Appendix 1

EMS MEDICATIONS

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Acetaminophen (Tylenol)

Action/Mechanism:
An analgesic/antipyretic that has weak anti-inflammatory activity and no effects on platelets or bleeding time. Acetaminophen acts both centrally and peripherally via multiple enzymatic processes. The most significant appears to be peroxidase inhibition which yields COX-2 inhibitor-like effects.

Indication:
Fever. Minor pain.

Contraindication:
Known liver disease (relative). Hypersensitivity.

Precaution:
Do not administer if used in the last 4 hours.

Adverse Effects:
Gastric irritation (rare)

Dose:
- Adult: PO/Rectal 650-1000mg
- Pediatric: 15mg/kg PO/Rectal; Max 650 mg

Adenosine (Adenocard)

Action/Mechanism:
A naturally occurring nucleoside that acts on the AC node to slow conduction and inhibit reentry pathways. Useful in PSVT. Rapidly metabolized—Half-life is <5 seconds.

Indication:
To convert acute PSVT to normal sinus rhythm. Diagnostic agent for distinguishing supraventricular from ventricular tachycardia, as well as broad QRS complex tachycardia's.

Contraindication:
Patients with hypersensitivity to the drug. Those in second or third degree heart block, sick sinus syndrome, or symptomatic bradycardia. Unstable patient with SVT is treated with synchronized cardioversion.

Precaution:
Could produce bronchoconstriction in-patients with asthma. Patients who develop high level heart block after a single dose should not receive additional doses. Use with caution in-patients receiving digoxin and verapamil in combination. Therapeutic levels of theophylline and methylxanthines affect the response of adenosine Dipyridamole potentiates its effect.

Adverse Effects:

Chest pain, PVC's, dizziness, dyspnea and or shortness of breath, facial flushing, headache, lightheadedness, blurred vision, nausea, metallic taste, and numbness. More serious symptoms are persistent arrhythmias, bronchospasm, and hypotension.

Dose:
Rapid bolus over 1-3 seconds. The dose should be followed quickly by a 20 ml saline flush

- Adult: The initial dose is 6-mg. rapid bolus over 1-3 seconds. The dose should be followed quickly by a 20-ml saline flush. Then elevate the extremity. Repeat 12mg. in 1-2 minutes if needed.
- Pediatric: Initial- 0.1 mg/kg (Max 6mg), if not effective- 0.2 mg/kg (Max 12mg)

Albuterol (Ventolin/Proair/Proventil)

Action/Mechanism:
Relaxes bronchial, uterine, and vascular smooth muscle by stimulating beta2-adrenergic receptors.

Indication:
For the relief of bronchospasm in patients two years of age and older with reversible obstructive airway disease and acute attacks of bronchospasm. Not for use in croup. High-risk preterm labor when delivery is imminent with medical control consulted.

Contraindication:
Hypersensitivity to the drug.

Precaution:
Used with caution in patients with cardiovascular disorders, especially coronary insufficiency, cardiac arrhythmias and hypertension. MAO inhibitors, tricyclic antidepressants, may potentiate action on CV system. Propranolol, and other beta blockers inhibit the effect of albuterol.

Adverse Effects:
Tachycardia, hypertension, bronchospasm, bronchitis, nasal congestion, tremors, dizziness, nervousness, headache, and sleeplessness.

Dose:

- Adult and pediatric: 2.5 mg nebulized every 10-20 minutes as needed, (Max total= 7.5 mg or 3 nebs) Nebulized solution will usually be delivered over approximately 5 to 15 minutes depending on flow rate.

Amiodarone Hydrochloride (Cordarone)

Action/Mechanism:
Blocks sodium channels at rapid pacing frequencies, causing an increase in the duration of the myocardial cell action potential and refractory period, as well as alpha- and beta-adrenergic blockade. The drug decreases sinus rate, increases PR and QT intervals, results in development

of U waves, and changes T-wave contour. After IV use, amiodarone relaxes vascular smooth muscle, reduces peripheral vascular resistance (afterload), and increases cardiac index slightly.

Indication:
Used in a wide variety of atrial and ventricular tachyarrhythmia's and for rate control of rapid atrial arrhythmias in patients with impaired LV function when digoxin has proven ineffective

Contraindication:
Marked sinus bradycardia due to severe sinus node dysfunction, second- or third-degree AV block, syncope caused by bradycardia (except when used with a pacemaker). Cardiogenic shock. Lactation.

Precaution:
May produce vasodilation and hypotension. May have negative inotropic effects. May prolong QT interval. Do not routinely use with other drugs that prolong QT interval. Use with caution if renal failure is present.

Adverse Effects:
Cough and progressive dyspnea. Worsening of arrhythmias, symptomatic bradycardia, sinus arrest, SA node dysfunction, CHF edema, hypotension, cardiac conduction abnormalities, cardiac arrest, abnormal involuntary movements, headache, N&V, abdominal pain, flushing, and shock.

Dose:

- Adult: Cardiac Arrest: Anti-arrhythmics are indicated for shockable rhythms that are unresponsive to defibrillation: 300mg IV push. Consider repeating 150 mg IV push in 3-5 minutes. Wide complex tachycardia (stable): 150 mg rapid infusion IV (15 mg/min) over the first 10 minutes. May repeat 150 mg rapid infusion IV every 10 minutes as needed.
- Pediatric: Anti-arrhythmics are indicated for shockable rhythms that are unresponsive to defibrillation. IV/IO: 5 mg/kg (maximum: 300 mg/dose) rapid bolus; may repeat twice up to a maximum total dose of 15 mg/kg (total max 450 mg)

Aspirin (Ecotrin)

Action/Mechanism:
Irreversibly inhibits cyclooxygenase-1 and 2 (COX-1 and 2) enzymes, via acetylation, which results in decreased formation of prostaglandin precursors; irreversibly inhibits formation of prostaglandin derivative, thromboxane A2, via acetylation of platelet cyclooxygenase, thus inhibiting platelet aggregation; analgesic, and anti-inflammatory properties

Indication:
Cardiac chest pain patients fitting criteria

Contraindication:
Hypersensitivity to NSAIDs; patients with asthma, rhinitis, and nasal polyps; use in children or teenagers for viral infections, with or without fever.

Precaution:
Documentation of allergenic cross-reactivity for salicylates is limited. However, because of similarities in chemical structure and/or pharmacologic actions, the possibility of cross-sensitivity cannot be ruled out with certainty.

Adverse Effects:
Bleeding gums, signs of GI bleeding, and petechiae. Aspirin will increase bleeding time.

Dose:
- Adult: 162 mg-325 mg oral- chewed once (chewable tabs preferred)
- Pediatric: Do not use unless ordered by OLMC

Atropine

Action/Mechanism:
Anticholinergic that inhibits acetylcholine at the parasympathetic neuroeffector junction, blocking vagal effects on the SA and AV nodes; this enhances conduction through the AV node and speeds heart rate, increases heart contractility, improves automaticity, and dilates peripheral vessels which increases cardiac output. Atropine dries secretions by reversing the muscarinic effects of cholinergic poisoning due to agents with acetylcholinesterase inhibitor activity by acting as a competitive antagonist of acetylcholine at muscarinic receptors. The primary goal in cholinergic poisonings is reversal of bronchorrhea and bronchoconstriction. Atropine has no effect on the nicotinic receptors responsible for muscle weakness, fasciculations, and paralysis.

Indication:
Treatment of symptomatic sinus bradycardia, second and third degree heart block, or ventricular asystole. Second drug for asystole or PEA. Antidote in organophosphate poisoning.

Contraindication:
Hypersensitivity to the drug, unstable cardiovascular status, myocardial ischemia, glaucoma, and COPD

Precaution:
Use with caution in presence of myocardial ischemia and hypoxia. Avoid in hypothermic bradycardia. Usually not effective in second degree block type II and third degree blocks with wide QRS complexes. Antacids decrease absorption of med.

Adverse Effects:
Postural hypotension, Blurred vision, dryness of the mouth, GI reflux, nausea, vomiting, tachyarrhythmias, and urinary retention. May also cause ventricular tachycardia or ventricular fibrillation.

Dose:
- Adult: For bradycardia, 0.5mg IV/IO every three to five minutes as needed, up to a total of 3mg. In asystole give 1mg. IV, repeat every 3 to 5 minutes up to a total of 0.04 mg/kg.

- Pediatric: 0.02 mg/kg IV/IO/ET up to 0.5 mg for child or 1mg for adolescent (minimum dose 0.1mg). May be repeated once in 5 minutes.

Organophosphate Poisonings:
Atropine sulfate 2 mg rapid IV (preferred) or IM repeated every 10 minutes until you have:

- Control of bronchorrhea (excessive watery sputum)
- Control of bronchoconstriction, (as reflected by level of oxygenation and ease of ventilation)
- Reversed dangerous bradyarrhythmias or AV-blocks

Calcium Chloride/ Calcium Gluconate

Action/Mechanism:
Electrolyte. Calcium is a positively charged ion involved in multiple physiologic functions. Calcium is required for muscle contraction, nerve impulse transmission, hormone secretion, blood coagulation, cell division, cell motility and wound healing. In vascular smooth muscle, calcium is involved in the maintenance of vascular tone. Calcium is also required for cardiac muscle contraction. The entry of calcium into cardiac cells during depolarization triggers additional intracellular calcium release from the sarcoplasmic reticulum, leading to myocardial contraction. The cardiac pacemaker cells of the SA and AV nodes depend on an inward calcium current for depolarization. Calcium antagonizes the effects of both potassium and magnesium at the cell membrane. In hyperkalemia, calcium antagonizes cardiac membrane excitability. It has no effect on the serum potassium level. The effect of cardiac membrane stabilization is temporary (20-40 min) and some patients may require a repeat dose.

Indication:
Hyperkalemia. Hydrofluoric acid (HF) exposure. Calcium channel blocker toxicity. Beta blocker toxicity. Cardiac Arrest with presumed hyperkalemic cause (i.e. dialysis patient overdue for dialysis). Hypermagnesemia.

Contraindication:
Known hypersensitivity. Digitalis toxicity

Precaution:
Calcium chloride contains three times more elemental calcium than calcium gluconate (1 gm of calcium chloride is equivalent to 3 gm of calcium gluconate). Administer slowly if not in cardiac arrest. **Calcium chloride and calcium gluconate are two commonly used parenteral formations of calcium. In the EMS setting, the two preparations may be used interchangeably, but it should be noted that calcium chloride contains three times more elemental calcium than does calcium gluconate (1 gm of calcium chloride is equivalent to 3 gm of calcium gluconate). Calcium chloride has greater bioavailability, but is more likely to cause tissue damage if extravasation occurs. Ideally use AC or larger vessel. Sodium bicarbonate and calcium preparations are not compatible and should be given through separate IV lines if possible. If they must be administered via the same IV line, the line should be flushed in between the administration of each.

Adverse Effects:

Bradycardia. Ventricular fibrillation. Extravasation necrosis. Abdominal pain. Nausea/vomiting.

Dose:

- Adult:
  - **Calcium Chloride:** 1 gm SLOW PUSH IV/IO. May repeat once after 5 min.
  - **Calcium Gluconate:** 3 gm SLOW PUSH IV/IO. May repeat once after 5 min.
- Pediatric:
  - **Calcium Chloride:** 20mg/kg (max 1 gm/dose) SLOW PUSH IV/IO. May repeat once after 10 minutes
  - **Calcium Gluconate:** 100 mg/kg IV/IO (max 3 grams/dose). May repeat once after 10 min.

Diazepam (Valium)

Action/Mechanism:
Binds to stereospecific benzodiazepine receptors on the postsynaptic GABA neuron at several sites within the central nervous system, including the limbic system, reticular formation. Enhancement of the inhibitory effect of GABA on neuronal excitability results by increased neuronal membrane permeability to chloride ions. This shift in chloride ions results in hyperpolarization (a less excitable state) and stabilization. Benzodiazepine receptors and effects appear to be linked to the GABA-A receptors. Benzodiazepines do not bind to GABA-B receptors

Indication:
Anxiety, muscle spasms, neuroleptic malignant syndrome, seizures

Contraindication:
Hypersensitivity to diazepam or any component of the formulation; acute narrow-angle glaucoma; untreated open-angle glaucoma; infants <6 months of age (oral); myasthenia gravis, severe respiratory impairment, severe hepatic impairment, sleep apnea syndrome (oral tablet).

Precaution:
Use caution with patients that have received opiates due to additive CNS depression

Adverse Effects:
Drowsiness, hypotension, vasodilation, headache, ataxia, dizziness, euphoria, abnormality in thinking, agitation, confusion, emotional lability, nervousness, pain, speech disturbance, skin rash, diarrhea, abdominal pain, asthenia, asthma, rhinitis

Dose:

- Adult:
  - IV/IO – 5 mg every 10 min to the desired effect or max dosage of 20 mg
  - Intramuscular (IM) – 10 mg once (IM not preferred, unless no other options)
- Pediatric:

- IV/IO - 0.1 mg/kg (max 5 mg), may repeat once in 10 minutes, if needed. Total max dose: 10 mg
- Intramuscular (IM) – 0.2 mg/kg (max 10 mg) once Total max dose: 20 mg (IM not preferred unless no other options)

Diphenhydramine (Benadryl)

Action/Mechanism:
Competes with histamine for H1-receptor sites on effector cells. Prevents, but does not reverse, histamine-mediated responses. It also has anticholinergic (antispasmodic), antiemetic, and sedative effects. It has a rapid onset and is widely distributed throughout the body.

Indication:
Supplemental therapy to epinephrine in anaphylaxis and other uncomplicated allergic reactions requiring prompt treatment.

Contraindication:
Hypersensitivity to the drug, during acute asthmatic attacks, in newborns, premature neonates, or breastfeeding women. Avoid use in patients taking MAO inhibitors. Also patients with glaucoma, peptic ulcer, and COPD

Precaution:
Use with extreme caution in patients with asthma or COPD, increased intraocular pressure, hyperthyroidism, CV disease, hypertension. Drug and alcohol use causes increased CNS depression

Adverse Effects:
Palpitations, hypotension, tachycardia, confusion, decreased level of consciousness, insomnia, headache, vertigo, restlessness, tremor, seizures, blurred vision, nausea and vomiting, thickened bronchial secretions, and anaphylactic shock.

Dose:
- Adult: 50mg IV/IO/IM once
- Pediatric: 1 mg/kg IM/IV/PO (Max 50mg) Children may be more prone to paradoxical responses than adults

Dextrose

Action/Mechanism:
Dextrose provides calories and increases blood glucose concentrations.

Indication:
Diabetics who are unable to take oral fluids due to altered level of consciousness and low blood glucose. - Unknown, unconsciousness

Contraindication:
Hypersensitivity to dextrose, corn or corn products, or any component of the formulation; hypertonic solutions in patients with intracranial or intraspinal hemorrhage, diabetic coma, or delirium tremens, especially if dehydrated; severe dehydration; glucose-galactose malabsorption syndrome

Precaution:
Use with caution in patients with cardiac or pulmonary disease, hypertension, renal insufficiency, urinary obstruction, or hypovolemia. Avoid extravasation may cause tissue sloughing, necrosis, and phlebitis.

Adverse Effects:
Pulmonary edema, exacerbated hypertension, heart failure, Hyperglycemia, (during infusion), hyperosmolar syndrome (mental confusion, loss of consciousness), hypokalemia, reactive hypoglycemia (after infusion).

Dose:

- Adult: One prefilled syringe of D50W- 25mL(12.5 gm) IV—may repeat as appropriate
- Pediatric:
    - D10W 5 ml/kg (0.5 gm/kg) IV- Max 12.5 gm(125 ml) [Preferred for everyone]
    - D25W 2ml/kg (0.5 gm/kg) IV (only for >1year old) Max 12.5gm(50mL)

Note:
Vesicant (at concentrations ≥10%); ensure proper needle or catheter placement prior to and during IV infusion. Avoid extravasation. If extravasation occurs, stop infusion immediately and disconnect (leave needle/cannula in place); gently aspirate extravasated solution (do NOT flush the line); initiate hyaluronidase antidote; remove needle/cannula; apply dry cold compresses; elevate extremity.

Epinephrine (Adrenaline)

Action/Mechanism:
Stimulates alpha and beta-adrenergic receptors within the sympathetic nervous system. A potent cardiac stimulant, it strengthens the myocardial contraction (positive inotropic effect) and increases cardiac rate (positive chronotropic effect). Increases myocardial and cerebral blood flow during CPR.

Indication:
Cardiac arrest: VF, pulseless VT, asystole, pulseless electrical activity. Anaphylaxis, severe allergic reactions, and profound bradycardia or hypotension after other drugs tried may be used as a gtt.

Contraindication:
None when used in a life-threatening situation

Patients with angle-closure glaucoma, shock (other than anaphylactic shock), organic brain damage, cardiac dilation, coronary insufficiency, cerebral arteriosclerosis or labor and delivery. Do not use to treat overdose of adrenergic blocking agents.

Precaution:
High doses do not improve survival or neurologic outcome and may contribute to post-resuscitation myocardial dysfunction. Raising blood pressure and increasing heart rate may cause myocardial ischemia, angina and increased myocardial oxygen demand. Higher doses may be required to treat poison/drug-induced shock. The effects of the drug may be potentiated by tricyclic antidepressants.

Adverse Effects:
Nervousness, tremor, headache, agitation, dizziness, weakness, cerebral hemorrhage, palpitations, hypertension, tachycardia, anginal pain, nausea and vomiting, and dyspnea.

Dose:

- Adult: Cardiac Arrest Epinephrine 1mg (10ml of 1:10,000) every 3-5 min as long as the patient remains pulseless. Unless a clear response to epinephrine is observed, consider a limit of 3 total doses.
    - For WHEEZING(Asthma): Epinephrine 0.5 mg IM every 20 minutes as needed for acute severe asthma unresponsive to multiple doses of inhaled beta-agonists
    - For STRIDOR(Croup): Epinephrine 2mg (1 mg/mL; 1:1000) mixed with 3mL of normal saline nebulized
    - *Anaphylaxis:* 0.5 mg (1mg/mL; 1:1000) IM every 10 minutes as needed
- Pediatric: Cardiac arrest- Epinephrine 0.01 mg/kg (0.1 ml/kg of 0.1mg/mL; 1:10,000) push (Max dose= 1 mg or 10 mL) every 3-5 min as long as the patient remains pulseless. Unless a clear response to epinephrine is observed, consider a limit of 3 total doses.
    - For WHEEZING: Epinephrine IM 0.01 mg/kg every 20 minutes as needed for Acute severe asthma unresponsive to inhaled beta-agonist
    - For STRIDOR: Epinephrine 2mg (2mL of 1 mg/mL; 1:1000) added to 3mL of Normal Saline via nebulizer
    - *Anaphylaxis:* 0.01 mg/kg (0.01 mL/kg of 1 mg/mL; 1:1000) IM up to 0.3 mg if patient was exposed to commonly recognized allergen and has respiratory distress or hypotension.

Epinephrine – “Push Dose” Pressor Administration

Action/Mechanism:
Stimulates alpha and beta-adrenergic receptors within the sympathetic nervous system. A potent cardiac stimulant, it strengthens the myocardial contraction (positive inotropic effect) and increases cardiac rate (positive chronotropic effect). I

Indication:
Immediate/temporizing treatment of hypotension, not due to hypovolemia, while preparing IV pressors.

Contraindication:

None when used in a life-threatening situation. Patients with angle-closure glaucoma, shock (other than anaphylactic shock), organic brain damage, cardiac dilation, coronary insufficiency, cerebral arteriosclerosis or labor and delivery. Do not use to treat overdose of adrenergic blocking agents.

Precaution:
If patients condition continues to worsen (decreasing mental status, increasing breathing difficulty, decreasing blood pressure) obtain medical direction to administer additional dose of epinephrine, treat for shock (hypoperfusion) and prepare to initiate basic life support measures (CPR, AED) If patient's condition improves, provide oxygen and treat for shock. Transport immediately.

Adverse Effects:
Nervousness, tremor, headache, agitation, dizziness, weakness, cerebral hemorrhage, palpitations, hypertension, tachycardia, anginal pain, nausea and vomiting, and dyspnea.

Dose:
- Adult: 0.5-2 mL's (5-20mcg) every 2-5 minutes to maintain blood pressure.
- Pediatric: 1 mcg/kg (0.1mL/kg) IV every 2-5 minutes to maintain blood pressure

How to make:
- Recipe 1 =10mL
    - Take a 10 ml syringe with 9 ml of normal saline
    - Into this syringe, draw up 1 ml of epinephrine from the cardiac amp (Cardiac amp contains Epinephrine 100 mcg/ml)
    - Now you have 10 mls of Epinephrine 10 mcg/ml
- Recipe 2 =50mL
    - Take a 50 ml syringe with 45 ml of normal saline
    - Into this syringe, draw up 5 ml of epinephrine from the cardiac amp (Cardiac amp contains Epinephrine 100 mcg/ml)
    - Now you have 50 mls of Epinephrine 10 mcg/ml
- Recipe 3 = 100mL
    - Draw up epinephrine 1 mg (preferred 1mg/mL but can use Cardiac amp contains Epinephrine 100 mcg/ml)
    - Inject epinephrine 1mg into NS 100 mL bag
    - You now have 100 mL of epinephrine 10mcg/mL

Fentanyl

Action/Mechanism:
Fentanyl is a potent synthetic narcotic with similar actions to those of Morphine and Demerol, but action is more prompt (<5min) and less prolonged (half-life 90 min). Fentanyl exhibits less hemodynamic effects than does Morphine or Demerol. Fentanyl is also less likely to cause nausea/vomiting.

Indication:
Patients with significant pain due to injury or medical condition

Contraindication:
Known allergy to Fentanyl or hypersensitivity to opiates. Major trauma to head, chest, abdomen or pelvis. Airway compromise, respiratory depression/insufficiency. Evidence of shock (hypotension). Myasthenia Gravis

Precaution:
Continuously monitor vitals, oximetry, and mental status before and after administration. Fentanyl should be administered SLOWLY (over 2 minutes). High doses may cause chest wall and jaw muscular rigidity with resultant difficult ventilation. Respiratory depression may outlast pain control effects.

Adverse Effects:
Sedation/decreased level of consciousness, respiratory depression/arrest, bradycardia, hypotension or hypertension, mild nausea and/or vomiting, increased intracranial pressure. Rule out significant trauma prior to administration.

Dose:

- Adult: 1-2 mcg/kg slowly IV/IM. Expected dose: 25-50 mcg. Max Dose: 100 mcg
- Pediatric: 0.5-1 mcg/km slowly IV/IM. Max Dose: 50 mcg.
    - 2 mcg/kg Nasal Max Dose= 100 mcg (administer ½ in each nostril)

Glucagon (GlucaGen)

Action/Mechanism:
Induces liver glycogen breakdown, releasing glucose from the liver. Blood glucose is raised within 10 minutes. Has a half-life of 8 to 18 minutes.

Indication:
Treatment of severe hypoglycemia

Contraindication:
Known hypersensitivity to drug, and in patients with pheochromocytoma or with insulinoma (tumor of pancreas).

Precaution:
Give with caution to patients that have low levels of releasable glucose (e.g., adrenal insufficiency, chronic hypoglycemia, and prolonged fasting). Potentiates oral anticoagulants. Depletes glycogen stores especially in children and adolescents.

Adverse Effects:
Hyperglycemia (excessive dosage), nausea and vomiting hypersensitivity reactions (anaphylaxis, dyspnea, hypotension, rash), increased blood pressure, and pulse; this maybe greater in patients taking beta-blockers.

Dose:

- Adult: Give 1 mg. IM, after reconstituting powder and sterile water, for symptomatic diabetic patient whose IV access has been difficult.
- Pediatric: 0.01-0.02 mg/kg (max dose of 1 mg) IM if no IV/IO access after reconstituting powder and sterile water, for symptomatic diabetic patient whose IV access has been difficult.

Oral Glucose

Action/Kinetics: Increases blood sugar levels

Indications:
Patient meets all of the following criteria:
- Altered mental status - Known history of diabetes mellitus

Contraindications:
Unconsciousness, known diabetic who has not taken insulin for days, patient who is unable to swallow

Precaution:

Adverse Effects:
None when given properly. May be aspirated by the patient without gag reflex.

Dose: Administer one tube between the patient's cheek and gums.

Ibuprofen (Motrin/Advil)

Action/Mechanism:
Ibuprofen is a non-steroidal anti-inflammatory agent (NSAID) with analgesic effects, anti-inflammatory, and antipyretic effects. NSAIDs are thought to exert their effects by inhibiting prostaglandin synthesis by inhibiting the cyclooxygenase (COX) enzyme, which catalyzes the conversion of arachidonic acid to prostaglandin and endoperoxide. Prostaglandins are a modulator of inflammation and are also involved in thermoregulation, pain transmission, and platelet aggregation.

Indication:
Mild to moderate pain. Fever Control.

Contraindication:
Avoid NSAIDS in women who are pregnant or could be pregnant. Not to be used in patients with history of GI Bleeding (ulcers) or renal insufficiency (i.e. chronic kidney disease). Not to be used in patients with allergies to aspirin or other NSAID drugs. Avoid in patients currently

taking anticoagulants, such as Coumadin. Avoid use for immune-compromised patients (on chemotherapy, with autoimmune disorders, etc.) Not to be used in patients less than 6 months old.

Precaution:
Ibuprofen is not indicated for the treatment of abdominal pain.

Adverse Effects:
GI bleeding, Nausea/vomiting, Headache, Drowsiness, Abdominal pain, Dyspepsia, Diarrhea.

Dose:

- Adult: 400-600 mg PO q4-6h prn Max: 2400 mg/day)
- Pediatric 6 months and older: 10 mg/kg PO (q6-8h prn) Max: 600mg

Ipratropium (Atrovent)

Action/Mechanism:
Inhibits vagally mediated reflexes by antagonizing acetylcholine at muscarinic receptors on bronchial smooth muscle.

Indication:
Either Alone or with other bronchodilators, especially beta adrenergics, is used for treatment of bronchospasm associated with chronic obstructive pulmonary disease, including asthma, chronic bronchitis, and emphysema.

Contraindication:
Hypersensitivity to the drug, atropine and its derivatives, and those with a history of hypersensitivity to soy lecithin or related food products such as soybeans and peanuts.

Precaution:
Use cautiously in patients with angle-closure glaucoma, prostatic hyperplasia, and bladder-neck obstruction. Avoid leakage around the face mask, temporary blurring of vision or eye pain may occur.

Adverse Effects:
Dizziness, headache, nervousness, palpitations, hypertension, cough, blurred vision, rhinitis, epistaxis, GI distress, chest pain, flu-like symptoms.

Dose:

- Adult/Peds- 0.5mg added to the nebulized albuterol. May repeat neb of albuterol 2.5 mg with ipratropium 0.5mg x 1

Ketamine HCL

Action/Mechanism:

Ketamine is a dissociative anesthetic agent, structurally similar to phencyclidine (PCP). It is unique among sedative agents in that it provides analgesia along with its amnestic and sedative effects.

Indication:
As an induction agent in the performance of the Rapid Sequence Induction procedure. As a sedative in Excited Delirium. For pain and procedure-related anxiety management.

Contraindication:
Increased ICP, severe HTN, aneurysms, acute heart failure

Precaution:
Caution should be used in the hypertensive patient and in the patient with existing tachyarrhythmia

Adverse Effects:
Laryngospasm: this very rare adverse reaction presents with stridor and respiratory distress.

- After every administration of ketamine:
    - Prepare to provide respiratory support including bag-valve-mask ventilation and suction which are generally sufficient in rare cases of laryngospasm.
    - Institute cardiac monitoring, pulse oximetry and continuous waveform capnography
    - Establish IV or IO access, check blood glucose
    - Establish and maintain physical restraint.
- Emergence reaction: presents as anxiety, agitation, apparent hallucinations or nightmares as ketamine is wearing off. For severe reactions, consider benzodiazepine.
- Nausea and Vomiting: always have suction available after ketamine administration. Give antiemetic as needed.
- Hypersalivation: Suction usually sufficient. If profound hypersalivation causing airway difficulty, consult Medical Control for Atropine 0.5mg/IV.

Dose:

- Adult:
    - Violent patient:
        - Intramuscular (IM) – 4 mg/kg once (max 300 mg)
        - IV/IO – 1 mg/kg every 10 min to the desired effect (max dose 200 mg)
    - Pain or Procedural-related Anxiety:
        - IV/IO – 0.1-0.3 mg/kg (max 30mg) diluted in 100mL of normal saline IV/IO drip over 15 minutes
- Pediatric: ONLY FOR USE in patients over the age of 2.--move below to peds
    - Violent patient:
        - Intramuscular (IM) – 3 mg/kg once (max 300 mg)
        - IV/IO – 1 mg/kg once (max dose 200 mg)
    - Pain or Procedural-related Anxiety:
        - IV/IO – 0.1-0.3 mg/kg (max 30mg) diluted in 100mL of normal saline IV/IO drip over 15 minutes

Special Considerations:

- Some patients experience an “emergence phenomenon” in which a patient experiences disturbing dreams as they emerge from Ketamine induced dissociation.
- Emergence phenomena are less of a concern when Ketamine is used as an induction agent for RSI after which the patient is generally sedated with benzodiazepines for a substantial period.

Ketorolac (Toradol)

Action/Mechanism:
Inhibition of prostaglandin synthesis by competitive blocking of the enzyme cyclooxygenase (COX). Ketorolac is a non-selective COX inhibitor. Ketorolac is a potent non-steroidal anti-inflammatory drug (NSAID) often used as an analgesic.

Indication:
Moderate to severe acute pain management. Consider in isolated extremity injuries such as strains or sprains, non-complicated isolated fractures, known kidney stones, acute exacerbations of chronic back pain.

Contraindication:
Patients who are actively bleeding or have incomplete bleeding control, such as trauma. Patients at high risk for bleeding, including current use of Aspirin, NSAIDs, or blood thinners. Patients with known or suspected renal disease. Significant volume depletion or dehydration. History of peptic ulcer disease or GI bleed. Hypersensitivity to NSAIDS or ASA. Pregnant or nursing. Elderly (relative).

Precaution:
Separate use from other NSAIDs by 6 hours.

Adverse Effects:
Dyspepsia

Dose:
- Adult: 15mg IV/IO Single dose.
- Pediatric: 0.5mg/kg IV (max 15mg), single dose only, ONLY FOR USE in patients over the age of 2.

Lidocaine

Action/Mechanism:
Decreases ventricular excitability without depressing the force of ventricular contractions by increasing the stimulation threshold of the ventricle during diastole. Onset of action should occur within 2 minutes and last approximately 10 to 20 minutes. Metabolized in the liver and excreted in the urine

Indication:

Cardiac arrest from VF/VT (class II B) Stable VT, wide-complex tachycardias of uncertain type, wide-complex PSVT (class IIB). Used to stabilize patients converted from VT/VF. Occasionally used in control of symptomatic criteria PVC's.

Contraindication:
Hypersensitivity to the drug. Stokes-Adams syndrome, Wolff-Parkinson-White syndrome, severe degrees of SA, AV, or intraventricular block (when no pacemaker is present.).

Precaution:
Do not administer with sinus bradycardia, second or third degree AV blocks and idioventricular rhythms. Prophylactic use in AMI patients is not recommended. Discontinue infusion immediately if signs of toxicity develop. Elderly clients who have hepatic or renal disease or who weigh less than 45.5 kg. Should be watched closely for adverse side effects. Toxicity can occur due to reduced metabolism of lidocaine.

Adverse Effects:
Anaphylaxis, bradycardia, hypotension, cardiovascular collapse, seizures, malignant hyperthermia, respiratory depression, tremors, lightheadedness, confusion, tinnitus, blurred or double vision, and vomiting

Dose:

- Adult:
    - V tach - Lidocaine 100 mg. (1.0-1.5 mg/kg) IV over two minutes. Use 1⁄2 dose, i.e., 50 mg. if patient is over age 70 or if CHF or hepatic failure present. Repeat 0.5 to 0.75 mg/kg every 5 to 10 minutes; maximum total dose: 3 mg/kg.
    - Cardiac arrest from VF/VT - Lidocaine 100 mg. (1.5 mg/kg) may repeat lidocaine 100mg. IV or 200 mg. ET followed by defib. Drip – 2gm/500cc's administered 1-4 mg/min. Always preceded by a bolus.
- Pediatric:
    - Cardiac Arrest – 1 mg/kg IV/ET/IO. Maintenance IV/IO Follow bolus with continuous 20 to 50 mcg/kg/minute. Per manufacturer, do not exceed 20 mcg/kg/minute in patients with shock, hepatic disease, cardiac arrest, or CH

Lorazepam

Action/Mechanism:
Though the drug is still widely used as an anticonvulsant, it is relatively weak and of shorter duration than diazepam. Rapid IV administration may be followed by respiratory depression and excessive sedation. Lorazepam is frequently used to treat anxiety and stress. In emergency care, it is used to treat alcohol withdrawal and grand mal seizure activity. Benzodiazepines act on the limbic, thalamic, and hypothalamic regions of the CNS to potentiate the effects of inhibitory neurotransmitters, raising the seizure threshold in the motor cortex. It may also be used in conscious patients during cardioversion to induce amnesia and sedation.

Indication:
Status epilepticus, acute anxiety states, acute alcohol withdrawal, Procedural (cardioversion) anxiolysis

Contraindications:
Hypersensitivity to the drug, acute narrow & open angle glaucoma, Hypotension, Head injury, CNS depression, Respiratory depression

Precautions:
Lorazepam may precipitate CNS depression and psychomotor impairment when the patient is taking CNS depressant medications. Should not be administered with other drugs because of possible precipitation (incompatible with most fluids; should be administered into an IV of normal saline solution).

Adverse Effects:
Hypotension, Reflex tachycardia, Respiratory depression, Ataxia, Psychomotor impairment, Confusion, Nausea/Vomiting

Dose:

- Adult:
    - Status Epilepticus: 4 mg slow IV (<2 mg/min) or IM. Agitation / Anxiety Relief: 0.5 - 2 mg slow IV (<2 mg/min) or IM
- Pediatrics:
    - Status Epilepticus: 0.1 mg / kg (max 4 mg per dose) slow IV (<2 mg/min) or IM

Special Considerations:

- Pregnancy safety: Category D - dangerous to fetus, but benefits to mother MAY outweigh risks
- Must be diluted 1:1 with normal saline prior to IV administration, and given not more than 2mg/minute
- Has short duration of anticonvulsant effect
- Reduce dose by 50% in elderly patients
- Resuscitation equipment should be readily available, monitor respirations carefully! -

Magnesium Sulfate

Action/Mechanism:
Magnesium is an important cofactor for enzymatic reactions and plays an important role in neurochemical transmission and muscular excitability. Magnesium prevents or controls convulsions by blocking neuromuscular transmission and decreasing the amount of acetylcholine liberated at the end plate by the motor nerve impulse. Magnesium is said to have a depressant effect on the central nervous system, but it does not affect the mother, fetus or neonate when used as directed in eclampsia and pre- eclampsia. Magnesium acts peripherally to produce vasodilation.

Indication:
Parenteral anticonvulsant for the prevention and control of seizures in severe toxemia of pregnancy.

- Torsades de pointes

- Suspected hypomagnesemic state (eg. chronic alcoholism and chronic use of diuretics)
- Refractory ventricular fibrillation
- Asthma Refractory to other treatment

Contraindication:

Precaution:

Adverse Effects:
Signs of hypermagnesemia include: flushing, sweating, hypotension, depression of reflexes, flaccid paralysis, hypothermia, circulatory collapse, depression of cardiac function and central nervous system depression. These symptoms can precede fatal paralysis.

Dose:
- *Eclamptic seizures*: 4 gm IV (mixed in 50/100 ml of D5W/NS and administered over 4 minutes). May repeat once at 2 gm IV (mixed in 50/100 ml of D5W/NS and administered over 5 minutes)
- *Torsades de pointes and refractory VF*: 1-2 gm IV (mixed in 50/100 ml of D5W/NS and administered over 1-2 minutes) followed by a maintenance infusion (1 gm in 250 ml of D5W/NS administered at 30-60 gtt/min)
- *Asthma*
    - Adult: 2 grams in 50/100 ml of D5W/NS over 20 min
    - Pediatric: 50 mg/kg (Max dose = 2 gm) in 50/100 ml of D5W/NS over 20 min

Special Considerations:
Magnesium Sulfate Injections USP, 50% must be diluted to a concentration of 20% or less prior to IV infusion. Because magnesium is removed from the body solely by the kidneys, the drug should be used with caution in patients with renal impairment. Monitoring magnesium serum levels and the patient's clinical status is essential to avoid the consequences of overdose in toxemia. Clinical indications that it is safe to give magnesium include the presence of patellar reflex (knee jerk) and absence of respiratory depression (approximately 16 breaths or more/ minute). Calcium Chloride should be immediately available to counteract the potential hazards of magnesium intoxication in eclampsia. Intravenous use of magnesium sulfate should not be given to mothers with toxemia of pregnancy during the two hours immediately preceding delivery.

Morphine

Action/Mechanism:
An opium-derivative, narcotic analgesic, which is a CNS depressant. Induces sleep and inhibits perception of pain by binding to opiate receptors, decreasing sodium permeability, and inhibiting transmission of pain pulses. Causes peripheral vasodilation, thereby decreasing venous blood return to the heart. Relieves pulmonary congestion, and lowers myocardial oxygen need.

Metabolized in the liver and excreted in the urine. Onset 2-3 minutes, peak 30 minutes, and duration is 3-6 hours.

Indication:
Analgesic of choice in pain associated with myocardial infarction that is unresponsive to nitrates. Treatment of acute pulmonary edema associated with left ventricular failure, (if blood pressure is adequate). Used for sedation, to decrease anxiety and facilitate induction of anesthesia. Used for management of pain in trauma, kidney stones, etc...

Contraindication:
Hypersensitivity to opiates, acute bronchial asthma, heart failure secondary to lung disease, upper airway obstruction, acute alcoholism, convulsive states, and paralytic ileus.

Precaution:
Causes hypotension in volume-depleted patients. Administer slowly and titrate to effect. May cause apnea in asthmatic patients. May also cause increase ventricular response rate in presence of supraventricular tachycardias. Use with caution in the elderly, head injuries with increased intracranial pressure, COPD, severe hepatic or renal disease.

Adverse Effects:
Seizures (with large doses), hypotension, bradycardia, cardiac arrest, or may see tachycardia, and hypertension. Nausea and vomiting, rash, itching, urine retention, respiratory depression and arrest, hypothermia, and increased intracranial pressure may also been seen.

Dose:
- Adult: For persistent pain, 2-10 mg IV titrated to obtain pain relief (use caution in presence of COPD)
- Pediatric: 0.1mg/kg IV/IM (Max 4mg)

Midazolam

Action/Mechanism:
A short-acting benzodiazepine and CNS depressant 3-4 times as potent as diazepam. Depressant effects are dependent on dose, route of administration, presence of other medications, and age of patient. It can depress the ventilatory response to CO2 stimulation. It diminishes patient recall. Onset of action is 1-5 min with IV dosing, 5-15 min with IM dosing, and 10 min with IN dosing. Duration of action is generally less than 2 hours.

Indications:
Midazolam HCL can be given IV/IM/IN for:
- Anxiolysis / amnesia
- Sedation of intubated and mechanically ventilated patients
- Anticonvulsant effect in status epilepticus

- For procedure-related anxiety

Contraindications:
Hypersensitivity to midazolam or any component of the formulation; intrathecal or epidural injection of parenteral forms containing preservatives (ie, benzyl alcohol); use in premature infants for parenteral forms containing benzyl alcohol; acute narrow-angle glaucoma.

Precaution:
Use cautiously in patients with uncompensated acute illness and in elderly or debilitated patients. Administer slowly over at least 2 minutes. Use with caution in neonates. Versed does not protect against the intracranial pressure or against the pulse and blood pressure rise associated with intubation. Erythromycin may alter the metabolism of Versed. Oral contraceptives prolong the half-life. Sedatives effects may be antagonized by theophylline.

Adverse Effects:
Serious cardiac and respiratory events have been associated with the use of IV Midazolam HCl. These include airway obstruction, apnea, hypotension, depressed saturations, respiratory and cardiac arrest. Risk increases with patients over age 55, concomitant use of opioid analgesics, and rapid administration. It should only be given in the setting of continuous respiratory and cardiac monitoring. Other effects can include paradoxical behavior, excitement, coughing, headache, hiccups, nausea, vomiting, and nystagmus (especially in children)

Dose:
- *Status seizure*:
    - ADULT (>5min duration):
        - IV -- 2.5 - 5 mg slowly(1-2 min)
        - IM -- 5 - 10 mg
        - IN -- 10 mg, divide dose between nostrils (use atomizer)
    - PEDIATRIC (>5min duration):
        - IV -- 0.1 mg/kg with max 5 mg
        - IM -- 0.2 mg/kg with max 10 mg
        - IN -- 0.2 mg/kg, divide dose between nostrils (use atomizer) Max 10mg
- *Agitation* (intubated patient, behavioral emergencies):
    - 2.5 – 5 mg IV or 5 – 10 mg IM
- *Anxiety*
    - IV/IO -- 2.5- 5 mg, may repeat once in 10 minutes, if needed. Total max dose: 10mg
    - Intranasal (IN) -- 5 mg, may repeat once in 10 minutes to a max dose of 10mg
    - Intramuscular (IM) -- 2.5- 5 mg, may repeat every 10 minutes, if needed. Total max dose: 10mg
- *Cardioversion:*
    - 2.5 - 5 mg IV if patient alert

Naloxone (Narcan)

Action/Mechanism:

Overcomes effects of narcotic overdose including respiratory depression, sedation, and hypotension. It does not have any narcotic effect itself. It exhibits essentially no pharmacologic activity. Diagnostic agent in unconsciousness of unknown origin. Pure opioid antagonist that competes and displaces opioids at opioid receptor sites

Indication:
Suspected opioid overdose

Contraindication:
Hypersensitivity to the drug

Precaution:
May precipitate acute withdrawal symptoms in narcotic addicts. Effects of drug may not outlast effects of narcotics. Use with caution in patients with cardiac disease or those receiving cardiotoxic drugs. It is ineffective against respiratory depression caused by barbiturates, anesthetics, other non-narcotic agents, or pathologic conditions.

Adverse Effects:
VF, tachycardia, hypertension, nausea, vomiting, and diaphoresis, in higher doses. Tremors and withdrawal symptoms in narcotic-dependent patients

Dose:

- Adult: If suspected narcotic overdose consider 2 mg Narcan IV. For physical findings consistent with narcotics overdose, may give 2 mg. Narcan IV.
- Pediatric: 0.1 mg/kg IV/IM/IN Max 2mg

Nitroglycerin

Action/Mechanism:
Primary action is relaxation of the vascular smooth muscle and dilatation of peripheral arteries and veins. Although venous effects predominate, nitro produces dilation of both arterial and venous beds. Promotes peripheral pooling of blood and decreases venous return to the heart, reducing left ventricular pressure (preload). Arteriolar relaxation reduces systemic vascular resistance and arterial pressure (afterload). Also increases blood flow through the collateral coronary vessels.

Indication:

- Control of pain associated with angina pectoris/myocardial infarction
- Relief of pulmonary edema caused by left-sided heart failure.

Contraindication:
Hypersensitivity to nitroglycerin, other nitrates or nitrites, or any component of the formulation (includes adhesives for transdermal product); concurrent use with phosphodiesterase-5 (PDE-5) inhibitors (avanafil, sildenafil, tadalafil, or vardenafil); concurrent use with soluble guanylate cyclase (sGC) stimulators (eg, riociguat).

Precaution:
If patient is wearing a nitroglycerin patch or paste, an additional administration may not be appropriate. If patient is taking prescribed Viagra, consult medical control regarding nitro administration.

Adverse Effects:
Headache, transient episodes of lightheadedness related to blood pressure changes, hypotension, syncope, crescendo angina, rebound hypertension, and anaphylactoid reactions. Abd pain and vomiting may also be seen.

Dose:
- One tablet S.L. 0.4 mg
- May repeat same dosage every 5 minutes x 3 if SBP remains 100 or greater if medical control gives authorization.

Norepinephrine (Levophed)

Actions/Mechanism:
Stimulates beta1 and alpha1 receptors in sympathetic nervous system, causing vasoconstriction, increased blood pressure, enhanced contractility, and decreased heart rate.

Indications:
Severe hypotension- due to cardiogenic, septic, or neurogenic shock either refractory to intravascular fluid boluses or in which intravascular fluid bolusing is contraindicated (e.g. pulmonary edema).

Contraindications:
Hypersensitivity to drug, hypotension caused by blood volume deficit (except in emergencies until blood volume replacement is completed), profound hypoxia or hypercarbia, mesenteric or peripheral vascular thrombosis

Precautions:
- Use IV pump only to infuse
- Monitor IV site closely for extravasation
- Watch for signs of inadequate peripheral tissue perfusion, pale-cyanotic-black
- Never leave patient unattended during infusion
- Monitor VS Q 5 minutes
- Infusions should be reduced gradually, avoiding abrupt withdrawal

Adverse Effects:
- CNS: headache, anxiety
- CV: bradycardia, severe hypertension, arrhythmias
- Respiratory: respiratory difficulty

- Skin: irritation with extravasation, necrosis
- Other: ischemic injury

Dose:
- Adult dose: 1 to 4 mcg/min
- Maintenance dose: Adjust the rate for a low normal blood pressure (usually 80 to 100 mm Hg systolic). The average maintenance dose ranges from 1 to12 mcg/min (maximum dose 30 mcg/min)
- Pediatric dose:0.1 – 2 mcg/kg/min; 2 mcg/kg/min max

Note:
Overdosage with norepinephrine may result in headache, severe hypertension, reflex bradycardia, marked increase in peripheral resistance, and decreased cardiac output. In case of accidental overdosage, as evidenced by excessive blood pressure elevation, discontinue norepinephrine until the condition of the patient stabilizes.

Ondansetron

Action/Mechanism:
Selective 5-HT3 receptor antagonist which blocks serotonin, both peripherally on vagal nerve terminals and centrally in the chemotrigger zone

Indication:
When non-sedating antiemetic is desirable - Prevention and treatment of severe nausea

Contraindication:
Known hypersensitivity/allergy to Zofran, patient's <1 yrs. of age

Precaution:
Use with caution in patients with impaired liver function. Rate of administration should not be less than 30 seconds but preferably over 2 to 5 minutes. NOTE: Zofran has no effect on motion sickness.

Adverse Effects:
Headache, dizziness, diarrhea, may cause pain at injection site.

Dose:
- Adult: 4mg IV (over 2-5 minutes) OR 4 mg IM injection. May repeat up to 8 mg with medical control approval.
- Pediatric: 0.1 mg/kg IV/IM. Max dose 4mg. NOT TO BE USED IN PATIENT'S UNDER 1 YRS OF AGE

Oxytocin

Action/Mechanism:

Stimulates contraction of the smooth muscles in the uterus, thereby constricting uterine blood vessels and controlling excessive bleeding or hemorrhage.

Indication:
Control of postpartum hemorrhage Contraindications: In the field oxytocin should not be used until after the baby is fully delivered. Be sure there is only one baby.

Contraindication:

Precaution:

Adverse Effects

- Fetal bradycardia (should not be administered prior to delivery of the infant)
- Uterine rupture
- Maternal hypotension, bradycardia and cardiac arrhythmia
- Nausea/vomiting
- Anaphylaxis

Dose:
Oxytocin may be started if bleeding continues:

- IM 10 units followed by IV/IO Infusion by adding 10-40 units to 500ml or 1000mL NS and titrating the infusion to decrease bleeding and patient comfort.

Sodium Bicarbonate

Action/Mechanism:
Neutralizes excess acids, returning blood and body fluid to a more normal pH, in which metabolic processes and medications work more effectively.

Indication:
Metabolic acidosis caused by circulatory insufficiency resulting from shock or severe dehydration, severe renal disease, cardiac arrest w/prolonged CPR, tricyclic overdoses, and hyperkalemia.

Contraindication:
None

Precaution:
Not recommended for routine use in cardiac arrest patients. Sodium bicarbonate inactivates norepinephrine and forms a precipitate with calcium. Use with caution in the elderly with renal or cardiovascular insufficiency with or without CHF.

Adverse Effects:
Gastric distention, belching, flatulence, hypokalemia, metabolic alkalosis, hypernatremia, hyperosmolarity, hyperirritability or tetany. Extravasation of IV sodium bicarbonate may cause chemical cellulitis with tissue necrosis.

Dose:

- Adult
    - Drug overdose: Consider Na Bicarb 50 mEq IV in tricyclic ingestions.
    - Symptomatic renal patient: Consider Na Bicarb 50 mEq IV.
    - Cardiac arrest-asystole-PEA: Consider Na Bicarb 50 mEq (1 amp) or 1 mEq/kg if arrest interval long or return of circulation after prolonged resuscitation. All subsequent doses 1⁄2 dose every 10 minutes.
- Pediatrics
    - Cardiac arrest asystole-PEA: Consider (1 mEq/cc) if arrest interval long or upon spontaneous circulation. Give 1 mEq/kg or 1 mL/kg IV/IO up to 50 cc.

Tranexamic Acid/TXA (Cyklokapron)

Action/Mechanisms:
Tranexamic acid is an anti-fibrinolytic agent that inhibits the conversion of plasminogen to plasmin and at the same time acts as a weak non-competitive inhibitor of plasmin thus arresting fibrinolysis. As a result, a stable clot can be formed and blood loss is reduced. TXA needs to be given broadly to save the most lives, so clinical judgement based on assessment is crucial. **When given within 3 hrs** of injury risk of bleeding death drops by 1/3. Studies have demonstrated improved outcomes when the interval from injury to administration is decreased, therefore early administration is recommended.

Indications:

- Blunt or penetrating trauma patient's ≥ 14 years of age, at high risk of ongoing internal hemorrhage or significant external bleeding, that meet the following:
    - Injury sustained within 3 hrs prior to administration. TXA must be administered within 3 hrs of injury. Administer as early as possible following gross bleeding control and other lifesaving interventions.
    - Systolic BP < 90mmHg and signs of ongoing hemorrhage, AND/OR
    - Tachycardia > 110bpm with signs of hypoperfusion (altered mental status, pallor, cool extremities) and signs of ongoing hemorrhage.
    - Considered in paramedics judgement to be at high risk of significant hemorrhage.
- Also indicated for excessive hemorrhage following delivery or delayed placenta delivery if within 3 hours of delivery.

Contraindications:

- Injuries > 3 hours old
- Patients < 14 years of age.

- Known hypersensitivity to drug

Precautions:

- Notify receiving hospital of TXA administration.
- Clearly document mechanism of injury, time injury/incident occurred, indications for administration and time of administration of TXA.
- TXA should NEVER be administered at a “wide open” rate.

Adverse Effects:
Hypotension (with rapid IV injection), Seizures in high doses (>2-10 grams), allergic dermatitis, diarrhea, nausea, vomiting, blurred vision.

Dose:
Mix 1g/10 ml of TXA in 100ml NS. Infuse over 10 min.