

MEDICATION

APPENDIX

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MEDICATION APPENDIX

PURPOSE

This section will discuss the medications and their pharmacology used in the EMS Protocol and Procedures Manual.

MEDICATION LIST

Adenosine (Adenocard)
Albuterol (Proventil / Ventolin)
Amiodarone (Cordarone)
Aspirin
Atropine Sulfate
Calcium Chloride
25% Dextrose (D25)
50% Dextrose (D50)
Diazepam (Valium)
Diphenhydramine HCL (Benadryl)
Dopamine (Intropin)
Epinephrine (Adrenalin)
Furosemide (Lasix)
Glucagon
Haloperidol (Haldol)
Lidocaine (Xylocaine) 2%
Lorazepam (Ativan)
Magnesium Sulfate
Midazolam (Versed)
Morphine Sulfate
Naloxone (Narcan)
Nitroglycerin
Oxygen (O2)
Promethazine (Phenergan)
Sodium Bicarbonate
Tetracaine (Pontocaine, Ophthalmic)
Vasopressin (Pitressin)
Zofran (ondansteron)

PHARMACOLOGY REVIEW

- I. ACTIONS OF DRUGS
 - A. Local Effects
 - B. Systemic Effects

- II. EFFECTS DEPENDS UPON
 - A. Age of Patient
 - B. Condition of Patient
 - C. Dosage
 - D. Route of Administration

- III. ROUTE OF ADMINISTRATION
 - A. Intravenous (IV)
 - * Most Rapidly Effective
 - * Most Dangerous
 - * Give SLOWLY Through an Established IV Line
 - B. Intramuscular (IM)
 - * Takes Longer to Act
 - * Longer Duration of Action
 - * Deltoid or Gluteus Maximus Site
 - * Absorption VERY Dependent on Blood Flow
 - C. Subcutaneous (SQ)
 - * Slower and More Prolonged Absorption
 - * Under Skin of Upper Arms, Thigh, Abdomen
 - D. Inhalation
 - * Bronchodilators
 - * Steroids
 - E. Endotracheal
 - * Epinephrine, Atropine, Lidocaine, Narcan
 - * Dilute Usual IV Dose with 10cc of Sterile Water
 - F. Sublingual (SL)
 - * Rapid Absorption

MEDICATION REVIEW (cont)

- G. Oral
 - * Ipecac
 - * Charcoal
- H. Rectal
 - * Rapid but Unpredictable Absorption
- I. Intracardiac
 - * Dangerous
 - * No Advantage Over IV or Endotracheal Routes
 - * Dilute Usual IV Dose with 10cc of Sterile Water

IV. RATES OF ABSORPTION

- A. "Directly Related to Route of Administration"
 - * IV -- Fastest
 - * IM
 - * SQ
 - * Oral -- Slowest

V. ELIMINATION

- A. Many Methods
- B. Usually Metabolized by the Liver
- C. Eliminated by the Kidneys, Lungs, Skin

VI. TERMS

- A. Indications - Conditions Drugs Used For
- B. Contraindications - Conditions Drugs Not Used For
- C. Depressants - Lessens / Decreases Activity
- D. Stimulant - Increases Activity
- E. Physiologic Action - Action From Normal Body Amounts of Drug
- F. Therapeutic Action - Beneficial Action Expected
- G. Untoward Reaction - Harmful Side Effect
- H. Irritation - Damage to Tissue
- I. Antagonism - Opposition Between Effects of Drugs
- J. Cumulative Action - Increased Action After Several Doses

MEDICATION REVIEW (cont)

VI. TERMS (cont)

- K. Tolerance - Decreased Effects after Repeated Doses
- L. Synergism - Combined Effects Greater Than Sum of Parts
- M. Potentiation - Enhancement of One Drug by Another
- N. Habituation - Drug Necessary for Feeling of "Well Being"
- O. Idiosyncrasy - Unexpected, Abnormal Response to a Drug
- P. Hypersensitivity - Exaggerated Response, Allergy

VII. AUTONOMIC NERVOUS SYSTEM

Controls Automatic or Involuntary Actions

- A. Parasympathetic - Controls Vegetative Functions
- B. Sympathetic - "Flight or Fight"

VIII. PARASYMPATHETIC NERVOUS SYSTEM

- A. Mediated by vagus nerve
- B. Acetylcholine is transmitter (cholinergic)
- C. Atropine is Acetylcholine Blocker

IX. SYMPATHETIC NERVOUS SYSTEM

- A. Mediated by Nerves from Sympathetic Chain
- B. Norepinephrine is Transmitter (Adrenergic)
- C. Epinephrine is Released from Adrenals

X. SYMPATHETIC RECEPTORS

- A. Alpha (a)
- B. Beta (b)

XI. COMMON SYMPATHETIC AGENTS

- A. Isoproterenol (Isuprel) - pure BETA
- B. Epinephrine (Adrenalin) - predominately BETA
- C. Dobutamine (Dobutrex) - predominately BETA, slight ALPHA
- D. Norepinephrine (Levophed) - predominately ALPHA
- E. Dopamine (Intropin) - BETA at low dose: ALPHA at high dose

MEDICATION REVIEW (cont)

- F. Metaraminol (Aramine) - predominately ALPHA
- G. Phenylephrine (Neo-Synephrine) - pure ALPHA

XII. SYMPATHETIC BLOCKERS

- A. Propranolol (Inderal) - BETA BLOCKER

XIII. DRUG ADMINISTRATION

Appropriate:

1. Indication
2. Order
3. Dose
4. Observation
5. Dilution
6. Route
7. Rate

ADENOSINE (ADENOCARD)

THERAPEUTIC EFFECTS: Adenosine slows tachycardias associated with the AV node via modulation of the autonomic nervous system without causing negative inotropic effects. It acts directly on sinus pacemaker cells and vagal nerve terminals to decrease chronotropic and dromotropic activity. Adenosine is the drug of choice for paroxysmal supraventricular tachycardia (PSVT) and can be used diagnostically for stable, wide-complex tachycardia of unknown type after two doses of lidocaine.

INDICATIONS: Conversion of PSVT to sinus rhythm.

CONTRAINDICATIONS: Second or third degree AV block, or sick-sinus syndrome
Atrial flutter
Atrial fibrillation
Ventricular tachycardia
Hypersensitivity to adenosine

SIDE EFFECTS:

Facial flushing	Chest pain
Lightheadedness	Hypotension
Paresthesia	Shortness of breath
Headache	Nausea
Diaphoresis	Metallic taste
Palpitations	

HOW SUPPLIED: 6mg/2ml and 12mg/4ml vials or pre-filled syringes.

ADULT DOSAGE:

Initial Dose: 6mg rapid IVP (over 1-3 sec.) immediately followed with a 20cc saline flush.

Repeat Dose: If no response is observed after 1-2 min., administer 12mg rapid IVP (over 1-3 sec.) immediately followed with a 20 cc saline flush.

PEDIATRIC DOSAGE:

Initial Dose: 0.1mg/kg rapid IVP followed with a 10cc saline flush.

Repeat Dose: If no response is observed after 1-2 min., administer 0.2mg/kg rapid IVP followed with a 10cc saline flush.

ALBUTEROL (PROVENTIL / VENTOLIN)

THERAPEUTIC EFFECTS: Beta-2 stimulator, dilates smooth muscle, bronchodilator.

INDICATIONS: Shortness of breath caused by bronchoconstriction.

CONTRAINDICATIONS:

- * Allergy to drug
- * Excessive prior use of beta stimulants
- * Shortness of breath not from bronchoconstriction

SIDE EFFECTS:

- * Nervousness
- * Weakness
- * Tremor
- * Increased heart rate

HOW SUPPLIED: Unit dose 2.5mg vials (3ml).

ADMINISTRATION: By inhalation through a breathing aerosol device.

ADULT DOSAGE: 2.5mg in N/S via aerosol device with oxygen at 6 liters per minute.

PEDIATRIC DOSAGE: 2.5mg (3ml) in aerosol device at 6 liters O₂ per minute.

AMIODARONE (CORDARONE)

THERAPEUTIC EFFECT:	Complex drug with effects on sodium, potassium, and calcium channels as well as alpha and beta-adrenergic blocking properties.
INDICATIONS:	<p>Recommended after defibrillation and epinephrine administration in cardiac arrest with persistent VT or VF (Class IIb).</p> <p>Effective for control of hemodynamically stable VT or wide complex tachycardias of uncertain origin (Class IIb).</p>
CONTRAINDICATIONS:	<p>Known hypersensitivity to any of the components of the medication.</p> <p>Patients in cardiogenic shock.</p> <p>Severe bradycardic rhythms.</p> <p>Second or third degree AV blocks.</p>
SIDE EFFECTS:	Hypotension is the most common effect. This is often related to the medication being administered to quickly.
HOW SUPPLIED:	Ampules containing 150 mg in 3 ml (50 mg/ml).
ADMINISTRATION:	Given by intravenous bolus.
ADULT DOSAGE:	<p>Stable wide complex tachycardia with a pulse: 150 mg diluted with NS to a volume of 10cc given IVP over 10 minutes. A second dose of 150 mg may be given after 10 minutes.</p> <p>Unstable wide complex tachycardia with a pulse: 150 mg diluted with NS to a volume of 10cc given IVP over 10 minutes. A second dose of 150 mg may be given after 10 minutes.</p> <p>V-fib and pulseless V-tach: 300 mg diluted with NS to a volume of 20cc given as an IVP. A second dose of 150 mg may be given after 10 minutes.</p>
PEDIATRIC DOSAGE:	Not currently approved for use in Peds in the BCH protocol.

ASPIRIN

THERAPEUTIC EFFECTS: Aspirin exhibits analgesic, anti-inflammatory and antipyretic activity. Due to aspirin's ability to inhibit platelet aggregation and cause vasodilation, there is a decreased likelihood of thrombosis.

INDICATIONS: Sudden onset of cardiac related chest pain.

Patient must fit thrombolytic profile:

- * 30 or older
- * Systolic < 180 / Diastolic < 110
- * Persistent chest pain 15 minutes or longer
- * Lack of stroke, bleeding, CNS problems, trauma
- * No pregnancy

CONTRAINDICATIONS: Aspirin hypersensitivity

Active or history of GI lesions

Impaired renal function

SIDE EFFECTS: GI bleeds.

Mucosal lesions

Bronchial spasm in some asthma patients

HOW SUPPLIED: 325mg coated tablets
81 mg chewable tablets

ADMINISTRATION: Orally

ADULT DOSAGE: 325mg upon onset of cardiac signs and symptoms.

ATROPINE SULFATE

THERAPEUTIC EFFECTS: By blocking parasympathetic (vagal) action on the heart, atropine increases the rate of discharge by the sinus node, enhances conduction through the AV junction, and accelerates the heart rate, thereby improving cardiac output. In addition, by speeding up a slow heart to a normal rate, atropine reduces the chances of ectopic activity in the ventricles and thus of ventricular fibrillation. Atropine is most effective in reversing bradycardia due to increased parasympathetic tone or to morphine; it is less effective in treating bradycardias due to actual damage to the AV or SA node.

INDICATIONS: SINUS BRADYCARDIA when accompanied by hypotension.

SECOND and THIRD DEGREE HEART BLOCK when accompanied by bradycardia.

In some cases of ASYSTOLE to remove any type of heart block.

As an antidote in ORGANOPHOSPHATE POISONING (Mega doses).

CONTRAINDICATIONS: Atrial flutter or atrial fibrillation where there is a rapid ventricular response.

Glaucoma - narrow angle

Use with extreme caution in myocardial infarction.

SIDE EFFECTS: The patient should be warned that they may experience some of the following side effects and that these side effects are part of the drug's usual and expected actions:

- * Blurred vision, headache, pupillary dilatation
- * Dry mouth, thirst
- * Flushing of the skin

HOW SUPPLIED: Pre-filled syringes containing 1mg in 10ml.

ADMINISTRATION: In the field, atropine is usually given intravenously for bradycardia.

For organophosphate poisoning, a combination of intravenous and intramuscular administration is commonly used.

In resuscitation from cardiac arrest, if an intravenous route cannot be established, atropine may be given through the endotracheal tube.

ATROPINE SULFATE (cont)

ADULT DOSAGE: In bradycardia: 0.5 – 1.0mg IV, repeated at 5-minute intervals until the desired heart rate is achieved.

The total dose should not, however, exceed .04 mg/kg (3 mg) (Except in organophosphates).

Doses smaller than 0.5mg, or a dose given too slowly, may slow rather than speed up the heart rate.

Excessive doses may precipitate ventricular tachycardia or fibrillation.

* For asystole, 1mg IV, repeated in 5 minutes if asystole persists.

* For organophosphate poisoning: 2mg IM and 1mg IV.

The IV dose may be repeated every 5 to 10 minutes as needed until a decrease in secretions is observed.

Endotracheal Dosage: 1.0-2.0mg diluted in 10ml NS.

PEDIATRIC DOSAGE: In bradycardia: 0.02mg/kg; may be repeated one time.

Minimum dose - 0.1mg.

Maximum dose - 0.5mg in child / 1.0mg in adolescent.

Endotracheal Dosage: 0.02mg/kg diluted in 10ml NS.

CALCIUM CHLORIDE

THERAPEUTIC EFFECTS:	<p>Reverses overdose with magnesium sulfate or calcium channel blockers (such as verapamil).</p> <p>Previously, calcium was used in resuscitation because it was believed to stimulate the heart to beat in asystole and to strengthen cardiac contractions in electromechanical dissociation.</p> <p>However, careful recent studies have failed to show any benefit from using calcium in cardiac arrest, and indeed the effects of calcium may be harmful in that situation.</p>
INDICATIONS:	<p>As an antidote to magnesium sulfate and verapamil toxicity.</p> <p>When hyperkalemia or hypocalcemia is present (eg, after multiple blood transfusions).</p>
CONTRAINDICATIONS:	<p>Should be given with extreme caution, and in reduced dosage, to persons taking digitalis.</p> <p>Should not be given in the same infusion with sodium bicarbonate, since calcium chloride will combine with sodium bicarbonate to form an insoluble precipitate (calcium carbonate).</p>
SIDE EFFECTS:	<p>When given to a patient who has been taking digitalis or when given too rapidly, calcium can cause <u>sudden death</u> from ventricular fibrillation.</p> <p>Given in appropriate circumstances, calcium preparations have no significant side effects.</p>
HOW SUPPLIED:	<p>Calcium chloride: 10 ml of a 10% solution in pre-filled syringes (1 gram).</p>
ADMINISTRATION:	<p>Calcium preparations are given as a slow intravenous injection.</p>
DOSAGE:	<p>For verapamil toxicity:</p> <p>Calcium Chloride, 10 ml of a 10% solution slowly IV.</p> <p>For Cardiac Arrest in the renal dysfunction patient:</p> <p>Calcium Chloride, 10 ml (1000mg) slow IVP.</p>

25% DEXTROSE (D25)

THERAPEUTIC EFFECTS:	Restores circulating blood sugar level to normal in states of hypoglycemia. Acts transiently as an osmotic diuretic.
INDICATIONS:	When blood sugar reading is below 70 with Glucometer: To treat coma caused by HYPOGLYCEMIA; To treat COMA OF UNKNOWN CAUSE; To treat STATUS EPILEPTICUS OF UNCERTAIN CAUSE; and Some cases of REFRACTORY CARDIAC ARREST
CONTRAINDICATIONS:	Intracranial hemorrhage.
SIDE EFFECTS:	Will cause tissue necrosis if it infiltrates; should therefore be given only through a good, rapidly flowing IV line.
HOW SUPPLIED:	Prefilled syringes and vials containing 10ml of 25% dextrose (= 2.5g of dextrose). Most likely it will have to be mixed. Use equal parts of D50 and NS to yield the desired concentration.
ADMINISTRATION:	Given intravenously, <u>through a free-flowing intravenous line</u> , preferably in a large vein. If possible, draw blood for serum glucose determinations before administering the dextrose.
PEDIATRIC DOSAGE:	2ml/kg in children under 50 pounds. Newborn dose: 1ml/kg.

50% DEXTROSE (D50)

THERAPEUTIC EFFECTS:	Restores circulating blood sugar level to normal in states of hypoglycemia. Acts transiently as an osmotic diuretic.
INDICATIONS:	When blood sugar reading is below 70 with Glucometer: To treat coma caused by HYPOGLYCEMIA; To treat COMA OF UNKNOWN CAUSE; To treat STATUS EPILEPTICUS OF UNCERTAIN CAUSE; and Some cases of REFRACTORY CARDIAC ARREST.
CONTRAINDICATIONS:	Intracranial hemorrhage.
SIDE EFFECTS:	May precipitate severe neurologic symptoms in alcoholics. For this reason, when given to a known alcoholic, should be accompanied by <u>thiamine</u> , 50mg IV and 50mg IM, which will prevent this neurologic syndrome. Will cause tissue necrosis if it infiltrates; should therefore be given only through a good, rapidly flowing IV line.
HOW SUPPLIED:	Prefilled syringes and vials containing 50ml of 50% dextrose (= 25g of dextrose).
ADMINISTRATION:	Given intravenously, <u>through a free-flowing intravenous line</u> , preferably in a large vein. If possible, draw blood for serum glucose determinations before administering the dextrose.
ADULT DOSAGE:	50ml of 50% dextrose (25g) as a bolus IV.
PEDIATRIC DOSAGE:	1ml/kg in children over 50 pounds.

DIAZEPAM (VALIUM)

THERAPEUTIC EFFECTS:	Enhances pre-sympathetic inhibition, inhibits spinal polysynaptic afferent paths
INDICATIONS:	Anxiety, acute alcohol withdrawal, adjunct in seizure disorders; skeletal muscle relaxation; rectally for acute repetitive seizures
CONTRAINDICATIONS:	Hypersensitivity to benzodiazepines, narrow-angle glaucoma, psychosis, pregnancy, lactation, coma, respiratory depression
SIDE EFFECTS:	Respiratory depression, ECG changes, tachycardia, neutropenia, dizziness, drowsiness, confusion, hypotension, headache, nausea, vomiting
HOW SUPPLIED:	5mg/ml injection
ADMINISTRATION:	IV/IM
ADULT DOSE:	5mg IV or IM
PEDIATRIC DOSE:	0.2 mg/kg slow IV push over 3 minutes to a maximum dose of 5 mg

DIPHENHYDRAMINE (BENADRYL)

THERAPEUTIC EFFECTS:	Blocks histamine effects in allergic reactions. Sedative. Reverses untoward effects of some phenothiazine tranquilizers. Inhibits motion sickness (antiemetic).
INDICATIONS:	As an adjunct to epinephrine in the treatment of ANAPHYLACTIC SHOCK and SEVERE ALLERGIC REACTIONS. To treat EXTRAPYRAMIDAL REACTIONS (Parkinson-like movement disorders) caused by phenothiazines.
CONTRAINDICATIONS:	Asthma Narrow angle (acute) glaucoma Prostate enlargement Ulcer disease with symptoms of obstruction Pregnancy
SIDE EFFECTS:	Resemble those of atropine: <u>Drowsiness, confusion</u> <u>Blurring of vision</u> <u>Dry mouth</u> <u>Wheezing</u> ; thickening of bronchial secretions
HOW SUPPLIED:	In vials of 10 or 30ml, containing 10mg/ml In vials of 10ml containing 50mg/ml In ampules of 1ml containing 50mg/ml In prefilled syringes containing 50mg in 1ml
ADMINISTRATION:	For most purposes, diphenhydramine can be by deep Intramuscular injection or IVP.
ADULT DOSAGE:	10-50mg
PEDIATRIC DOSAGE:	1mg/kg with no hypotension IM or IV.

DOPAMINE (INTROPIN)

THERAPEUTIC EFFECTS:	<p>Beta sympathetic drug-hence causes an increase in the force and rate of cardiac contractions as well as dilatation of renal and mesenteric arteries.</p> <p>This latter effect promotes urine flow, and for this reason, dopamine is sometimes preferred over norepinephrine (which constricts renal arteries) in shock.</p> <p>Dopamine causes less increase in oxygen consumption by the myocardium than does Isoproterenol.</p> <p>At low doses, the beta effects of dopamine predominate; at high doses, dopamine has alpha effects as well and thus will cause vasoconstriction.</p>
INDICATIONS:	<p>To increase cardiac output in CARDIOGENIC SHOCK while maintaining good renal perfusion.</p>
CONTRAINDICATIONS:	<p>Should not be used as first-line therapy in hypotension caused by hypovolemia (e.g., hemorrhagic shock), where volume replacement should precede the use of vasopressors.</p> <p>Pheochromocytoma (a tumor that produces epinephrine and/or related substances).</p> <p>Should not be given in the presence of uncorrected tachyarrhythmias or ventricular fibrillation.</p> <p>Do not mix with bicarbonate since dopamine may be inactivated by alkaline solutions.</p>
SIDE EFFECTS:	<p><u>Ectopic beats, palpitations, tachycardia</u> <u>Nausea, vomiting</u> <u>Dyspnea, angina</u> <u>Headache</u></p>
HOW SUPPLIED:	<p>400mg in 250ml D5W Pre-Mix 200 or 400 mg vials (must be mixed in a 500cc bag of normal saline)</p>
ADMINISTRATION:	<p>Given by titrated intravenous infusion (microdrip infusion set).</p>
ADULT DOSAGE:	<p>START the infusion at a rate of 5mcg/kg/min (e.g., 140-350ug/min for a 70kg man, or roughly 0.25ml/min of the above dilution).</p> <p>TITRATE the infusion according to the state of consciousness, blood pressure, and urine flow.</p>

EPINEPHRINE (ADRENALIN)

THERAPEUTIC EFFECTS: In cardiac arrest, may restore electric activity in asystole; increases myocardial contractility; and decreases the threshold for defibrillation--all through its actions as a beta sympathetic agent.

In addition, the alpha effects of epinephrine, causing vasoconstriction, elevate the perfusion pressure and may thus improve coronary blood flow during external cardiac compressions.

In anaphylaxis, acts as a bronchodilator (beta effect) and helps maintain blood pressure (alpha effect).

INDICATIONS: In CARDIAC ARREST, to restore electric activity in asystole or to enhance defibrillation potential in ventricular fibrillation; also to elevate systemic vascular resistance and thereby improve perfusion pressure during resuscitation.

To treat the life-threatening symptoms of ANAPHYLAXIS.

To treat acute attacks of ASTHMA.

CONTRAINDICATIONS: Must be used with caution in patients with angina, hypertension, or hyperthyroidism.

THERE ARE NO CONTRAINDICATIONS TO THE USE OF EPINEPHRINE IN THE SITUATION OF CARDIAC ARREST OR ANAPHYLACTIC SHOCK.

SIDE EFFECTS: In a conscious patient, may cause palpitations, from tachycardia or ectopic beats, and elevations of blood pressure (which may not be desirable if the patient is already hypertensive).

The asthmatic with preexisting heart disease may experience dysrhythmias if treated with epinephrine.

HOW SUPPLIED: Prefilled syringes containing 1mg in 10ml (1:10,000 solution)

Ampules containing 1mg in 1ml (1:1,000 solution)

Multi-dose vial: 30mg in 30ml (1:1,000 solution)

EPINEPHRINE (ADRENALIN) (Cont)

ADMINISTRATION: In cardiac arrest, epinephrine is given intravenously every 3-5 minutes.

If an IV route cannot be established quickly, the drug may be instilled in the tracheo-bronchial tree via catheter through an endotracheal tube.

For anaphylactic reactions, epinephrine is given subcutaneously.

ADULT DOSAGE:

In cardiac arrest situations:

1.0mg (10ml of 1:10,000 solution)

Endotracheal dose: 2mg (1:1,000) diluted to 10ml with normal saline given via catheter during ventilation.

In anaphylactic reactions:

Mild reactions: 0.3mg subcutaneously, (0.3ml of a 1:1,000 solution)

(Do not, however, inject fingers or toes)

Another 0.3ml is given SQ on another extremity.

Severe reactions, with shock: 0.5mg slow IV. (5ml of a 1:10,000 solution)

For mild to moderate asthmatic attacks:

0.3 to 0.5ml of a 1:1,000 solution, Sub Q

PEDIATRIC DOSAGE:

Bradycardia: 0.01mg/kg 1:10,000 every 3 minutes

Cardiac Arrest:

Initial Dose: 0.01mg/kg 1: 10,000 IVP or IOP

Second & Subsequent Dose: 0.1mg/kg 1:1000 IVP or IOP

Endotracheal: 0.1mg/kg 1:1,000 diluted with 2ml of NS

Newborn Cardiac Arrest: 0.02mg/kg 1:10,000 every 5 min. By IV, IO

Allergic Reaction/Asthma:

0.01mg/kg 1:1,000 Sub Q Max 0.3mg. No response and IV in place, 0.1mg/kg 1:10,000 IVP

FUROSEMIDE (LASIX)

THERAPEUTIC EFFECTS:	<p>A potent diuretic that inhibits sodium and chloride reabsorption in the kidneys and causes venous dilation, thus useful in ridding the body of excess fluid in conditions such as congestive heart failure (CHF) and pulmonary edema.</p> <p>The first effect of lasix is that within approximately 5 minutes of administration it causes venous dilation resulting in a decreased preload. The second effect is the diuretic effect, and this begins 5-30 minutes after administration.</p>
INDICATIONS:	<p>To reverse fluid overload associated with CONGESTIVE HEART FAILURE and PULMONARY EDEMA.</p>
CONTRAINDICATIONS:	<p>Should not be given to pregnant women.</p> <p>It should not be given to patients with a known history of allergic reactions to sulfa drugs.</p> <p>Should not be given to patients with hypokalemia (low potassium) Hypokalemia may be suspected in a patient who has been on chronic diuretic therapy or whose EKG shows prominent P waves, diminished T waves, and the presence of U waves.</p>
SIDE EFFECTS:	<p>Immediate side effects may include <u>nausea</u> and <u>vomiting</u>, <u>potassium depletion</u> (with attendant cardiac dysrhythmias), and <u>dehydration</u>.</p>
HOW SUPPLIED:	<p>Multi-dose vials of 20, 40, or 100 mg. The standard concentration is 10 mg/ml.</p>
ADMINISTRATION:	<p>In the field, furosemide is given intravenously.</p>
ADULT DOSAGE:	<p>40 – 80 mg SLOW IV PUSH (injected over 1-2 min). The dose depends on clinical severity and medication history. If the patient already takes 40 mg per day, administer 80 mg.</p>

GLUCAGON

THERAPEUTIC EFFECTS:	<p>Accelerates the breakdown of glycogen to glucose in the liver, causing an increase in blood glucose level.</p> <p>Glucagon also relaxes the smooth muscle of the GI tract.</p> <p>Glucagon is helpful, in hypoglycemia only if the liver glycogen is available. Because glucagon is of little or no help in states of starvation, adrenal insufficiency, or chronic hypoglycemia, glucose should be considered for the treatment of hypoglycemia.</p>
INDICATIONS:	<p>For the treatment of hypoglycemia when IV Dextrose is not available.</p> <p>In anaphylaxis, if the patient is on beta blocking medication, hypertensive, has known coronary artery disease and/or is pregnant.</p>
CONTRAINDICATIONS:	<p>Glucagon is contraindicated in patients with known hypersensitivity to it or in patients with pheochromocytoma.</p>
SIDE EFFECTS:	<p>Glucagon is relatively free of adverse reactions except for occasional nausea and vomiting which may also occur with hypoglycemia.</p> <p>Generalized allergic reactions including urticaria, respiratory distress and hypotension, have been reported in patients who receive glucagon by injection.</p>
HOW SUPPLIED:	<p>Vials of 1mg glucagon with 1ml of diluting solution.</p>
ADMINISTRATION:	<p>For adults and for children weighing more than 20kg, administration may be by subcutaneous intramuscular or intravenous injection.</p> <p>Glucagon must be reconstituted with dilution solution provided and used immediately. If dose is higher than 2mg, reconstitute with sterile water for injection and use immediately.</p> <p>Glucagon is compatible with dextrose solutions, but precipitates may form in solutions of sodium chloride, potassium chloride or calcium chloride.</p>
ADULT DOSAGE:	<p>In hypoglycemia, 0.5 to 1.0mg IV, SC or IM injection. Response is usually seen in 5 to 20 minutes. If response is delayed, dose may be repeated 1 to 2 times.</p>
PEDIATRIC DOSAGE:	<p>In hypoglycemia for children weighing more than 20kg, 0.5 to 1.0mg IV, SC or IM injection. Response is usually seen in 5 to 20 minutes. If response is delayed, dose may be repeated 1 to 2 times.</p>

HALOPERIDOL (HALDOL)

THERAPEUTIC EFFECTS:	Blocks the dopamine receptors in the brain that are responsible for mood and behavior. Has antiemetic properties.
INDICATIONS:	Acute psychotic episodes.
CONTRAINDICATIONS:	Haldol should not be used in the management of dysphoria caused by Talwin.
SIDE EFFECTS:	Physical and mental impairment. Parkinson-like reactions have been known to occur, especially in children.
HOW SUPPLIED:	5 mg ampule.
ADMINISTRATION:	Haldol is administered by IM injection.
ADULT DOSAGE:	5 mg by IM injection.

LIDOCAINE (XYLOCAINE) 2%

THERAPEUTIC EFFECTS: Suppresses ventricular ectopic activity by decreasing the excitability of heart muscle and the cardiac conduction system.

INDICATIONS:

- To SUPPRESS PREMATURE VENTRICULAR CONTRACTIONS (PVC's).
- To PREVENT VENTRICULAR FIBRILLATION in acute myocardial infarction.
- To PREVENT RECURRENCE OF VENTRICULAR FIBRILLATION after electric conversion.
- To treat VENTRICULAR TACHYCARDIA.

CONTRAINDICATIONS:

- Known history of allergy to lidocaine or local anesthetics (e.g., Novocaine).
- Second or third degree heart block.
- Sinus bradycardia or sinus arrest.
- Idioventricular rhythm.

SIDE EFFECTS:

- By decreasing the force of cardiac contractions as well as decreasing peripheral resistance, may cause a fall in cardiac output and blood pressure.
- May cause numbness, drowsiness, or confusion when given in high doses, especially to the elderly or to patients in heart failure, may cause seizures.

HOW SUPPLIED: Ampules and prefilled syringes containing 100mg in 5ml (20 mg/ml) for bolus injection.

ADMINISTRATION:

- Given by intravenous bolus.
- Reduce the dosage (both bolus and infusion) by half for patients in congestive heart failure or shock and for patients over 70 years old.
- If an intravenous route cannot be established, lidocaine may be given via catheter through an endotracheal tube.

ADULT DOSAGE: 1.5mg/kg IV push, followed by .75mg/kg bolus every 20 minutes.

PEDIATRIC DOSAGE: V-Fib: 1mg/kg IVP, IOP or ET

LORAZEPAM (ATIVAN)

THERAPEUTIC EFFECTS:	Lorazepam is a benzodiazepine that works as a sedative and anticonvulsant.
INDICATIONS:	Persistent or recurrent seizure activity. Acute psychiatric episodes requiring sedation.
CONTRAINDICATIONS:	Hypersensitivity to benzodiazepines.
SIDE EFFECTS:	Drowsiness Hypotension Respiratory depression Apnea
HOW SUPPLIED:	2 mg in vials and pre-filled syringes.
ADMINISTRATION:	Lorazepam may be administered by either IV or IM.
ADULT DOSAGE:	For seizures, IV or IM injection of 1-2mg. For restraint of the psychiatric patient, 1 mg IV or 2 mg IM.

MAGNESIUM SULFATE

THERAPEUTIC EFFECTS: Magnesium is an electrolyte that has antiarrhythmic, anticonvulsant, and antidysrhythmic properties, that also relaxes bronchial smooth muscle and depresses the central nervous system.

INDICATIONS:

- Eclampsia.
- Torsades de Pointes.
- Refractory ventricular fibrillation or pulseless ventricular tachycardia.
- Severe asthma with a history of intubation / hospital admission after similar attacks.

CONTRAINDICATIONS: Patients with a known hypersensitivity to the drug.

PRECAUTIONS: Toxicity may produce a decreased level of consciousness, decreased reflexes, hypotension or respiratory depression.

SIDE EFFECTS: Rapid administration may cause flushing, sweating, mild bradycardia, or hypotension.

HOW SUPPLIED: 10 ml vials with 5 gm (50% solution)

ADMINISTRATION: Eclampsia – 4 gm of 10% solution over four minutes. Take 4 gm (8 ml of 50% solution) and dilute with 32 ml of normal saline to a total of 40 ml. Administer slow IVP over 4 minutes.

Torsades de Pointes – 1-2 gm of 10% solution IVP. Take 1-2 gm (2-4 ml of 50% solution) and dilute with 8-16 ml of normal saline to a total of 10-20 ml. Administer as a slow IVP over 3-5 minutes.

Refractory V-fib – 1-2 gm of 10% solution IVP. Take 1-2 gm (2-4 ml of 50% solution) and dilute with 8-16 ml of normal saline to a total of 10-20 ml. Administer as an IVP.

Asthma – 25-100 mg/kg for children diluted to a 10% solution and administered over 20 minutes. 2 gm for adults diluted to a 10% solution and administered over 20 minutes. Take 2 gm (4 ml of 50% solution) and dilute with 16 ml of normal saline to a total of 20 ml. Administer 1 ml per minute for 20 minutes.

MIDAZOLAM (VERSED)

THERAPEUTIC EFFECTS:	Versed is a short acting benzodiazepine CNS depressant. Onset of sedative effects after IM administration is 15 minutes with peak sedation occurring 30 - 60 minutes following injection.
INDICATIONS:	<p>Versed is indicated intramuscularly for preoperative sedation and to impair memory of perioperative events.</p> <p>Intravenously, Versed is used as an agent for conscious sedation prior to short diagnostic therapeutic or endoscopic procedures.</p> <p>Versed is also used IV for induction of general anesthesia before administration of other anesthetic agents.</p> <p>Versed has also been shown to be effective intramuscularly for control of seizure activity.</p>
CONTRAINDICATIONS:	In patients with known hypersensitivity to the drug.
SIDE EFFECTS:	<p>Fluctuation in vital signs was the most frequently seen findings following administration of Versed and include:</p> <ul style="list-style-type: none">* Decrease tidal volume and respiratory rate* Apnea* Variations in BP and pulse rate
HOW SUPPLIED:	2ml disposable syringes containing 5mg per ml 2 mg or 5 mg vials containing 1 mg/ml or 5 mg/ml
ADMINISTRATION:	<p>Versed should only be administered IM or IV</p> <p>Because serious and life threatening cardiorespiratory adverse events have been reported, provision for monitoring, detection and correction of these reactions must be made for every patient to whom Versed injection is administered regardless of age or health status</p>
ADULT DOSAGE:	For persistent seizure activity, IV or IM injection of 5mg initially and titrate to patient's condition up to 10mg maximum
PEDIATRIC DOSAGE:	For persistent seizure activity, IV or IM injection of 0.2mg/kg

MORPHINE SULFATE

THERAPEUTIC EFFECTS:	<p>Decreases pulmonary edema by pooling blood in the peripheral circulation and thereby reducing venous return to the heart.</p> <p>Helps as well to allay the anxiety associated with pulmonary edema.</p>
INDICATIONS:	<p>To treat PULMONARY EDEMA associated with CONGESTIVE HEART FAILURE</p> <p>To RELIEVE PAIN in myocardial infarction and other, selected conditions</p>
CONTRAINDICATIONS:	<p>Marked hypotension.</p> <p>Respiratory depression, except that caused by pulmonary edema, where the drug may be used if ventilatory support is provided.</p>
SIDE EFFECTS:	<p><u>Hypotension</u> (most likely in volume depleted patients).</p> <p>Increased vagal tone, leading to <u>bradycardia</u>. (This effect can be reversed with atropine.)</p> <p><u>Respiratory depression</u>. (This effect can be reversed with naloxone.)</p> <p><u>Nausea and vomiting</u>.</p>
HOW SUPPLIED:	<p>Pre-filled (tubex) syringes containing 10mg or 4 mg.</p>
ADMINISTRATION:	<p>Given by titrated intravenous injection</p> <p>If hypotension occurs, keep the patient flat, and do not give more of the drug.</p> <p>Watch for respiratory depression.</p>
ADULT DOSAGE:	<p>2 to 5mg by IV push every 5 to 30 minutes until the desired therapeutic effect is achieved. Do not exceed 15mg in the field.</p>

NALOXONE (NARCAN)

THERAPEUTIC EFFECTS:	<p>Specific antidote for narcotic agents.</p> <p>Reverses the actions of all narcotic drugs including heroin, morphine, methadone, codeine, Demerol, Dilaudid, Darvon, paregoric, and Percodan.</p> <p>Naloxone is thus effective in counteracting the effects of overdose from any of these agents.</p> <p>Naloxone will reverse stupor, coma, respiratory depression, etc. when these are due to narcotic overdose.</p>
INDICATIONS:	<p>To treat known NARCOTIC OVERDOSE or coma suspected to be due to narcotic overdose.</p>
CONTRAINDICATIONS:	<p>None</p>
SIDE EFFECTS:	<p>Too rapid administration may precipitate <u>projectile vomiting</u> and <u>ventricular dysrhythmias</u>.</p> <p>Administration to people who are physically dependent on narcotics may cause an acute withdrawal syndrome.</p> <p>For this reason, naloxone should be given very slowly, using improvement of respiratory status as an end point.</p> <p>In general, the duration of action of naloxone is shorter than that of the narcotics it is used to counteract.</p> <p>Thus, the patient who has been successfully roused with naloxone may fall back into stupor or coma as the naloxone wears off.</p> <p>These patients must therefore be watched closely, and the dose of naloxone should be repeated as necessary.</p> <p>Has been reported to cause pulmonary edema and sudden death in rare cases.</p>
HOW SUPPLIED:	<p>2mg in 2ml pre-filled syringe, or vials, or ampules.</p>

NALOXONE (NARCAN) (Cont)

ADMINISTRATION:

In the field, given slowly by slow intravenous injection.

As soon as there is improvement in the respirations, stop giving the drug.

It is preferable that the patient NOT wake up fully in the field, as these patients may be violent when brought abruptly out of coma.

USE RESPIRATIONS AS A GUIDE.

If there is no response to two doses, suspect overdose with another, non-narcotic drug.

ADULT DOSAGE:

Initial dose: 2mg. Administer this solution VERY SLOWLY IV while monitoring the rate and depth of the patient's respirations.

If there is no response to the full dose of naloxone, it may be repeated in 5 minutes in the same fashion.

PEDIATRIC DOSAGE:

0.1mg/kg Newborn dose: (narcotic dependent with decreased respiration)

0.1mg/kg every 3 minutes until respiration is improved.

NITROGLYCERIN

THERAPEUTIC EFFECTS:	<p>The primary pharmacologic effect of nitroglycerin and related drugs is to relax smooth muscle, and the effects of nitroglycerin on the cardiovascular system are chiefly due to relaxation of <u>vascular</u> smooth muscle (hence vasodilatation).</p> <p>Nitroglycerin provides relief of pain in angina, probably by dilating coronary arteries and thereby increasing blood flow through them as well as by decreasing myocardial oxygen demand.</p> <p>Through its vasodilatation action on peripheral vessels, nitroglycerin promotes pooling of the blood in the systemic circulation and decreases the resistance against which the heart has to pump (the afterload); these effects may be useful in treating congestive heart failure.</p>
INDICATIONS:	<p>To relieve the pain of ANGINA.</p> <p>To treat selected cases of PULMONARY EDEMA due to LEFT HEART FAILURE</p>
CONTRAINDICATIONS:	<p>Use with caution in myocardial infarction.</p> <p>Increased intracranial pressure.</p> <p>Concurrent administration with Cialis, Levitra, Viagra</p>
SIDE EFFECTS:	<p>Transient, throbbing <u>headache</u>.</p> <p><u>Hypotension</u></p> <p><u>Dizziness, weakness</u></p>
HOW SUPPLIED:	<p>Many forms, including ointment, spray, tablets, sustained release capsules. For use in the field, tablets of 0.4mg strength are preferred.</p>
ADMINISTRATION:	<p>Given sublingually (under tongue).</p> <p>The patient should be semi-sitting or recumbent.</p> <p>Monitor blood pressure and be prepared for hypotension.</p>
ADULT DOSAGE:	<p>One 0.4mg tablet or spray under the tongue.</p> <p>May repeat once every 5 minutes as long as B/P stays normal to a max of three times.</p>

OXYGEN (O₂)

THERAPEUTIC EFFECTS:	Reverses the deleterious effects of hypoxemia on the brain, heart, and other vital organs.
INDICATIONS:	<p>Any condition in which global or local hypoxemia may be present:</p> <p>CARDIAC or RESPIRATORY ARREST (given with artificial ventilation). DYSPNEA or RESPIRATORY DISTRESS from any cause. CHEST PAIN. SHOCK. COMA from any cause. CHEST TRAUMA. NEAR-DROWNING. PULMONARY EDEMA TOXIC INHALATIONS (smoke, chemicals, carbon monoxide). ACUTE ASTHMATIC ATTACK. ACUTE DECOMPENSATION OF COPD STROKE, HEAD INJURY REPEATED SEIZURES Any patient in CRITICAL CONDITION</p>
CONTRAINDICATIONS:	<p>None.</p> <p>May depress respirations in rare patients with chronic obstructive pulmonary disease. This is <u>not</u> a contraindication to its use, but simply means that such patients must be watched closely and assisted to breathe if the respiratory rate declines.</p>
SIDE EFFECTS:	None when given for short periods to adults. (less than 24 hr.)
HOW SUPPLIED:	As a compressed gas in cylinders of varying sizes.
ADMINISTRATION:	<p>Administered by inhalation from a dosage mask, nasal cannula, endotracheal tube, etc.</p> <p>A patent airway and adequate ventilation must be ensured.</p>
ADULT DOSAGE:	Depends on the condition being treated. For cardiac arrest and other critical conditions, 100% oxygen should be given as soon as possible.

PROMETHAZINE (PHENERGAN)

THERAPEUTIC EFFECTS: Blocks the cholinergic receptors in the vomiting center that are believed to mediate the nausea and vomiting caused by gastric irritation.

Phenergan depresses the RAS, including the parts of the brain involved with wakefulness.

INDICATIONS: Treatment and prevention of motion sickness; prevention and control of nausea and vomiting associated with anesthesia and surgery.

CONTRAINDICATIONS: Coma or severe CNS depression
Hypersensitivity to antihistamines or phenothiazines
Patient has consumed large amounts of depressants (alcohol, barbiturates, narcotics)
Children whose signs and symptoms may suggest Reye's Syndrome or other hepatic diseases.
Antiemetics SHOULD NOT be used in children with vomiting of unknown etiology.

SIDE EFFECTS:

* Drowsiness	* Vertigo
* Blurred Vision	* Headache
* Urticaria	* Dry Mouth
* Hypotension	

HOW SUPPLIED: Vials or one milliliter syringes containing 25mg/ml.

ADMINISTRATION: The preferred parenteral route of administration for Phenergan is by deep intramuscular injection.

The proper intravenous administration of this product is well tolerated but use of this route is not without some hazard. Inadvertent intra-arterial injection can result in gangrene of the affected extremity.

Subcutaneous injection is contraindicated as it may result in tissue necrosis.

ADULT DOSAGE: For severe nausea and vomiting:

12.5 to 25mg slow IV push or deep IM injection

PEDIATRIC DOSAGE: 0.5mg/lb given by slow IV push or deep IM injection

CHILDREN 12 YEARS OLD OR YOUNGER ONLY.

SODIUM BICARBONATE

THERAPEUTIC EFFECTS: By neutralizing excess acid, helps return the blood towards a physiologic pH, in which normal metabolic processes and sympathomimetic agents (such as epinephrine) work more effectively.

INDICATIONS: To treat METABOLIC ACIDOSIS, as in:

SHOCK and other low-output states (after resuscitation from cardiac arrest).

To treat HYPERKALEMIA (high serum potassium)

To promote the excretion of some types of BARBITURATES taken in OVERDOSE.

CONTRAINDICATIONS: Conditions in which the patient cannot tolerate a salt load, such as congestive heart failure.

SIDE EFFECTS: Because each mEq of bicarbonate comes along with a mEq of sodium, sodium bicarbonate has the same effect as any other salt-containing infusion, i.e., it increases the vascular volume.

Three 50ml syringes of sodium bicarbonate (1 mEq/ml) contain approximately the same amount of salt as 1 liter of normal saline.

Patients in borderline heart failure cannot tolerate salt loads of this magnitude.

Administration of sodium bicarbonate lowers serum potassium.

In some cases, this is the desired effect, as when bicarbonate is used to treat hyperkalemia.

However, in cardiac patients, if the potassium falls too low, the heart becomes irritable, and dysrhythmias may occur.

This is especially likely in patients taking diuretics.

Sodium bicarbonate administration transiently raises the arterial carbon dioxide level, and thus its administration must be accompanied by controlled hyperventilation to blow off this excess CO₂. (e.g, with bag-valve-mask)

SODIUM BICARBONATE (Cont)

HOW SUPPLIED: Vials and pre-filled syringes of 50ml, containing 1 mEq/ml.

ADMINISTRATION: Given by intravenous bolus injection.

ADULT DOSAGE: For cardiac arrest:

If used at all, 1 mEq/kg after the first 10 minutes of CPR.

Acidosis should thereafter be prevented by hyperventilation.

Do not give bicarbonate in the same syringe with epinephrine or calcium.

For other conditions: As ordered by physician.

PEDIATRIC DOSAGE: Cardiac Arrest:

1 mEq/kg diluted with 1ml/kg NS

Newborn: 0.5mEq/kg diluted with .5ml/kg NS

TETRACAINE

(PONTOCAINE, OPHTHALMIC)

THERAPEUTIC EFFECTS:	Provides local anesthesia to eyes. Provides relief from eye pain so that an appropriate eye exam and treatment can be completed.
INDICATIONS:	Irritation and/or pain of the eyes when there is a non-penetrating injury.
CONTRAINDICATIONS:	Penetrating or open eye injury. Allergy or hypersensitivity to Tetracaine.
SIDE EFFECTS:	Burning sensation in eyes Redness Tearing
HOW SUPPLIED:	Ophthalmic drops in dropper bottle
ADMINISTRATION:	1-2 drops in affected eye every 5-10 minutes as needed for pain control. Don't touch dropper tip to eye, lid or finger to keep bottle sterile.

VASOPRESSIN (PITRESSIN)

THERAPEUTIC EFFECTS:	Is a naturally occurring antidiuretic hormone. When given in high doses, vasopressin acts as a vasoconstrictor.
INDICATIONS:	Used as an alternative to epinephrine for the treatment of adult V-fib / Pulseless V-tach. (Class IIb)
CONTRAINDICATIONS:	None when used in adult V-fib / Pulseless V-tach.
SIDE EFFECTS:	Pallor of the skin, nausea, intestinal cramping
HOW SUPPLIED:	Ampules containing 20 international units in 1 ml
ADMINISTRATION:	Intravenous bolus
ADULT DOSAGE:	A one time dose of 40 units IVP

ZOFRAN (ondansetron)

THERAPEUTIC EFFECTS:	Prevents nausea, vomiting by blocking serotonin peripherally, centrally and in the small intestine.
INDICATIONS:	Used as an alternative to phenergan for the treatment of nausea and vomiting.
CONTRAINDICATIONS:	Hypersensitivity
SIDE EFFECTS:	Diarrhea, constipation, abdominal pain, headache, dizziness, fatigue, drowsiness
HOW SUPPLIED:	Injection 2 mg/ml
ADMINISTRATION:	Undiluted given over 30 seconds IV/IM
ADULT DOSE:	4 mg IV/IM > 30 seconds
PEDIATRIC DOSE:	2-12 year old IV 0.1 mg/kg (<40 kg) IV 4 mg (>40 kg)