APPENDIX 3:

MEDICATION INFORMATION

0.9% Normal Saline

Class:
Isotonic Crystalloid Solution

Description:
Normal Saline contains 154mEq/L of sodium ions and approximately 154mEq/L of chloride ions. Because the concentration of sodium is near that of the blood, the solution is considered isotonic.

Mechanism of Action:
Normal Saline replaces water and electrolytes.

Indications:
Heat related problems (heat exhaustion, heat stroke).

Contraindications:
The use of 0.9%NaCl should not be considered in patients with congestive heart failure because circulatory overload can easily be induced.

Precautions:
When large amounts of Normal Saline are administered, it is quite possible for other physiological electrolytes to become depleted.

Side Effects:
Rare in therapeutic doses.

Interactions:
Few in the emergency setting.

Activated Charcoal with Sorbitol (ex: Insta-Char™ / Actidose ™)

Class:
Adsorbent

Description:
Activated charcoal is used to adsorb ingested toxins that cannot be removed through emesis, or after emesis has been induced, to adsorb remaining toxins.

Mechanism of Action:
Adsorbs toxins by chemical binding and prevents gastrointestinal adsorption.

Indications:
Poisoning following emesis, or when emesis is contraindicated.

Contraindications:
None in severe poisoning.

Precautions:
Use with caution in patients with altered mental status. May adsorb ipecac before emesis; if ipecac is administered, wait at least 10 minutes to administer Activated Charcoal.

Side Effects:
Nausea and vomiting, constipation.

Interactions:
None reported in the emergency setting.

Adenosine

Class:
Antiarrhythmic

Description:
Adenosine is a naturally occurring nucleoside that slows AV conduction through the AV node. It has an exceptionally short half-life and a relatively good safety profile.

Mechanism of Action:
Adenosine decreases conduction of the electrical impulse through the AV node and interrupts AV re-entry pathways in PSVT. The half-life of Adenosine is about 5 seconds. Because of its rapid onset of action and very short half-life, the administration of Adenosine is sometimes referred to as chemical cardioversion.

Indications:
Adenosine is used in PSVT refractory to common vagal maneuvers.

Contraindications:
Adenosine is contraindicated in patients with second or third degree heart block, sick sinus syndrome, or those with known hypersensitivity to the drug.

Precautions:
Adenosine typically causes arrhythmias at the time of cardioversion; in extreme cases transient asystole may occur. Adenosine should be used cautiously in patients with asthma.

Side Effects:
Facial flushing, headache, shortness of breath, dizziness and nausea.

Interactions:
Methylxanthines (Aminophylline and Theophylline) may decrease the effectiveness of Adenosine, requiring larger doses. Dipyridamole (Persantine) can potentiate the effects of Adenosine.

Albuterol Sulfate (ex: Proventil ™, Ventolin ™)

Class:
Sympathetic Agonist

Description:
Albuterol is a sympathomimetic that is selective for Beta-2 adrenergic receptors.

Mechanism of Action:
Albuterol is a selective Beta-2 agonist with a minimal number of side effects. It causes prompt bronchodilation and has a duration of action of approximately 5 hours.

Indications:
Bronchial asthma, reversible bronchospasm associated with COPD and emphysema.

Contraindications:
Known hypersensitivity to the drug.

Precautions:
Use caution when administering this drug to elderly patients and those with cardiovascular disease or hypertension. If possible, peak flow rate should be measured before and after administration.

Side Effects:
Palpitations, anxiety, dizziness, headache, nervousness, tremor, hypertension, arrhythmias, chest pain, nausea, vomiting.

Interactions:
The possibility of developing unpleasant side effects increases when administered with other sympathetic agonists. Beta blockers may blunt the effects of Albuterol.

Amiodarone (ex: Cordarone ™)

Class:
Antiarrhythmic Agent

Description:
Amiodarone is a Class III Antiarrhythmic agent used to treat ventricular arrhythmias unresponsive to other antiarrhythmics.

Mechanism of Action:
Amiodarone prolongs the action potential duration in all cardiac tissues.

Indications:
Ventricular fibrillation, ventricular tachycardia.

Contraindications:
Breast-feeding patients in cardiogenic shock, severe sinus node dysfunction resulting in marked bradycardia, second or third degree AV block, symptomatic bradycardia, or known hypersensitivity.

Precautions:
Amiodarone should be used with caution in patients with latent or manifest heart failure because failure may be worsened by its administration.

Side Effects:
Hypotension, bradycardia, increased ventricular beats, prolonged P-R interval, prolonged QRS complex, prolonged Q-T interval. The patient should also be monitored for signs of pulmonary toxicity such as dyspnea and cough.

Interactions:
Amiodarone may react with Warfarin, Digoxin, Procainamide, Quinidine, and Phenytoin.

Aspirin (ex: Bayer ™, Bufferin ™, Ecotrin ™)

Class:
Platelet Aggregator Inhibitor

Description:
Aspirin is an anti-inflammatory agent and an inhibitor of platelet function.

Mechanism of Action:
Aspirin blocks the formation of the substance thromboxane A_2, which causes platelets to aggregate and arteries to constrict.

Indications:
Aspirin is used for new chest pain suggestive of acute myocardial infarction.

Contraindications:
Known hypersensitivity. Aspirin is relatively contraindicated in patients with active ulcer disease and asthma.

Precautions:
Aspirin can cause GI upset and bleeding. Aspirin should be used with caution in patients who report allergies to NSAIDS.

Side Effects:
Heartburn, GI bleeding, nausea, vomiting, wheezing, and prolonged bleeding.

Interactions:
When administered together, aspirin and other anti-inflammatory agents may cause an increased incidence of side effects. Administration of aspirin with antacids may reduce blood levels by reducing absorption.

Atropine Sulfate

Class:
Anticholinergic

Description:
Atropine is a parasympatholytic that is derived from parts of the *Atropa Belladonna* plant.

Mechanism of Action:
Atropine is a potent parasympatholytic and is used to increase the heart rate in hemodynamically significant bradycardias. Atropine acts by blocking acetylcholine receptors, thus inhibiting parasympathetic stimulation. Atropine has positive chronotropic properties, and little or no inotropic effect. It plays an important role as an antidote in organophosphate poisonings. Atropine is also used in the treatment of respiratory emergencies due to its bronchodilation and drying of respiratory tract secretions.

Indications:
Hemodynamically significant bradycardia, and asystole.
Bronchial asthma, reversible bronchospasm associated with chronic bronchitis and emphysema.
Organophosphate overdose.

Contraindications:
Known hypersensitivity.

Precautions:
Atropine may worsen the bradycardia associated with second-degree type II and third-degree AV blocks. In these instances, pacing should be attempted prior to administration of Atropine
For respiratory use: Use caution when administering this drug to elderly patients and those with cardiovascular disease or hypertension. If possible, peak flow rate should be measured before and after administration.

Side Effects:
Blurred vision, dilated pupils, dry mouth, tachycardia, drowsiness, confusion, palpitations, anxiety, dizziness, headache, nervousness, rash, nausea, and vomiting.

Interactions:
There are few interactions in the pre-hospital setting.

Calcium Chloride 10%

Class:
Calcium supplement

Description:
Calcium Chloride provides elemental calcium in the form of the cation. Calcium is required for many physiological activities.

Mechanism of Action:
Calcium Chloride replaces calcium in cases of hypocalcemia. It causes a significant increase in myocardial contractile force, and increases ventricular automaticity. Calcium Chloride is an antidote for Magnesium Sulfate, and can minimize the some of the side effects of calcium channel blocker usage.

Indications:
Acute hyperkalemia, acute hypocalcemia, calcium channel blocker toxicity.

Contraindications:
Calcium may precipitate Digitalis toxicity in patients taking Digoxin.

Precautions:
Flush IV line between administrations of Calcium Chloride and Sodium Bicarbonate to avoid precipitation.

Side Effects:
Bradycardia, arrhythmias, syncope, nausea, vomiting, cardiac arrest.

Interactions:
Flush IV line between administrations of Calcium Chloride and Sodium Bicarbonate to avoid precipitation. Calcium Chloride can cause elevated Digoxin levels, and Digitalis toxicity in those patients receiving Digitalis preparations.

Dextrose 10%

Class:
Carbohydrate

Description:
Dextrose is used to describe the 6-carbon sugar D-glucose, which is the principal form of carbohydrate used by the body.

Mechanism of Action:
Dextrose supplies supplemental glucose in cases of hypoglycemia.

Indications:
Hypoglycemia, coma of unknown origin.

Contraindications:
There are no major contraindications to the administration of Dextrose for suspected hypoglycemia.

Precautions:
It is important to obtain a Glucometer reading and obtain a blood sample prior to administration of Dextrose. Infiltration can cause local tissue necrosis. Dextrose should be used with caution in patients with increased intracranial pressure, because the Dextrose load may worsen cerebral edema.

Side Effects:
Tissue necrosis, phlebitis at the injection site.

Interactions:
There are no interactions in the emergency setting.

Diazepam (ex: Valium ™)

Class:
Anticonvulsant and Sedative

Description:
Diazepam is a benzodiazepine that is frequently used as an anticonvulsant, sedative, and hypnotic.

Mechanism of Action:
Diazepam is used primarily for its anticonvulsant properties. It suppresses the spread of seizure activity through the motor cortex of the brain, but appears not to abolish the abnormal discharge focus. It is used in the management of anxiety and stress. It is effective in treating the tremors and anxiety associated with alcohol withdrawal. It is an effective skeletal muscle relaxant, and induces amnesia.

Indications:
Diazepam is used in major motor seizures, status epilepticus, pre-medication prior to cardioversion, skeletal muscle relaxant, and acute anxiety states.

Contraindications:
Known hypersensitivity

Precautions:
Because Diazepam is a relatively short-acting drug, seizure activity may recur. Injectable Diazepam can cause local venous irritation.

Side Effects:
Hypotension, drowsiness, headache, amnesia, respiratory depression, blurred vision, nausea, vomiting.

Interactions:
Diazepam is incompatible with many medications. Whenever Diazepam is given intravenously in conjunction with other drugs, the IV line should be adequately flushed. The effects of Diazepam can be additive when used in conjunction with other CNS depressants and alcohol.

Diltiazem (ex: Cardizem ™)

Class:
Calcium Channel Blocker

Description:
Diltiazem is a calcium ion antagonist, causing a relaxation of vascular smooth muscle, and slowed conduction through the AV node. Diltiazem has a nearly equal effect on vascular smooth muscle and AV conduction.

Mechanism of Action:
Diltiazem causes relaxation of vascular dilation and slows conduction through the AV node. It slows the rapid ventricular rate associated with atrial fibrillation and atrial flutter. It is also used in the treatment of angina because of its negative inotropic effect and because it dilates the coronary arteries.

Indications:
Rapid ventricular rates associated with atrial fibrillation and atrial flutter, angina pectoris, PSVT refractory to Adenosine.

Contraindications:
Severe hypotension, cardiogenic shock, ventricular tachycardia, Wolff-Parkinson-White syndrome.

Precautions:
Diltiazem can cause systemic hypotension. Calcium chloride can be used to prevent the hypotensive effects of calcium channel blockers and in the management of calcium channel blocker overdose.

Side Effects:
Diltiazem can cause nausea, vomiting, dizziness, headache, bradycardia, heart block, hypotension, and asystole.

Interactions:
Diltiazem should not be administered to patients receiving intravenous beta-blockers because of an increased risk of congestive heart failure, bradycardia, and asystole.

Diphenhydramine (ex: Benedryl ™)

Class:
Antihistamine

Description:
Diphenhydramine is a potent antihistamine that blocks H1 and H2 histamine receptors.

Mechanism of Action:
Diphenhydramine blocks the effects of H1 receptor stimulation (bronchoconstriction, visceral contractions) and that of H2 receptor stimulation (peripheral vasodilation and secretion of gastric acids). Diphenhydramine is also useful in the treatment of dystonic reactions accompanying phenothiazine use.

Indications:
Anaphylaxis, Allergic reactions, Dystonic (extrapyramidal) reactions due to phenothiazines

Contraindications:
Asthma, nursing mothers

Precautions:
The primary drug for treatment of severe allergic reactions is epinephrine, as it reverses the effects of histamines. Diphenhydramine will block histamine receptors, preventing subsequent stimulation.

Side Effects:
Sedation, dries bronchial secretions, blurred vision, headache, palpitations, tachycardia

Interactions:
Potentiation can occur by the administration of CNS depressants, other antihistamines, narcotics, and alcohol.

Dopamine (ex: Intropin ™)

Class:
Sympathetic Agonist

Description:
Dopamine is a naturally occurring catecholamine. It acts on alpha, beta-1, and Dopaminergic adrenergic receptors. Its effect on alpha-receptors is dose dependent.

Mechanism of Action:
Dopamine's effect on beta-1 receptors causes a positive inotropic effect on the heart. Dopamine also acts on alpha-adrenergic receptors causing peripheral vasoconstriction. Dopamine maintains renal and mesenteric blood flow because of its effect on the Dopaminergic receptors. Dopamine increases both systolic and pulse pressure. There is usually less effect on the diastolic pressure.

Indications:
Hemodynamically significant hypotension not resulting from hypovolemia, and cardiogenic shock.

Contraindications:
Dopamine should not be used as the sole agent in the management of hypovolemic shock unless fluid resuscitation is well under way. Pheochromocytoma.

Precautions:
Dopamine can induce or worsen SVT and ventricular arrhythmias. Dopamine should not be administered in the presence of tachyarrhythmias or ventricular fibrillation.

Side Effects:
Nervousness, headache, dysrhythmias, palpitations, chest pain, dyspnea, nausea, vomiting.

Interactions:
Dopamine can be deactivated by alkaline solutions. If a patient is taking a monoamine oxidase inhibitor, the dose should be reduced. Dopamine can cause hypotension when used concomitantly with Phenytoin.

Epinephrine

Class:
Sympathetic Agonist

Description:
Epinephrine is a naturally occurring catecholamine. It is a potent alpha- and beta-adrenergic stimulant with more profound beta effects.

Mechanism of Action:
Epinephrine works directly on alpha- and beta-adrenergic receptors with effects of increased heart rate, cardiac contractile force, increased electrical activity in the myocardium, systemic vascular resistance, increased blood pressure, and increased automaticity. It also causes bronchodilation. Effects usually appear within 90 seconds of administration, and last only a short duration.

Indications:
Bronchial asthma, exacerbation of COPD, anaphylaxis.

Contraindications:
Underlying cardiovascular disease, hypertension.

Precautions:
Epinephrine should be protected from light. It also tends to be deactivated by alkaline solutions.

Side Effects:
Palpitations, anxiety, tremulousness, headache, dizziness, nausea, vomiting, myocardial oxygen demand.

Interactions:
Effects can be intensified in patients taking antidepressants

Etomidate (ex: Amidate ™)

Class:
General anesthetic and adjunct to general anesthesia

Description:
Etomidate is a short-acting, intravenously administered sedative hypnotic. Etomidate has a rapid onset of action and recovery. It has minimal cardiac and respiratory-depressive effects and causes no histamine release, so it is useful in patients with compromised cardiopulmonary function.

Mechanism of Action:
Etomidate appears to facilitate GABAminergic neurotransmission by increasing the number of available GABA receptors, possibly by displacing endogenous inhibitors of GABA binding. Etomidate produces clinical responses such as hypnosis, elevations in arterial carbon dioxide tension, reduced cortisol plasma levels, and a transient 20—30% decrease in cerebral blood flow. Its effects are at least partially due to depression of the brainstem reticular formation.

Indications:
Induction of general anesthesia.

Contraindications:
Use with caution in the elderly and in patients with hepatic disease because they are more likely to develop etomidate-related adverse reactions.

Precautions:
Use with caution during lactation.

Side Effects:
Skeletal muscle: Myoclonic skeletal muscle movements, tonic movements. *Respiratory:* Apnea of short duration, hyperventilation or hypoventilation, ***laryngospasm.*** *CV:* Either hypertension or hypotension; tachycardia or bradycardia; arrhythmias. *GI:* Postoperative N&V. *Miscellaneous:* Eye movements, averting movements, hiccoughs, snoring.

Interactions:
Etomidate potentiates the effects of CNS depressants such as ethanol, general anesthetics, local anesthetics, antidepressants, H_1-blockers, opiate agonists, skeletal muscle relaxants, phenothiazines, barbiturates, and benzodiazepines. Concurrent use of antihypertensive agents and etomidate can result in hypotension. This is particularly true if any of the following agents are used with etomidate: calcium-channel blockers, diazoxide, mecamylamine.

Fentanyl (ex: Fentora ™, Onsolis ™)

Class:
Opioid analgesic

Description:
Produces analgesia and euphoria by binding to opiate receptors.

Mechanism of Action:
Binds to opiate receptors in the CNS, altering the response to and perception of pain, produces CNS depression.

Indications:
Induction/maintenance of anesthesia, supplement to regional/local anesthesia, preoperative and postoperative analgesia.

Contraindications:
Hypersensitivity; cross-sensitivity among agents may occur, known intolerance.

Precautions:
Geriatric, debilitated, or critically ill patients; diabetes; severe renal, pulmonary or hepatic disease; CNS tumors; increased intracranial pressure; head trauma; adrenal insufficiency; undiagnosed abdominal pain; hypothyroidism; alcoholism; cardiac disease (arrhythmias); pregnancy and lactation.

Side Effects:
Respiratory depression, apnea, rigidity and bradycardia; if these remain untreated, respiratory arrest, circulatory depression or cardiac arrest could occur. Other adverse reactions that have been reported are hypertension, hypotension, dizziness, blurred vision, nausea, emesis, laryngospasm and diaphoresis

Interactions:
Avoid use in patients who have received MAO inhibitors within the previous 14 days (may produce unpredictable, potentially fatal reactions), concomitant use of CYP3A4 inhibitors including ritonavir, ketoconazole, itraconazole, clarithromycin, nelfinavir, nefazodone, diltiazem, aprepitant, fluconazole, fosamprenavir, verapamil, and erythromycin may result in increased plasma levels and increased risk of CNS and respiratory depression.

Nalbuphine, buprenorphine, or pentazocine may decrease analgesia.
Grapefruit juice is a moderate inhibitor of the CYP3A4 enzyme system; concurrent use may increase blood levels and the risk of respiratory and CNS depression.

Furosemide (ex: Lasix ™)

Class:
Diuretic

Description:
Furosemide is a potent diuretic that inhibits sodium and chloride reabsorption in the kidneys and causes venous dilation.

Mechanism of Action:
Furosemide is a loop diuretic that inhibits sodium and chloride reabsorption in the kidneys. Furosemide first causes venous dilation within 5 minutes of administration, reducing preload and decreasing cardiac work. Diuretic effects begin 5-15 minutes after administration.

Indications:
Congestive Heart Failure, Pulmonary Edema.

Contraindications:
Use in pregnancy should be limited to life threatening situations in which the benefits of administration outweigh the risks. It should not be administered to patients who are allergic to the sulfa class of medications.

Precautions:
Dehydration, electrolyte depletion, and hypotension can result from excessive doses. Blood pressure should be frequently monitored. Furosemide should be protected from light.

Side Effects:
Headache, dizziness, hypotension, volume depletion, potassium depletion, arrhythmias, diarrhea, nausea, vomiting.

Interactions:
Furosemide should not be administered in the same line as Amrinone, as a precipitate will form. Administration with other diuretics can lead to severe volume depletion and electrolyte imbalance.

Glucagon

Class:
Hormone and Anti-hypoglycemic

Description:
Glucagon is a hormone secreted by the alpha cells of the pancreas. It is used to increase the blood glucose level in cases of hypoglycemia in which an IV cannot immediately be placed.

Mechanism of Action:
Glucagon causes a breakdown of stored glycogen to glucose, and inhibits the synthesis of glycogen from glucose. A return to consciousness following the administration of Glucagon usually takes from 5-20 minutes. Glucagon is only effective if there are sufficient stores of glycogen in the liver. Glucagon exerts a positive inotropic action on the heart and decreases renal vascular resistance.

Indications:
Hypoglycemia, Beta-Blocker overdoses.

Contraindications:
Known hypersensitivity.

Precautions:
Glucagon is only effective if there are sufficient stores of glycogen in the liver. Glucagon should be administered with caution to patients with a history of cardiovascular or renal disease.

Side Effects:
Hypotension, dizziness, headache, nausea, vomiting.

Interactions:
There are few interactions reported in the emergency setting.

Ipratropium Bromide (ex: Atrovent ™)

Class:
Anticholinergic

Description:
Ipratropium is an anticholinergic that is chemically related to atropine.

Mechanism of Action:
Ipratropium is a parasympatholytic used in the treatment of respiratory emergencies. It causes bronchodilation and dries respiratory tract secretions. Ipratropium acts by blocking acetylcholine receptors, thus inhibiting parasympathetic stimulation.

Indications:
Bronchial asthma, reversible bronchospasm associated with chronic bronchitis and emphysema.

Contraindications:
Known hypersensitivity.

Precautions:
Use caution when administering this drug to elderly patients and those with cardiovascular disease or hypertension. If possible, peak flow rate should be measured before and after administration.

Side Effects:
Palpitations, anxiety, dizziness, headache, nervousness, tremor, hypertension, arrhythmias, chest pain, nausea, vomiting.

Interactions:
There are few interactions in the prehospital setting.

Ketorolac (ex: Toradol ™)

Class:
Analgesic

Description:
Potent nonsteroidal anti-inflammatory analgesic, that does not possess any sedative or anxiolytic activities.

Mechanism of Action:
Inhibits prostaglandin synthesis, producing peripherally mediated analgesia, also has antipyretic and anti-inflammatory properties.

Indications:
Short-term management of pain

Contraindications:
Hypersensitivity, cross-sensitivity with other NSAIDs may exist, active or history of peptic ulcer disease or GI bleeding, known alcohol intolerance, cerebrovascular bleeding, advanced renal impairment or at risk for renal failure due to volume depletion, concurrent use of pentoxifylline or probenecid, lactation.

Precautions:
Cardiovascular disease or risk factors for cardiovascular disease, heart failure, coagulation disorders, mild-to-moderate renal impairment, hepatic impairment.

Side Effects:
Drowsiness, *anaphylaxis*

Interactions:
Concurrent use with aspirin may decrease effectiveness, May increase serum lithium levels and increase risk of toxicity. Increase bleeding risk with arnica, chamomile, clove, dong quai, feverfew, garlic, ginger, ginkgo, Panax ginseng.

Lidocaine

Class:
Antiarrhythmic

Description:
Lidocaine is an amide-type local anesthetic. It is frequently used to treat life-threatening dysrhythmias.

Mechanism of Action:
Lidocaine depresses depolarization and automaticity in the ventricles, and increases the ventricular fibrillation threshold by increasing phase IV repolarization.

Indications:
Ventricular tachycardia, ventricular fibrillation, malignant premature ventricular contractions.

Contraindications:
Second and third degree heart blocks, ventricular escape beats.

Precautions:
CNS depression may occur when the drug exceeds 300mg/hr. Exceedingly high doses can result in coma and death.

Side Effects:
Drowsiness, seizures, confusion, hypotension, bradycardia, heart blocks, nausea, vomiting, and respiratory and cardiac arrest.

Interactions:
Lidocaine should be used with caution when administered concomitantly with Procainamide, Phenytoin, Quinidine, and beta-blockers as drug toxicity may result.

Lidocaine (Viscous) 2% Gel

Class:
anesthetics (topical/local)

Description:
Contains a local anesthetic agent and is administered topically. Lidocaine Hydrochloride Oral Topical Solution USP, 2% (Viscous) contains lidocaine HCI. .

Mechanism of Action:
Produces local anesthesia by inhibiting transport of ions across neuronal membranes, thereby preventing initiation and conduction of normal nerve impulses.

Indications:
Produces local anesthesia to facilitate nasotracheal intubation

Contraindications:
There are no contraindications in the pre-hospital setting when used to facilitate nasotracheal intubation.

Precautions:
There are no precautions in the pre-hospital setting when used to facilitate nasotracheal intubation.

Side Effects:
Stinging, burning and/or decreased or absent gag reflex.

Interactions:
There are no interactions in the pre-hospital setting when used to facilitate nasotracheal intubation.

Lorazepam (ex: Ativan ™)

Class:
Anticonvulsant, antianxiety, analgesic agent

Description:
Lorazepam is a benzodiazepine used in the management of status epilepticus, as an adjunct in the management of anxiety or insomnia, and for preoperative sedation.

Mechanism of Action:
Lorazepam depresses the CNS by potentiating GABA, an inhibitory neurotransmitter. Therapeutic effects include sedation, decreased anxiety, and decreased seizure activity. Lorazepam is absorbed and eliminated faster than other benzodiazepines.

Indications:
Lorazepam is used in the management of status epilepticus and as an adjunct in the management of anxiety or insomnia. Lorazepam is also used for preoperative sedation and as an antiemetic prior to chemotherapy. Lorazepam decreases preoperative anxiety and provides amnesia.

Contraindications:
Hypersensitivity, CNS depression, comatose, uncontrolled severe pain, narrow-angle glaucoma, pregnancy, and lactation.

Precautions:
Lorazepam should be used with caution in patients with severe hepatic/renal/pulmonary impairment, myasthenia gravis, history of suicide or drug abuse, geriatric or debilitated patients.

Side Effects:
CNS: Dizziness, drowsiness, lethargy, hangover, headache, mental depression, paradoxical excitation. *EENT:* Blurred vision. *RESP:* Respiratory depression. *CV:* Rapid IV use may cause apnea, cardiac arrest, bradycardia, and hypotension. *GI:* Constipation, diarrhea, nausea, vomiting. *Derm:* Rash. *Misc:* Physical/psychological dependence, tolerance.

Interactions:
Additive CNS depression with other CNS depressants including alcohol, antihistamines, opioid analgesics, and other sedative/hypnotics including other benzodiazepines. Lorazepam may decrease the efficacy of levodopa. Probenecid may decrease metabolism or Lorazepam, enhancing its actions. Smoking may increase metabolism and decrease effectiveness.

Magnesium Sulfate

Class:
Antiarrhythmic, Mineral, Electrolyte

Description:
Magnesium Sulfate is a salt that dissociates into the Magnesium cation and the sulfate anion when administered. Magnesium is an essential element in numerous biochemical reactions that occur within the body.

Mechanism of Action:
Magnesium Sulfate acts as a physiological calcium channel blocker and blocks neuromuscular transmission. A decreased magnesium level is associated with cardiac arrhythmias, symptoms of cardiac insufficiency, and sudden death. Hypomagnesemia can cause refractory ventricular fibrillation. Magnesium Sulfate is also a central nervous system depressant effective in the management of seizures associated with eclampsia.

Indications:
Magnesium Sulfate is used in refractory ventricular fibrillation, pulseless ventricular tachycardia, post-myocardial infarction for prophylaxis of arrhythmias, and torsade de pointes or multiaxial ventricular tachycardia. It is also used in severe bronchospasm, and in eclampsia.

Contraindications:
Shock, persistent severe hypertension, third degree AV block, routine dialysis patients, known hypocalcemia.

Precautions:
Magnesium Sulfate should be administered slowly to minimize side effects. Use with caution in patients with known renal insufficiency. Hypermagnesemia can occur, Calcium Chloride should be available as an antidote if serious side effects occur.

Side Effects:
Flushing, sweating, bradycardia, decreased deep tendon reflexes, drowsiness, respiratory depression, arrhythmia, hypotension, hypothermia, itching, and rash.

Interactions:
Magnesium Sulfate can cause cardiac conduction abnormalities if administered in conjunction with digitalis.

Methylprednisolone (ex: Solu-Medrol ™, Medrol ™)

Class:
Corticosteroid and Anti-inflammatory

Description:
Methylprednisolone is a synthetic steroid with potent anti-inflammatory properties. It is related to the natural hormones secreted in the adrenal cortex.

Mechanism of Action:
The pharmacological effects of steroids are vast and complex. Effective as anti-inflammatory agents, they are used in the management of allergic reactions, asthma, and anaphylaxis. Methylprednisolone is considered an intermediate-acting steroid with a plasma half-life of 3 to 4 hours.

Indications:
Severe anaphylaxis, asthma, or COPD, urticaria, and spinal cord injury.

Contraindications:
There are no major contraindications in the use of Methylprednisolone in the emergency setting.

Precautions:
A single dose is all that should be given in the prehospital setting. Long-term steroid therapy can cause gastrointestinal bleeding, prolonged wound healing, and suppression of adrenocortical steroids.

Side Effects:
Fluid retention, congestive heart failure, hypertension, abdominal distention, vertigo, headache, nausea, malaise, and hiccups.

Interactions:
There are few interactions in the prehospital setting.

Metoprolol (ex: Lopressor ™)

Class:
Selective Beta-Blocker

Description:
Metoprolol is a selective beta1-adrenoreceptor blocking agent. It is a white, practically odorless, crystalline powder made available in ampules mixed with sodium chloride and water for injection.

Mechanism of Action:
Metoprolol affects beta1 adrenoreceptors, chiefly located in cardiac muscle. However at higher doses also inhibits beta2-adrenoreceptors, chiefly located in the bronchial and vascular musculature. Effects of Metoprolol include slowing of the sinus rate and decreasing AV nodal conduction resulting in reduction of heart rate and cardiac output, reduction of systolic blood pressure, reduction of reflex orthostatic tachycardia, and inhibition of catecholamine-induced tachycardia.

Indications:
Acute Myocardial Infarction, Angina Pectoris, and Hypertension.

Contraindications:
Metoprolol is contraindicated in sinus bradycardia, heart block, cardiogenic shock, systolic blood pressure <100mmHg, or moderate-to-severe cardiac failure.

Precautions:
Patients with Bronchospastic Diseases, Diabetes and Hypoglycemia, or Thyrotoxicosis should in general not receive beta blockers.

Side Effects:
Tiredness and dizziness, depression, confusion, short-term memory loss, headache, insomnia, diarrhea, nausea, gastric pain, shortness of breath, wheezing, bradycardia, congestive heart failure, hypotension, rash, tinnitus.

Interactions:
In hypertension and angina patients with congestive heart failure controlled by digitalis and diuretics, Metoprolol should be administered with extreme caution since beta blockade caries the potential of further decreasing myocardial contractility and precipitating more sever failure.

Midazolam

Class:
Sedative and Hypnotic

Description:
Midazolam is a benzodiazepine with strong hypnotic and amnestic properties.

Mechanism of Action:
Midazolam is a potent but short-acting benzodiazepine used as a sedative and hypnotic. It is three to four times more potent than Diazepam. Its onset of action is approximately 1.5 minutes when administered IV. Midazolam has impressive amnestic properties, and like other benzodiazepines, it has no effect on pain.

Indications:
Midazolam is used as a premedication before cardioversion and other painful procedures.

Contraindications:
Known hypersensitivity, narrow angle glaucoma, shock, depressed vital signs, and alcoholic coma.

Precautions:
Emergency resuscitative equipment must be available prior to the administration of Midazolam. Midazolam has more potential than the other benzodiazepines to cause respiratory depression and respiratory arrest.

Side Effects:
Laryngospasm, bronchospasm, dyspnea, respiratory depression and arrest, drowsiness, altered mental status, amnesia, bradycardia, tachycardia, premature ventricular contractions, and retching.

Interactions:
The effects of Midazolam can be accentuated by CNS depressants such as narcotics and alcohol.

Morphine Sulfate

Class:
Narcotic Analgesic

Description:
Morphine is a potent CNS depressant and analgesic.

Mechanism of Action:
Morphine acts on opiate receptors in the brain, providing analgesia and sedation. It increases peripheral venous capacitance and decreases venous return. Morphine also decreases myocardial oxygen demand.

Indications:
Severe pain associated with myocardial infarction, kidney stones, etc., and pulmonary edema.

Contraindications:
Volume depletion, severe hypotension, hypersensitivity, undiagnosed head injury or abdominal pain.

Precautions:
Morphine has a high tendency for addiction and abuse. Morphine can cause severe respiratory depression in high doses, especially in patients with respiratory impairment. Narcan should be available as an antagonist.

Side Effects:
Nausea, vomiting, abdominal cramps, blurred vision, constricted pupils, altered mental status, headache, respiratory depression.

Interactions:
CNS depression can be enhanced when administered with antihistamines, antiemetics, sedatives, hypnotics, barbiturates, and alcohol.

Naloxone (ex: Narcan ™)

Class:
Narcotic Antagonist

Description:
Naloxone is an effective narcotic antagonist.

Mechanism of Action:
Naloxone is chemically similar to narcotics, however it has only antagonistic properties. Naloxone competes for opiate receptors in the brain, and displaces narcotic molecules from opiate receptors. It can reverse respiratory depression from narcotic overdose.

Indications:
Complete or partial reversal of depression caused by narcotics. Naloxone can also be used in the treatment of coma of unknown origin.

Contraindications:
Known hypersensitivity.

Precautions:
Naloxone should be administered cautiously to patients who are known or are suspected to be physically dependent on narcotics. Abrupt and complete reversal by Naloxone can cause withdrawal type effects.

Side Effects:
Hypotension, hypertension, ventricular arrhythmias, nausea, vomiting.

Interactions:
Naloxone may cause narcotic withdrawal in the narcotic dependent patient. Only enough of the drug should be given to reverse respiratory depression.

Nitroglycerine (ex: Nitro-Stat ™, Nitro-Bid ™)

Class:
Nitrate

Description:
Nitroglycerine is a potent smooth muscle relaxant used in the treatment of angina pectoris.

Mechanism of Action:
Nitroglycerine is a rapid smooth muscle relaxant that reduces cardiac work and to a lesser degree dilates the coronary arteries. This results in increased coronary blood flow and improved perfusion of the myocardium. Pain relief following Nitroglycerine administration usually occurs within 1 to 2 minutes, with therapeutic effects up to 30 minutes later.

Indications:
Chest pain associated with angina pectoris, acute myocardial infarction, and acute pulmonary edema.

Contraindications:
Hypotension, increased intracranial pressure.

Precautions:
Patients taking Nitroglycerine may develop a tolerance to the drug necessitating a higher dose. Headache from vasodilation of the cerebral vessels is common. Nitroglycerine deteriorates rapidly once opened. Nitroglycerine should be protected from light.

Side Effects:
Headache, dizziness, weakness, tachycardia, hypotension, orthostasis, skin rash, dry mouth, nausea, vomiting.

Interactions:
Nitroglycerine can cause hypotension in patients who have recently ingested alcohol. It can cause orthostatic hypotension when used in conjunction with beta-blockers.

Nitrous Oxide (ex: Nitronox™)

Class:
Analgesic and Anesthetic Gas

Description:
Nitronox is a blended mixture of 50 % Nitrous Oxide and 50% Oxygen that has potent analgesic effects.

Mechanism of Action:
Nitrous Oxide is a CNS depressant with analgesic properties. The effects dissipate within 2-5 minutes after cessation of administration. Nitronox must be self administered through a modified demand valve. It is effective in treating many varieties of pain, including those from trauma. The high concentration of oxygen delivered with nitrous oxide will increase the oxygen amount in the blood, thus reducing hypoxia.

Indications:
Pain of musculoskeletal origin, burns, suspected ischemic chest pain, states of severe anxiety including hyperventilation.

Contraindications:
Nitronox should not be used with any patient who cannot understand verbal instructions or who is intoxicated with alcohol or other drugs. It should not be administered to any patient with a head injury who exhibits altered mental status. Nitronox should not be administered to COPD patients, as it tends to diffuse into closed spaces more readily than carbon dioxide or oxygen, thereby causing blebs to swell, and possibly rupture. Nitronox should also not be administered to patients with pneumothorax or tension pneumothorax, as the gas will accumulate and increase the size of the injury.

Precautions:
Nitronox should be used only in well-ventilated areas. Nitrous oxide exists in a liquid state inside the gas cylinder. Heat will cause the gas to vaporize, making the cylinder and lines cool to the touch. In very cold environments (less than 21 degrees F) the liquid may be slow to vaporize, and administration impossible.

Side Effects:
Dizziness, lightheadedness, altered mental state, hallucinations, nausea, and vomiting.

Interactions:
Nitronox can potentiate the effects of other CNS depressants such as narcotics, sedatives, hypnotics, and alcohol.

Ondansetron Hydrochloride (ex: Zofran™)

Class
Selective 5-HT_3 receptor antagonist.

Description
Ondansetron hydrochloride (HCl) is the racemic form of ondansetron and a selective blocking agent of the serotonin 5-HT_3 receptor type.

Mechanism of Action
Ondansetron's mechanism of action has not been fully characterized. The released serotonin may stimulate the vagal afferents through the 5-HT3 receptors and initiate the vomiting reflex. Ondansetron selectively antagonizes 5-HT_3 receptors.

Indications
Nausea and vomiting prevention.

Contraindications
History of Long QT syndrome, hypersensitivity to drug/class.

Precautions:
Category B in pregnancy- animal studies showed no harm. Human studies – not done, but unlikely to harm fetus. Caution in liver failure patients.

Side Effects:
Headache, dizziness, diarrhea, agitation, and prolonged QT interval.

Interactions:
Apomormphine, methadone, fluconazole, phenytoin, carbamazepine, rifampicin, and tramadol.

Oxymetazoline (ex: Afrin ™)

Class:
Nasal Antihistamine/Decongestant

Description:
Oxymetazoline is a selective alpha-1 agonist and partial alpha-2 agonist that shrinks blood vessels in the nasal passages.

Mechanism of Action:
Oxymetazoline is a sympathomimetic that selectively agonizes α1 and partially α2 adrenergic receptors. Since vascular beds widely express α1 receptors, the action of oxymetazoline results in vasoconstriction. In addition, the local application of the drug also results in vasoconstriction due to its action on endothelial postsynaptic α2 receptors. Vasoconstriction of vessels results in relief of nasal congestion in two ways: First, it increases the diameter of the airway lumen; second, it reduces fluid exudation from postcapillary venules

Indications:
Used prior to nasotracheal intubation as a vasoconstrictor of the nasal blood vessels.

Contraindications:
There are no contraindications in the pre-hospital setting when used to facilitate nasotracheal intubation.

Precautions:
There are no contraindications in the pre-hospital setting when used to facilitate nasotracheal intubation.

Side Effects:
Burning, stinging, increased nasal discharge, dryness inside the nose, sneezing, nervousness, nausea, dizziness , headache. Potential serious side effects are: tachycardia or bradycardia.

Interactions:
There are no interactions in the pre-hospital setting when used to facilitate nasotracheal intubation.

Sodium Bicarbonate

Class:
Alkalinizing Agent

Description:
Sodium Bicarbonate is a salt that provides bicarbonate to buffer metabolic acidosis.

Mechanism of Action:
Sodium Bicarbonate increases pH by providing the bicarbonate buffer (a weak base). Making the urine more alkaline enhances Tricyclic Antidepressant excretion. Sodium Bicarbonate is used to increase the pH of the urine and thereby speed excretion from the body.

Indications:
Tricyclic antidepressant overdose, Phenobarbital overdose, severe acidosis refractory to hyperventilation, and known hyperkalemia.

Contraindications:
There are no absolute contraindications.

Precautions:
Sodium Bicarbonate can cause metabolic alkalosis when administered in large quantities. It is important to calculate the dosage based on weight and size.

Side Effects:
There are few side effects when used in the emergency setting.

Interactions:
Most catecholamines and vasopressors (e.g., Epinephrine and Dopamine) can be deactivated by alkaline solutions such as Sodium Bicarbonate. Calcium Chloride should not be administered in conjunction with Sodium Bicarbonate, as a precipitate will form.

Succinylcholine (ex: Anectine ™)

Class:
Depolarizing Neuromuscular Blocker

Description:
Succinylcholine is a short acting, depolarizing skeletal muscle relaxant used to facilitate endotracheal intubation.

Mechanism of Action:
Like acetylcholine, Succinylcholine combines with cholinergic receptors in the motor nerves to cause depolarization. Neuromuscular transmission is thus inhibited, which renders the muscles unable to be stimulated by acetylcholine. Complete paralysis is obtained within 60 to 90 seconds, and persists for approximately 4 to 5 minutes. Effects then begin to fade, and a return to normal is seen within 6 minutes. Muscle relaxation begins in the eyelids and the jaw, and then progresses to the limbs, abdomen, diaphragm, and intercostals. *Succinylcholine has no effect on consciousness.*

Indications:
Succinylcholine is used to achieve temporary paralysis when endotracheal intubation is indicated, and muscle tone or seizure activity prevents it.

Contraindications:
Known hypersensitivity, penetrating eye injuries, and narrow-angle-glaucoma.

Precautions:
Succinylcholine should not be administered unless personnel skilled in endotracheal intubation are present and ready to perform the procedure. Oxygen and emergency resuscitative drugs should be readily available. Cardiac arrest and ventricular arrhythmias have been reported when Succinylcholine was administered to patients with severe burns and severe crush injuries.

Side Effects:
Succinylcholine can cause wheezing, respiratory depression, apnea, aspiration, arrhythmias, bradycardia, sinus arrest, hypertension, hypotension, increased intraocular pressure, increased intracranial pressure.

Interactions:
Lidocaine, Procainamide, beta-blockers, magnesium sulfate, and other neuromuscular blockers enhance the effects of Succinylcholine.

Tetracaine ½% Ophthalmic Drops (ex: Altacaine ™, Opticaine ™)

Class:
Ophthalmic Anesthetic

Description:
Tetracaine is an ester-type local anesthetic with an intermediate to long duration of action.

Mechanism of Action:
Tetracaine, like all local anesthetics, causes a reversible blockade of nerve conduction by decreasing nerve membrane permeability to sodium. This decreases the rate of membrane depolarization thereby increasing the threshold for electrical excitability.

Indications:
Ophthalmic anesthesia

Contraindications:
Use Tetracaine with caution in patients with known ester type anesthetic hypersensitivity.

Precautions:
After Tetracaine is applied to the eye, *do not rub or wipe the eye until the anesthetic has worn off and feeling in the eye returns*. To do so may cause injury or damage to the eye.

Side Effects:
Dizziness or drowsiness; increased sweating; irregular heartbeat; muscle twitching or trembling; nausea or vomiting; shortness of breath or troubled breathing; unusual excitement, nervousness, or restlessness; unusual tiredness or weakness, Burning, stinging, redness, or other irritation of eye.

Interactions:
The vagal effects and respiratory depression induced by opiate agonists may be increased by local anesthetics. Use of local anesthetics with rapid onset vasodilators, such as nitrates, may result in hypotension. Local anesthetics may enhance the effect of CNS depressive agents.

Vecuronium Bromide

Class:
Non-depolarizing Neuromuscular Blocker

Description:
Vecuronium is a derivative of Pancuronium and is used to provide muscle relaxation to facilitate endotracheal intubation.

Mechanism of Action:
Vecuronium is one-third more potent that Pancuronium with a shorter duration of effect. Vecuronium competes with acetylcholine for cholinergic receptor sites on the post junctional membrane. This competition results in paralysis of muscle fibers served by the occupied neuromuscular junction. It does not cause an initial depolarization wave, as does Succinylcholine. The onset is about 1 minute, with good to excellent intubation conditions within 2-3 minutes.

Indications:
Vecuronium is used to achieve temporary paralysis when endotracheal intubation is indicated, and muscle tone or seizure activity prevents it.

Contraindications:
Known hypersensitivity.

Precautions:
Vecuronium should not be administered unless personnel skilled in endotracheal intubation are present and ready to perform the procedure. Oxygen and emergency resuscitative drugs should be readily available.

Side Effects:
Vecuronium can cause wheezing, respiratory depression, apnea, aspiration, arrhythmias, bradycardia, sinus arrest, hypertension, hypotension, increased intraocular pressure, increased intracranial pressure.

Interactions:
Lidocaine, Procainamide, beta-blockers, magnesium sulfate, and other neuromuscular blockers enhance the effects of Vecuronium.