altered level of consciousness.
- Pediatric Bradycardia (HR <100 in an infant, HR <60 in a child) despite adequate oxygenation, ventilation, chest compressions, and refractory to epinephrine.

Contraindications:

- Atropine has no effect in patients with transplanted hearts
- 3rd degree AV block in the setting of acute MI, especially anterior wall MI.

Precautions:

- Too small a dose (<0.5 mg) or if normal dose pushed too slowly, may initially cause the heart rate to decrease.
- Atropine is potentiated by antihistamines and antidepressants.
- A maximum dose of 3 mg should not be exceeded.
- Cautious use in 2 degree Type II AV block and 3rd degree block with wide QRS complexes.

Side effects/ adverse reactions:

- Restlessness
- Agitation
- Confusion
- Pupil dilation
- Blurred vision
- Headache
- Increased myocardial oxygen demand
- Ventricular fibrillation
- Dry mouth
- Difficulty swallowing
- Urinary retention

Dosage/ administration:

- Adult symptomatic bradycardia:
    - 1 mg IV bolus, repeat every 3-5 minutes until improved (maximum dose 3 mg)
- Pediatric Symptomatic Bradycardia: (refractory to epinephrine)
    - 0.02 mg/kg IV, IO or ET, (minimum individual dose is 0.1 mg and maximum individual dose is 0.5 mg)
    - May be repeated in 3-5 minutes (Maximum total dose 1.0 mg)

ATROPINE SULFATE (AS AN ANTIDOTE FOR POISONINGS)

Pharmacologic properties:

Atropine is a potent parasympatholytic anticholinergic. It inhibits muscarinic receptor activity in the parasympathetic sites on smooth muscle and the central nervous system, as well as cardiac and secretory tissue. This reduces vagal tone, increases automaticity of the SA node and increases AV conductions, thus increasing heart rate. Additional effects include drying secretions and slowing motility in the gastrointestinal tract.

Indications:

- Organophosphate Poisoning (i.e. parathion, malathion, rid-a-bug) and carbamate (Baygon, Sevin, and many common roach and ant sprays).
- Poisoning Signs **"SLUDGE"**
    - Salivation
    - Lacrimation
    - Urination
    - Defecation
    - GI hypermotility (Emesis, diarrhea)
    - Excessive sweating and bronchorrhea
    - Can either see bradycardia or tachycardia and Hypotension or hypertension with some toxic Nerve agents (i.e. Sarin)
    - Additional signs include: pinpoint pupils and bradycardia

Contraindications:

- None when used in the management of severe organophosphate poisoning.

Precautions:

- It is important that the patient be adequately oxygenated and ventilated prior to using atropine, as atropine may precipitate ventricular fibrillation in a poorly oxygenated patient.
- Do not rely upon pupil constriction to discontinue or to titrate medications

Side effects/ adverse reactions:

- Victims of organophosphate poisoning can tolerate large doses of Atropine.
- Signs of atropinization are likely to occur:
    - Flushing, pupil dilation, dry mouth, tachycardia.

Dosage/ administration:

- Adult
    - 2 mg IV. May repeat 2 mg every 5 minutes
    - Titrate until respiratory secretions/ distress begin to decrease
- Pediatric
    - 0.02 mg/kg repeat every 5 minutes as necessary
    - Titrate until respiratory secretions/ distress begin to decrease

CALCIUM CHLORIDE

Pharmacologic properties:

Calcium is a cation that is essential for neurotransmission, bone formation, enzymatic reactions and muscle (including cardiac) contraction. In the myocardium, it increases the force of contraction and augments cardiac output. Calcium also has a stabilizing effect on myocardial membranes when dangerously high potassium levels make the heart at risk for fibrillation.

Indications:

- Hyperkalemia associated with ECG disturbances
- Hypocalcemia (known)
- Calcium channel blocker toxicity with hemodynamic compromise
- B-Blocker toxicity
- Magnesium (MgS04) toxicity

Contraindications:

- Cardiac arrest not associated with one of the above
- Digoxin toxicity (assumed if on Digoxin and unknown levels)
- Hypercalcemia

Precautions:

- Cautious use in patients receiving Digoxin - do not administer to patients with suspected Digoxin toxicity or overdose
- Do not mix with sodium bicarbonate

Side effects/ adverse reactions:

- Bradycardia, usually caused by rapid administration.
- Arrhythmias especially in patients on digoxin.
- Sclerosis of veins or tissue necrosis (if IV infiltrates)

Dosage/ administration:

- Adult
    - 1 gram (10 ml of a 10% solution), IV bolus
    - May repeat once in ten minutes if no response (maximum dose 2 grams)
    - Consider pre-medicating with Zofran 4mg IV when given in stable patients
- Pediatric
    - 0.2 ml/kg (20 mg/kg) slow IV push
    - May repeat once in 10 minutes if no response (maximum dose 2 grams)

CEFTRIAXONE (ROCEPHIN)

Pharmacologic Properties:

Ceftriaxone is an antibiotic that acts by inhibition of bacterial cell wall synthesis. Ceftriaxone has a broad spectrum of activity and is effective against many gram-negative organisms.

Indications:

- Open fractures

Contraindications:

- Hypersensitivity to cephalosporin or penicillin antibiotics
- Closed fractures

Side effects/adverse reactions:

- Pain at administration site
- Nausea

Dosage/Administration:

- Age ≥ 12 years old
    - 2 g reconstituted in 50-100 mL of NS or D5W and then administered over 15-30 minutes
- Age < 12 years old
    - 50 mg/kg reconstituted in 50-100 mL of NS or D5W (max 2 g) and then administered over 15-30 minutes
- Bag MUST be labelled and receiving facility must be notified of antibiotic administration

DEXTROSE (D50 & D10)

Pharmacologic properties:

Dextrose is a simple monosaccharide also known as glucose. It provides calories for metabolic needs, sparing body proteins and loss of electrolytes. Dextrose is a hypertonic solution that is readily excreted by the kidneys producing diuresis.

Indications:

- Hypoglycemia
    - Adult < 70 mg/dL
    - Pediatric < 70 mg/dL
- Coma of unknown origin (altered level of consciousness), and unable to perform glucose check

Contraindications:

- Acute brain injury/brain attack, with glucose > 50 mg/dL

Side effects/adverse reactions:

- Thrombosis, sclerosing if given in a peripheral vein
- Tissue irritation if infiltrates.
- Hyperglycemia
- Hypokalemia

Dosage/administration:

- Adult
    - Dextrose 10% 100 ml IV/IO, (repeat in 10 minutes if BGL remains <60 mg/dl) max of 250ml
    - Dextrose 50% 50ml IV/IO (25gm)
- Pediatric
    - Dextrose 10% solution 5 ml/kg (0.5g/kg) with a maximum single dose of 100ml, maximum total dose of 250ml.

DILTIAZEM (CARDIZEM®)

Pharmacological properties:

Diltiazem is a calcium channel blocking agent that inhibits the influx of calcium ions during membrane depolarization of cardiac and vascular smooth muscle. Its action is to slow AV nodal conduction and increase the AV nodal refractory period. Diltiazem slows the ventricular rate in patients with a rapid ventricular response during atrial fibrillation or atrial flutter, potentially converts supraventricular tachycardia to normal sinus rhythm, and decreases total peripheral resistance in both systolic and diastolic blood pressure.

Indications:

- Narrow complex atrial fibrillation/flutter with rapid ventricular rate (>150 bpm)
- PSVT refractory to adenosine

Contraindications:

- Patients with signs of active heart failure (edema, sob)
- 2nd or 3rd degree block
- Hypotension (SBP <90) or cardiogenic shock
- Patients with a history of Wolff-Parkinson-White Syndrome (WPW)
- Sick sinus syndrome
- Ventricular tachycardia or wide complex tachycardia

Precautions:

- Cautious use in patients with history of congestive heart failure, monitor for signs of pulmonary edema
- Cautious use in patients who are already taking antihypertensive medications, monitor for Hypotension
- Use caution when administering to patients > 65 y/o

Side Effects/adverse reactions:

- Hypotension
- Bradycardia
- Heart block

Dosage and administration:

- Adults
    - Administer *Diltiazem* (Cardizem) 20 mg IV/IO over two minutes if available
    - If inadequate response call Medical Control for additional orders
- Pediatric
    - Not indicated

DIPHENHYDRAMINE (BENADRYL®)

Pharmacologic properties:
Diphenhydramine is a histamine H1-receptor antagonist that prevents the release of histamine from effector mast cells. Histamine is a vasoactive substance central to allergic reactions that induces vasodilation, vascular permeability, and bronchoconstriction. Diphenhydramine prevents histamine-mediated responses, particularly the effects of histamine on the smooth muscle of the bronchial airways, skin, gastrointestinal tract, and blood vessels.

Indications:

- Acute allergic reactions (mild, moderate, or severe)
- Anaphylaxis
- Acute dystonic reactions associated with ingestion of phenothiazines and related drugs (haloperidol, thorazine, compazine, metoclopramide, ziprasidone)

Contraindications:

- Benadryl is not to be used in newborn or premature infants or in nursing mothers.
- Known hypersensitivity to diphenhydramine or antihistamines.

Precautions:

- In infants and children especially, antihistamines in an overdose may cause hallucinations, convulsions, or death.
- As in adults, antihistamines may diminish alertness in children. In young children, it may produce excitement.
- Benadryl has additive effects with alcohol and other CNS depressants (hypnotics, sedatives, tranquilizers, etc).
- Antihistamines are more likely to cause dizziness, sedation and hypotension in the elderly (60 years or older) patients.
- Diphenhydramine hydrochloride has an atropine-like action(anticholinergic) and therefore should be used with caution in patients with a history of bronchial asthma, increased intraocular pressure, hyperthyroidism, cardiovascular disease or hypertension.
    - Use with caution in patients with lower Respiratory disease, including asthma.

Side effects/ adverse reactions:

- Drowsiness, sedation, confusion
- Vertigo
- Hyperactivity in children
- Palpitations, tachycardia, PVC’s
- Hypotension
- Nausea, vomiting, diarrhea
- Dry mouth
- Constipation
- Urinary retention
- Thickening of bronchial secretion, wheezing

Dosage/ administration:

- Adults
    - 1 mg/kg IV or IM (maximum dose 50 mg)
- Pediatrics
    - 1 mg/kg IV or IM (maximum dose 50 mg)

DROPERIDOL

Pharmacologic Properties:

- First generation typical antipsychotic medication
- Droperidol antagonizes multiple receptors within the central nervous system. While it primarily acts as a dopamine D2 receptor antagonist, there is also effects at serotonin (5HT1A) and GABA receptors acting as an antiemetic, analgesic, as well as anxiolytic/sedative

Indications:

- Acute agitation > 13 years of age
- Nausea and vomiting
- Abdominal pain

Contraindications:

- Known prolonged QT interval

Precautions:

- Obtain 12-lead EKG prior to administration (if feasible)
- Cardiac monitoring to observe QT interval
- Pregnancy

Side Effects/Adverse Reactions:

- Hypotension
- Drowsiness

Dosage/Administration:

- Nausea/vomiting
    - Administer 1.25 mg IM or slow IV push
- Acute agitation
    - Administer 2.5 mg IV (if an IV has been established)
    - If unable to establish an IV, administer 5 mg IM
- Pediatric patients
    - Not authorized for use in pediatric patients less than 13 years of age

EPINEPHRINE HYDROCHLORIDE (1:1,000)

Pharmacologic properties:

- Epinephrine is a sympathomimetic which stimulates both alpha and beta adrenergic receptors. Its effects are to increase systemic vascular resistance, arterial blood pressure, coronary and cerebral blood flow, heart rate and contractility. The alpha-adrenergic effect increases vascular resistance and coronary blood flow, which may make the fibrillating myocardium more susceptible to counter-shock. The beta adrenergic effect increases heart rate and cardiac output, and induces bronchodilation.

Indications:

- Severe bronchospasm (wheezing) associated with Asthma or COPD exacerbation
- Acute allergic reaction associated with Severe systemic reaction (BP < 90, stridor, severe respiratory distress)/Anaphylaxis in adults and pediatrics

Contraindications:

- Known hypersensitivity

Precautions:

- Presence of hypertension
- History of heart disease
- Age over 50 years
- Epinephrine is inactivated by alkaline solutions and should not be mixed with Sodium Bicarbonate
- Epinephrine 1:1,000 cannot be given intravenously or intraosseously in non-cardiac arrest patients

Side effects/ adverse reactions:

- Anxiety
- Headache
- Cerebral hemorrhage
- Tachycardia
- Ventricular dysrhythmias
- Hypertension
- Angina
- Nausea and vomiting

Dosage/ administration:

- Adult
    - 0.5 mg IM (prior permission from medical control if on B blockers)
    - May repeat every 10-15 min. if severe anaphylactic symptoms persist after initial dose
- Pediatric
    - Bronchospasm / Acute allergic reaction
        - 0.01 mg/kg (max 0.5 mg) IM
        - May repeat every 15 minutes as needed X 2 additional doses (3 total)
        - May administer at same time nebulizer is being administered

EPINEPHRINE HYDROCHLORIDE (1:1,000) (DRIP CHART)

****Mix 2 mg of Epinephrine 1:1,000 in a 250 mL NS Bag****

mcg/min	gtt/min		mcg/min	gtt/min		mcg/min	gtt/min
2	15 gtt/min		10	75 gtt/min		18	135 gtt/min
4	30 gtt/min		12	90 gtt/min		20	150 gtt/min
6	45 gtt/min		14	105 gtt/min			
8	60 gtt/min		16	120 gtt/min			

*Note Epinephrine drip can be used if patient had been given Epinephrine 0.5 mg IM and continues with instability and there are clinical concerns for anaphylactic shock

EPINEPHRINE HYDROCHLORIDE (1:10,000)

Pharmacologic properties:

Epinephrine is a sympathomimetic which stimulates both Alpha and Beta adrenergic receptors. Its effects are to increase systemic vascular resistance, arterial blood pressure, coronary and cerebral blood flow, heart rate and contractility. The alpha-adrenergic effect increases vascular resistance and coronary blood flow, which may make the fibrillating myocardium more susceptible to counter-shock. The beta adrenergic effect increases heart rate and cardiac output, and induces bronchodilation.

Indications:

- Ventricular fibrillation or pulseless ventricular tachycardia
- Asystole
- Pulseless electrical activity (PEA)
- Newborn resuscitation/Neonatal asystole or bradycardia
- Pediatric bradycardia/Pulseless cardiac arrest/VF/pulseless VT
- Bradycardia with hypotension refractory to atropine and TCP
- Anaphylactic shock
- Hypotension not improved with sufficient IV fluids

Contraindications:

- NONE in the cardiac arrest situation

Precautions:

- Epinephrine is inactivated by alkaline solutions. NEVER mix with Sodium Bicarbonate.

Side effects/ adverse reactions:

- Cerebral hemorrhage
- Tachycardia
- Ventricular dysrhythmias
- Hypertension
- Angina
- Nausea and vomiting

Dosage/ administration:

- Adult
    - Cardiac arrest
        - 1 mg (10 ml) IV/IO, repeat every 3-5 minutes
    - Symptomatic Bradycardia with hypotension, resistant to dopamine:
        - 2-10 mcg/min (see chart on previous page)
    - Anaphylactic shock (cardiac arrest or respiratory arrest imminent)
        - 2-10 mcg/min IV/IO(see chart on previous page)
    - Hypotension in Pharmaceutically Assisted Intubation
        - If hypotensive give fluids (if tolerable) and a push-dose pressor for temporary improvement prior to administering sedative
        - **Push dose epinephrine:** using a three-way stopcock, attach 1:10,000 epinephrine on one opening and a 10 mL NS flush on another opening. Push 9 mL of 1:10,000 epinephrine out of the epinephrine syringe (leave 1 mL of epinephrine in the syringe (0.1 mg epinephrine)) and add 9 mL of NS from the flush to the epinephrine syringe to have a total of 10 mL of liquid in the

epinephrine syringe. This creates a push-dose epinephrine concentration of 10 mcg/ml. IV push 1 mL every minute to increase blood pressure; max 10 mL (100 mcg) in preparation for intubation

- Pediatric
    - Pulseless cardiac arrest / Ventricular fibrillation/pulseless VT
        - 0.01 mg/kg, (max 1.0 mg) IV/IO, repeat every 3-5 minutes
    - Bradycardia (heart rate < 60 bpm)
        - 0.01 mg/kg (max 1 mg) IV/IO, repeat every 3-5 minutes as needed
    - Newborn resuscitation
        - 0.01 mg/kg IV/IO of a 1:10,000 solution, repeat every 3-5 minutes

ETOMIDATE (AMIDATE®)

Pharmacologic properties:

- Sedative and hypnotic
- Produces a rapid induction of anesthesia with minimal respiratory and cardiovascular effects
    - Does not cause histamine release

Pharmacokinetics:

- Onset: 30-60 seconds
- Peak Effect: < 1 minute
- Duration: 3 – 5 minutes
- Half – Life: 30 – 70 minutes

Indications

- Induction agent for Pharmacologically assisted intubations
- Sedation

Contraindications

- Known hypersensitivity to the drug

Precautions:

- Marked hypotension
- Severe Asthma
- Severe Cardiovascular Disease

Side effects / adverse reactions:

- Myoclonic skeletal muscle movement
- Apnea
- Laryngospasm

Dosage / Administration

- Adult
    - 0.3 mg/kg IV/IO over 1-2 minutes
        - Maximum dose 30 mg
- Pediatric
    - >10 years of age
        - 0.3 mg/kg IV/IO over 1-2 minutes
        - Maximum dose 30 mg
    - ≤ 10 years of age
        - Contact Medical Control

FENTANYL (SUBLIMAZE®)

Pharmacologic properties:

Fentanyl is a synthetic opioid analgesic that suppresses pain by agonizing opioid receptors in the central nervous system. Fentanyl has fewer vasoactive effects than morphine and does not induce significant histamine release. As a result, the drug does not cause significant hypotension in proper doses.

Indications:

- Chest pain associated with suspected myocardial ischemia
- Thermal burns
- Frostbite
- Isolated extremity injury
- Pain from suspected kidney stone

Contraindications:

- Hypotension (SBP <100 mmHg) or volume depletion
- Head trauma
- Acute alcohol intoxication
- Acute respiratory distress
- Known hypersensitivity

Precautions:

- Use with caution in elderly patients
- Fentanyl is metabolized by the liver, use caution in patients with known liver disease
- Sedative effects are potentiated by alcohol, antihistamines, barbiturates, benzodiazepines, phenothiazines, and other sedatives

Side effects/adverse reactions:

- Euphoria
- Drowsiness
- Pupillary constriction
- Respiratory arrest
- Decreases gastric motility
- Nausea and vomiting
- Bradycardia
- Chest wall rigidity

Dosage and administration:

- Adult
    - 1 mcg/kg (maximum individual dose 100 mcg) slow IV; repeat once in 5 minutes as needed (maximum 200mcg total dose).
    - Intranasal - via mucosal atomization device (MAD) – single 100 mcg dose (divide dose between each nare)
- Pediatric (3-18 years old)
    - 1 mcg/kg (maximum individual dose 100 mcg) slow IV/IO push (maximum total dose 200 mcg)
    - Intranasal (via MAD) – single 1.5 mcg/kg dose (maximum 100 mcg, divide dose between each nare)

GLUCAGON

Pharmacologic properties:

Glucagon is an endogenous hormone that is produced in the pancreas. It acts as an insulin antagonist, accelerating hepatic glycogenolysis and gluconeogenesis. This has the effect of increasing blood glucose concentrations.

Indications:

- Hypoglycemia (where IV access cannot be obtained).
- Beta-blocker overdose
- Calcium Channel Blocker overdose

Contradictions:

- Since glucagon is a protein, hypersensitivity is a possibility.

Precautions:

- Glucagon should be administered with caution in patients with a history of insulinoma and/or pheochromocytoma.

Side effects/ adverse reactions:

- Gastrointestinal
    - Occasional nausea and vomiting

Dosage/ administration:

- Adult
    - Beta-blocker & Calcium Channel Blocker overdose
        - 1 mg IV
    - Hypoglycemia
        - 1 mg of Glucagon, IM/IN
- Pediatric
    - Hypoglycemia
        - 0.5mg-1mg (max 1.0 mg), IV/IO/IM/IN (Follow HandTevy)
    - Beta Blocker and Calcium Channel Blocker overdose
        - 0.5mg- 1mg IV/IO (max dose 1mg)

HYPERTONIC SALINE (3% Saline)

Pharmacologic Properties:

- Hypertonic solution with increased sodium concentration than in normal blood serum
- Due to the increased sodium concentration, when administered intravenously, an osmotic gradient is is created, which drives fluids from the interstitial space into the intravascular space

Indications:

- Pediatric patients with moderate to severe traumatic brain injury
    - GCS<8 and active airway management PLUS any of the following:
        - Unilateral fixed or dilated pupil
        - Unilateral paralysis
        - Posturing
        - Seizure after injury
        - Skull deformity

Contraindications:

- No specific contraindications

Side effects/adverse reactions:

- May cause discomfort at IV site, monitor for extravasation

Precautions:

- Caution in patients with congestive heart failure or known renal insufficiency

Dosage/Administration:

- 5 mL/kg slow push via IV/IO (max 250 mL)

IPRATROPIUM BROMIDE (ATROVENT®)

Pharmacologic properties:

Ipratropium bromide is an anticholinergic bronchodilator classified as a quaternary ammonium compound. Anticholinergics prevent the binding of acetylcholine with muscarinic receptors on bronchial smooth muscle, inhibiting bronchoconstriction. The bronchodilating effect of ipratropium is primarily local and site specific. Since it is not well absorbed systemically, there is low potential for toxicity.

Indications:

- Acute bronchospasm (wheezing) associated with asthma or COPD
- Acute bronchospasm (wheezing) in adult and pediatric patients

Contraindications:

- Hypersensitivity to atropine or its derivatives or to soya lecithin or related food products such as soybean or lecithin

Precautions:

- Use with caution in patients with narrow angle glaucoma and patients with acute urinary retention

Side effects/ adverse reactions:

- Palpitations
- Nervousness
- Dizziness
- Headache
- Nausea
- GI distress
- Dry mouth
- Cough

Dosage/administration:

- Adult
    - 0.5 mg/2.5 ml via updraft
    - Combined with Albuterol
- Pediatric
    - 0.5 mg/2.5 ml via updraft
    - Combined with Albuterol

KETAMINE HYDROCHLORIDE (KETALAR®)

Pharmacologic properties:

Produces rapid-acting anesthetic state with profound analgesia, normal pharyngeal-laryngeal reflexes, normal or slightly enhanced skeletal muscle tone, cardiovascular and respiratory stimulation, and, occasionally, transient and minimal respiratory depression.

Pharmacokinetics:

- Onset: 15– 30 seconds
- Duration: 5 – 10 minutes
- Half – Life: 10 – 15 minutes

Indications

- Induction agent for Pharmacologically assisted intubations
- Behavioral Emergencies (i.e., agitated or excitatory delirium)
- Acute pain (medical control order)

Contraindications

- Hypertension, severe or poorly controlled
- Hypersensitivity to the drug

Precautions:

- Acute Alcohol Intoxication
- Cardiac Decompensation
- Hypertension/Tachycardia

Side effects / adverse reactions:

- Tonic/clonic movements
- Hallucinations, confusion
- Tachycardia
- Arrhythmia
- HTN
- Bradycardia
- Hypotension
- Nausea/Vomiting

Dosage / Administration

- Adult
    - Induction:
        - 1 mg/kg IV (100mg max)
    - Agitation:
        - 0.5 mg/kg IV (50mg max)
        - 1 mg/kg IM (100mg max)
    - Acute Pain (only when authorized by Medical Control)
        - 0.1 mg/kg (max 10 mg) pushed over 10-15 minutes
    - For repeat dose contact Medical Control
- Consider administering Midazolam per protocol for emergence syndrome (i.e., hallucinations, confusion)

LEVETIRACETAM (KEPPRA)

Pharmacologic properties:

- Anti-epileptic medication, exact mechanism of action not completely understood

Indications:

- Pediatric patients with moderate to severe traumatic brain injury
    - GCS<8 and active airway management PLUS any of the following:
        - Unilateral fixed or dilated pupil
        - Unilateral paralysis
        - Posturing
        - Seizure after injury
        - Skull deformity

Contraindications:

- Hypersensitivity to medication

Precautions:

- May cause significant CNS depression, especially in the setting of concurrent sedating medications

Side effects/ adverse reactions:

- Nausea, vomiting
- Sedation

Dosage/ administration:

- 20 mg/kg IV push (maximum 1 g of initial dose)
- If seizure activity continues, administer additional 40 mg/kg
- Total maximum must not exceed 60 mg/kg

LIDOCAINE

Pharmacologic properties:

Antiarrhythmic Agent, Class Ib; Local Anesthetic.

Indications:

- Intraosseous line or infusion pain.
- Ventricular arrhythmias:
    - Sudden cardiac arrest due to ventricular fibrillation or pulseless ventricular tachycardia, unresponsive to cardiopulmonary resuscitation, defibrillation, and epinephrine
    - Hemodynamically unstable ventricular tachycardia

Contraindications:

- Hypersensitivity to local anesthetics, Wolff-Parkinson-White syndrome; severe degrees of SA, AV, or intraventricular heart block

Precautions:

- Adult renal and hepatic impairment
    - Administer lower maintenance infusion rate with close monitoring for toxicity.
- Pediatric hepatic impairment
    - Consider alternative therapy. Maximum rate of continuous IV infusion: 20 mcg/kg/minute

Side effects/ adverse reactions:

- The following adverse drug reactions and incidences are derived from product labeling unless otherwise specified. Effects vary with route of administration. Many effects are dose-related.
    - 1% to 10%:
        - Central nervous system: Headache

Dosage/ administration:

- Adult
    - Administration: Adult IV:
        - Bolus: According to the manufacturer, may administer at 25 to 50 mg/minute.
        - In the setting of cardiac arrest (eg, ventricular fibrillation or pulseless ventricular tachycardia), may be infused rapidly into a peripheral vein.
        - Continuous infusion: After initial bolus dosing, may administer as a continuous infusion; refer to indication-specific infusion rates in dosing for detailed recommendations.
        - In the setting of cardiac arrest, infusion may be initiated once the patient has return of spontaneous circulation resulting from lidocaine administration; however, there is no evidence to support subsequent continuous infusion to prevent recurrence.
    - Administration: Adult IO:
        - Intraosseous administration is a reasonable alternative when quick IV access is not feasible
    - Intraosseous line or infusion pain:
        - Lidocaine 1% or 2% preservative-free solution: Intraosseous: Initial dose: 1 mg/kg adults max initial dose of 40 mg over 1 to 2-minutes; After allowing lidocaine to dwell for up to 1-minute, follow with NS flush; immediately following the NS flush, administer second dose, 1/2 of the initial dose, max of 20 mg lidocaine over 30 to 60-seconds

    - Ventricular arrhythmias:
        - Sudden cardiac arrest due to ventricular fibrillation or pulseless ventricular tachycardia, unresponsive to cardiopulmonary resuscitation, defibrillation, and epinephrine
        - IV, intraosseous: Initial: 1 to 1.5 mg/kg bolus. If refractory ventricular fibrillation or pulseless ventricular tachycardia, repeat 0.5 to 0.75 mg/kg bolus every 5 to 10 minutes (maximum cumulative dose: 3 mg/kg). Follow with continuous infusion (1 to 4 mg/minute) after return of perfusion. *Reappearance of arrhythmia during continuous infusion*: Give an additional 0.5 mg/kg bolus then increase infusion.
    - Ventricular tachycardia, hemodynamically stable:
        - IV: 1 to 1.5 mg/kg; repeat with 0.5 to 0.75 mg/kg every 5 to 10-minutes as necessary (maximum cumulative dose: 3 mg/kg). Follow with continuous infusion of 1 to 4 mg/minute or 20 to 50 mcg/kg/minute.
- Pediatric
    - *Intraosseous line or infusion pain:* Infants, Children, and Adolescents: Lidocaine
        - 1% or 2 % preservative-free solution: Intraosseous: Initial dose: 0.5 mg/kg over 1 to 2-minutes max of 40mg; follow with NS flush; immediately following the NS flush, administer second dose, 1/2 of the initial dose, max of 20mg over 30 to 60-seconds.
        - **Note:** Intraosseous access devices have a minimum weight and age for a particular device in addition to specific instruction for insertion and validation; consult product specific information for more detail.
    - Ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT), shock refractory: Infants, Children, and Adolescents:
        - IV, Intraosseous
        - Loading dose: 1 mg/kg/dose; follow with continuous IV infusion; may administer second bolus if delay between initial bolus and start of infusion is > 15-minutes.
        - Continuous IV infusion: 20mcg/kg/minute. Per manufacturer, do not exceed 20 mcg/kg/minute in patients with shock, hepatic disease, cardiac arrest, or CHF.

MAGNESIUM SULFATE

Pharmacologic properties:

Magnesium is a cation that acts as a cofactor of the cellular membrane sodium-potassium pump, and plays an integral role in maintaining intracellular potassium levels. Magnesium is essential for energy transfer and electrical stability, and acts as a powerful antiarrhythmic - particularly in the setting of torsades de pointes. It is also a CNS depressant effective in the management of seizures associated with toxemia of pregnancy (eclampsia), and a bronchodilator effective for asthma and COPD.

Indications:

- Cardiac Arrest associated with suspected hypomagnesemic state
- Torsades de Pointes
- Eclampsia
- Acute refractory bronchospasm

Contraindication:

- Renal Failure

Precautions:

- Avoid rapid IVP unless unstable
- Calcium Chloride as antidote to respiratory depression.

Side effects/ adverse reactions:

- Loss of deep tendon reflexes
- Respiratory arrest
- Hypotension
- Drowsiness
- Flushing

Dosage/ administration:

- Adult
    - Cardiac arrest (in the setting of torsades de pointes or hypomagnesemic state):
        - 2 grams, IV/IO bolus over 1-2 minutes
    - Eclampsia:
        - 4 grams IV in 100 ml NaCl over 10 minutes
    - Bronchospasm:
        - 2 grams IV in 100 mL NaCl over 10-15 minutes
- Pediatric
    - Cardiac Arrest (in the setting of torsades de pointes or hypomagnesemic state):
        - 50 mg/kg IV/IO over 1-2 minutes (maximum dose 2 grams)
    - Bronchospasm:
        - 50 mg/kg IV over 5-10 minutes (maximum dose 2 grams)

METHYLPREDNISOLONE (SOLUMEDROL®)

Pharmacologic properties:

Methylprednisolone is a systemic corticosteroid that has many downstream effects on the body. Therapeutically, it has potent anti-inflammatory properties. The onset of action is several hours.

Indications:

- Acute exacerbation of asthma/COPD
- Anaphylaxis/ Acute allergic reactions
- Adrenal crisis/insufficiency

Contradictions:

- Systemic fungal infections
- Known hypersensitivity

Preparation:

- The rubber top of the Mix-O-Vial must be pressed so that the diluent mixes with the powder and dissolves it. Shake the mixture vigorously so that all the powder dissolves. The resulting solution must be clear in order to administer to a patient.

Precautions:

- Use caution when administering to patients with diabetes mellitus, pregnancy, liver disease, or signs of systemic infection
- Do not administer methylprednisolone preserved with benzyl alcohol to pregnant women, breast feeding women, or neonates – benzyl alcohol is associated with serious adverse events in this population

Side effects/ adverse reactions:

- Adverse effects with single bolus use of Solu-Medrol are uncommon, although patients on chronic steroids are at risk for a multitude of adverse reactions.

Dosage/ administration:

- Adult
    - 125 mg, IV/IO bolus over 2 minutes
- Pediatric
    - 2 mg/kg, IV/IO bolus over 2 minutes (max 60 mg)

MIDAZOLAM (VERSED®)

Pharmacologic properties:

Midazolam is a short-acting sedative hypnotic of the benzodiazepine family that increases the action of gamma-aminobutyric acid (GABA), the major inhibitory neurotransmitter in the central nervous system. Midazolam depresses the limbic system, thalamus, and hypothalamus resulting in profound sedation and muscle relaxation. The inhibitory nature of the drug also provides anti-epileptic activity that terminates and prevents seizures.

Indications:

- Status epilepticus
- Cocaine (sympathomimetic) toxicity
- Premedication prior to cardioversion or transcutaneous pacing.
- Adjunctive treatment for behavioral emergencies in patients with severe agitation or aggressive behavior resulting in interference with patient care or patient/crew safety
- Prevention/Treatment of emergence reaction after Ketamine administration
- Combative head injury

Contraindications:

- Acute alcohol intoxication
- Do not administer to neonatal patients
- Respiratory insufficiency
- Hypotension (SBP < 90 mmHg)
- Known hypersensitivity to benzodiazepines

Precautions:

- Rapid IV bolus, especially in hypovolemic patients may cause hypotension and respiratory depression
- Effects are exacerbated in the elderly, and when administered to patients who have already ingested another CNS depressant (EtOH, barbiturates, GHB)
- Use with caution in head injured patients due to possibility of respiratory depression

Side effects/ adverse reactions:

- Drowsiness, confusion
- Respiratory depression/arrest
- Hypotension
- Nausea, vomiting

Dosage/administration:

- Adult
    - Seizures
        - 5mg IM or intranasal via MAD
        - 2.5 mg IV (slow IVP)(maximum dose 5 mg)
    - Behavioral Agitation
        - 5 mg IM or intranasal via MAD
        - 2.5 mg IV (slow IVP)
- Pediatric
    - Seizures
        - 0.2 mg/kg IM or intranasal via MAD

        - 0.1 mg/kg IV (slow IVP) (maximum dose 5 mg)
    - Behavioral Agitation
        - 0.2 mg/kg IM (maximum dose 5 mg)
        - 0.1 mg/kg IV (maximum dose 2.5 mg)

NALOXONE (NARCAN®)

Pharmacologic properties:
Naloxone is a competitive mu opioid receptor antagonist. The drug antagonizes the effects of opiates by competing at the same receptor sites. Onset of action is 1-2 minutes, the duration of action is 1-4 hours.

Indications:

- Naloxone is indicated for the reversal of narcotic intoxication with respiratory depression
- Altered mental status (unknown cause)
- Clonidine overdose

Contraindications:

- Known hypersensitivity

Precautions:

- Use caution during administration as patient may become agitated or violent as level of consciousness increases
- Should be administered cautiously to persons who are known or suspected to be physically dependent on opiates, including newborns of dependent mothers – may precipitate acute withdrawal
- Naloxone has a relatively short half-life compared to many narcotics, monitor closely for the need to repeat dose
- Naloxone is not effective against a respiratory depression due to non-opioid drugs
- Patients who become responsive secondary to naloxone administration are not authorized to refuse medical care - transport all such patients as medically incapacitated

Side effects/ adverse reactions:

- Tremor
- Agitation, belligerence
- Pupillary dilation
- Seizures
- Sweating
- Hypertension
- Hypotension
- Ventricular tachycardia
- Pulmonary edema
- Ventricular fibrillation
- Nausea, vomiting

Dosage/Administration

- Adult
    - With respiratory depression
        - 2 mg IV, IO, IM, or intranasal via MAD every 3 min as needed (maximum dose 8 mg by EMS) (start at 0.5 mg for patients over 65 years old)
    - Altered, but without respiratory depression
        - 0.5 mg IV, IO, IM, or intranasal via MAD every 3 min as needed (maximum dose 2 mg)
- Pediatric
    - 0.1 mg/kg IV, IO, IM, or intranasal via MAD (maximum individual dose 2.0 mg)
    - May repeat dose once

NITROGLYCERIN (NITROSTAT®)

Pharmacologic properties:

Nitroglycerin is an organic nitrate which causes systemic vasodilation by entering vascular smooth muscle, converting to nitric oxide, and activating cGMP. This dose-dependent dilation acts primarily on the venous system, although it also produces direct coronary artery vasodilation as well. The overall result is a decrease in venous return which decreases the workload on the heart and thus, decreases myocardial oxygen demand. Nitroglycerin also improves blood flow to the myocardium and lowers systemic blood pressure.

Indications:

- Chest pain with suspected cardiac ischemia
- Suspected acute myocardial infarct
- Acute dyspnea with suspected pulmonary edema/congestive heart failure

Contraindications:

- Hypertension associated with acute stroke or severe brain injury
- Systolic BP < 90 mmHg
- Phosphodiesterase-5 inhibitor use within 24 hours (Viagra® or Levitra®) or 48 hours (Cialis®)
- Suspected RV MI (ST elevation inferior leads), whether the patient is hypotensive or not

Precautions:

- Patients on chronic nitrate therapy may require larger doses of nitroglycerine during acute anginal episodes
- Nitro tablets are inactivated by light, air and moisture and must be kept in amber glass containers with tight-fitting lids
- Alcohol will accentuate vasodilating and hypotensive effects.

Side Effects/adverse Reactions:

- Headache
- Hypotension
- Tachycardia
- Dizziness
- Flushing
- Nausea and Vomiting

Dosage/ administration:

- 0.4 mg spray or tablet sublingually, every 5 minutes as needed if no contraindication develops (maximum three doses)

NOREPINEPHRINE (LEVOPHED)

Pharmacologic properties:

Is a sympathomimetic amine which differs from epinephrine by the absence of a methyl group on the nitrogen atom. Norepinephrine functions as a peripheral vasoconstrictor (alpha-adrenergic action) and as an inotropic stimulator of the heart and dilator of coronary arteries (beta-adrenergic action).

Indications:

- Cardiogenic, neurogenic, septic, or anaphylactic shock.
- Bradycardia with hypotension refractory to Atropine and TCP
- Hemodynamically significant (SBP < 90 mm Hg) overdose
- Hypotension (SBP < 90 mm Hg), i.e., not secondary to hypovolemia

Contraindications:

- Mesenteric Thrombosis
- Norepinephrine is inactivated in alkaline solution, do not use any alkaline diluent
- Hypovolemic Shock until volume replacement therapy completed
- Tricyclic overdose
- MAOI therapy

Precautions:

- Significant local tissue necrosis can occur with extravasation from peripheral IV
- Norepinephrine is inactivated in alkaline solution, do not use any alkaline dilutent
- Tricyclic overdose

Side Effects/adverse Reactions:

- Arrhythmia exacerbation
- Pulmonary edema
- Bradycardia
- Lactic Acidosis
- Tissue necrosis with extravasation
- Anaphylactic Shock
- Photophobia
- Hypertension
- Sinus Tachycardia
- Hypovolemia
- Dyspnea
- Hypoxia

Dosage/ administration:

- 0.5-16 mcg/minute titrated to maintain SBP > 90 mm Hg
    - See chart on following page for infusion preparation and dosage

NOREPINEPHRINE (LEVOPHED) (DRIP CHART)

****Mix 4 mg of Norepinephrine in a 250 mL NS Bag****

mcg/min	gtt/min		mcg/min	gtt/min		mcg/min	gtt/min
1	4 gtt/min		11	41 gtt/min		21	79 gtt/min
2	8 gtt/min		12	45 gtt/min		22	82 gtt/min
3	11 gtt/min		13	49 gtt/min		23	86 gtt/min
4	15 gtt/min		14	53 gtt/min		24	90 gtt/min
5	19 gtt/min		15	56 gtt/min		25	94 gtt/min
6	23 gtt/min		16	60 gtt/min		26	98 gtt/min
7	26 gtt/min		17	64 gtt/min		27	101 gtt/min
8	30 gtt/min		18	68 gtt/min		28	106 gtt/min
9	34 gtt/min		19	71 gtt/min		29	109 gtt/min
10	38 gtt/min		20	75 gtt/min		30	113 gtt/min

ONDANSETRON HYDROCHLORIDE (ZOFRAN®)

Pharmacologic properties:

Ondansetron hydrochloride is an antiemetic which acts as a selective inhibitor of the serotonin 5-HT 3 receptor type. The drug binds to both central nervous system and peripheral receptors in the gastrointestinal tract to exert its effects. Its onset of action is 30 minutes, and duration of action is 2-7 hours. Contact Medical Control for use during pregnancy.

Indications:

- Severe, persistent vomiting

Contraindications:

- Known hypersensitivity
- Known Long-QT Syndrome

Precautions:

- May lengthen QT interval – patients should be placed on a cardiac monitor after administration
- The use of ondansetron in patients following abdominal surgery may mask a progressive ileus and/or gastric distention

Side effects/ adverse reactions:

- Headache
- Fatigue
- Diarrhea
- Dizziness

Dosage/administration:

- Adult:
    - 4 mg IV
    - 4 mg PO (Oral Disintegrating Tablet, ODT)
- Infants and Children 6 months to 10 years, ≥8 kg (18 lbs)
    - 8-15 kg (18-33 lbs): 2 mg ODT, PO
    - >15 kg (>33 lbs): 4 mg ODT, PO

SODIUM BICARBONATE

Pharmacologic properties:

Sodium bicarbonate is an endogenous anion that reacts with hydrogen ions to form water and carbon dioxide. It is an alkalizing agent used to buffer acids present in the body during periods of metabolic acidosis. Its effect is to raise the serum pH. This effect is favorable in the treatment of pre-existing metabolic acidosis, hyperkalemia, tricyclic antidepressant/salicylate (aspirin)/or phenobarbital overdose, and after profound hypoxia/prolonged cardiac arrest. Sodium bicarbonate is effective only when administered with adequate ventilation and oxygenation.

Indications:

- Bicarbonate responsive metabolic acidosis precipitating cardiac arrest
- Hyperkalemia
- Tricyclic antidepressant overdose

Contraindications:

- Congestive heart failure
- Alkalotic states
- Hypoxic Lactic Acidosis

Precautions:

- Excessive bicarbonate therapy inhibits the release of oxygen, induces hyperosmolarity and hypernatremia, and produces paradoxical acidosis in myocardial and cerebral cells.
- Bicarbonate does not improve the ability to defibrillate.
- May inactivate simultaneously administered catecholamines.
- Will precipitate if mixed with calcium chloride. Administration should be guided by arterial blood gasses and pH.

Side effects/ adverse reactions:

- Metabolic alkalosis
- Hypernatremia/Hyperosmolality
- Cerebral acidosis (paradoxical effect)
- Sodium and fluid retention which can cause pulmonary edema

Dosage/ administration:

- Adult
    - 1 meq/kg IV (max 50 mEq)
- Pediatric
    - 1 meq/kg IV (max 50 mEq)
- Infant
    - 0.5 meq/kg IV (diluted) slowly

TRANEXAMIC ACID (TXA)

Pharmacologic Properties:
- Antifibrinolytic agent that inhibits the activation of plasminogen, thus preventing clot breakdown and reduces bleeding

Indications:
- Suspected life-threatening hemorrhage in the setting of trauma and any of the following:
    - Systolic < 90 mmHg
    - MAP < 65
    - Sustained HR > 110
    - Traumatic cardiac arrest is loss of pulses occur AFTER patient contact with PEA on the monitor

Contraindications:
- Isolated head trauma
- Trauma more than 3 hours prior to arrival
- Hypersensitivity to TXA

Precautions:
- Ensure receiving facility is aware that TXA was administered
- Do not delay transport to perform procedures on scene unless immediately needed to stabilize the patient (airway management, hemorrhage control)

Side Effects/Adverse Reactions:
- Can cause hypotension with rapid IV injection

Dosage/Administration:
- Adult: administer 2 g in 100 mL NS over 10 minutes IV/IO
- Pediatric: 15 mg/kg (maximum dose 1 g) in 100 mL NS over 10 minutes IV/IO