

# APPENDIX - 4.1

## PHARMACUTICALS

### Drug Formulary

#### ACTIVATED CHARCOAL

<b>Other Names</b>	<i>Actidose (With Sorbitol)</i>
<b>Class</b>	Adsorbent
<b>Pharmacological Effects</b>	Pharmacologically inert, activated charcoal is not absorbed in the gastrointestinal tract. It adsorbs a variety of organic and inorganic substances. Once bound by the charcoal in the GI tract, toxins are inactivated and excreted.
<b>Indications</b>	<ul style="list-style-type: none"><li>• Adult ingested poisonings, after completion of vomiting or where ipecac is contraindicated.</li></ul>
<b>Contraindications</b>	<ul style="list-style-type: none"><li>• None in severe poisoning.</li></ul>
<b>Side Effects</b>	<ul style="list-style-type: none"><li>• GI: vomiting, constipation, diarrhea and black stools</li></ul>
<b>Precautions / Interactions</b>	<ul style="list-style-type: none"><li>• Patients with altered mental status.</li><li>• May absorb ipecac before emesis; wait at least 10 minutes if ipecac is administered.</li></ul>

#### ADENOSINE

<b>Other Names</b>	<i>Adenocard</i>
<b>Class</b>	Antidysrhythmic
<b>Pharmacological Effects</b>	Adenosine acts directly on the AV node to slow electrical conduction, thus interrupting the re-entry circuit that perpetuates most cases of paroxysmal supraventricular tachycardia (PSVT), including those associated with Wolff-Parkinson-White syndrome (WPW). The onset when given IV is usually within 30 seconds, and the half-life is less than 10 seconds.
<b>Indications</b>	<ul style="list-style-type: none"><li>• Conversion of stable or unstable SVT and PSVT, including that associated with accessory bypass tracts (i.e. WPW), to sinus rhythm</li></ul>
<b>Contraindications</b>	<ul style="list-style-type: none"><li>• Second- or third-degree AV block</li><li>• Sick sinus syndrome (except in patients with a functioning pacemaker).</li><li>• Hypersensitivity.</li></ul>

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#### Side Effects

- Antagonized competitively at receptor sites by methylxanthines such as caffeine and theophylline. Patients on theophylline will generally require larger doses.
- Effects are potentiated by the presence of dipyridamole, which blocks uptake, so smaller doses may be effective.
- Effects not blocked by atropine.
- Higher degrees of heart block may be produced in the presence of carbamazepine.
- Not effective for uncontrolled atrial fibrillation or flutter.

#### Precautions / Interactions

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#### ALBUTEROL

##### *Other Names*

*Albuterol Sulfate, Proventil, Ventolin, Rotacaps, Volmax*

##### **Class**

Sympathomimetic bronchodilator

##### **Pharmacological Effects**

In low doses, albuterol acts relatively selectively at beta<sub>2</sub> adrenergic receptors to cause bronchodilation and vasodilation; at higher doses, beta<sub>2</sub> selectivity is lost, and it acts at beta<sub>1</sub> receptors to cause typical sympathomimetic cardiac effects. The resulting bronchodilation reduces airway resistance, thus facilitating mucus drainage and increasing vital capacity.

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- Indications**
- Bronchial asthma and reversible bronchospasm associated with bronchitis and emphysema.
- Contraindications**
- Hypersensitivity.
- Side Effects**
- CNS: tremors, dizziness, sweating, nervousness, headache, vertigo, hyperactivity, irritable behavior, and insomnia.
  - CV: tachycardia, palpitations, peripheral vasodilation, angina and increased or decreased blood pressure.
  - EENT: dilated pupils, epistaxis, pharyngitis and nasal congestion.
  - GI: nausea, vomiting
  - RESP: bronchospasm, cough, bronchitis and wheezing.
- Precautions / Interactions**
- Use with extreme caution in patients with cardiovascular disorders, especially coronary insufficiency, dysrhythmias, and hypertension.
  - Use with extreme caution in patients with convulsive disorders, hyperthyroidism, diabetes mellitus and those who are sensitive to sympathomimetic amines.
  - Administer with extreme caution to patients being treated with MAO inhibitors or tricyclic antidepressants; may potentiate the effects on the vascular system.
  - Beta-receptor blocking agents and albuterol inhibit the effect of each other.
  - Peak flow rate should be measured before and after treatment.

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#### AMIODARONE

**Other Names** *Cordarone*

**Class** Antidysrhythmic

**Pharmacological Effects** Amiodarone prolongs duration of cardiac action potential and the effective refractory period. It decreases AV conduction velocity and sinus node function, and exerts an antifibrillatory effect without significantly altering the myocardial membrane

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potential.

#### Indications

- Cardiac arrest with ventricular fibrillation or pulseless ventricular tachycardia.
- Supraventricular and ventricular dysrhythmias that are resistant to other antiarrhythmic agents.

#### Contraindications

- None in cardiac arrest with ventricular fibrillation or ventricular tachycardia.
- SA node dysfunction.
- 2nd or 3rd degree heart block in the absence of a functioning pacemaker.
- Marked bradycardia.
- Cardiogenic shock.
- Hypersensitivity.
- Pregnancy or lactating mothers (risk of fetus/neonate to maternal health must be considered).

#### Side Effects

- CV: hypotension (16%), bradycardia (5%), CHF, cardiogenic shock, AV block and can cause dysrhythmia more difficult to reverse or less well tolerated.
- GI: nausea, vomiting
- RESP: pulmonary toxicity and fibrosis which can be life threatening.
- OTHER: headache, weakness, fatigue and malaise.

#### Precautions / Interactions

- Increased bradycardia and hypotension can occur when given with other beta-blockers or calcium channel blockers.
- Medication must be carefully withdrawn from vial; avoid air bubbles.
- Administration will increase the serum concentration of lidocaine, disopyramide, phenytoin, flecainide, digoxin, quinidine, procainamide, warfarin, dextromethorphan and cyclosporine.

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**ASPIRIN**

**Other Names**

*Acetylsalicylic acid*

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<b>Class</b>	Anticoagulant; anti-inflammatory
<b>Pharmacological Effects</b>	The anticoagulant effect of aspirin occurs by blocking prostaglandin synthetase, which prevents the formation of the platelet aggregating factor thromboxane A <sub>2</sub> . Thromboxane A <sub>2</sub> also causes arterial constriction. Its anti-inflammatory action is caused by the inhibition of prostaglandin synthesis and by altering other mediators of inflammation.
<b>Indications</b>	<ul style="list-style-type: none"><li>• Suspected AMI for reduction in mortality (20%) and re-infarction rates.</li></ul>
<b>Contraindications</b>	<ul style="list-style-type: none"><li>• Hypersensitivity</li></ul>
<b>Side Effects</b>	<ul style="list-style-type: none"><li>• GI: stomach pain, heartburn, anorexia, occult bleeding, nausea and vomiting.</li></ul>
<b>Precautions / Interactions</b>	<ul style="list-style-type: none"><li>• Use caution for patients with asthma and chronic urticaria, aspirin can induce bronchospasm.</li><li>• 15% of the patients who use aspirin experience hypersensitivity reactions, anaphylactoid reactions to fatal anaphylactic shock.</li><li>• Increased risk of bleeding with oral anticoagulants, heparin</li><li>• Increased risk of GI ulceration with steroids, phenylbutazone, alcohol and NSAIDs.</li><li>• Decreased absorption of aspirin with nonabsorbable antacids.</li><li>• Unexpected hypotension may occur with nitroglycerin.</li></ul>

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## ATROPINE

<b>Other Names</b>	<i>Atropine sulfate</i>
<b>Class</b>	Parasympatholytic
<b>Pharmacological Effects</b>	Atropine is a competitive antagonist of acetylcholine at peripheral muscarinic and central receptors that causes an increase in heart rate, decreased salivary secretion, decreased GI motility, sweating and increased urinary bladder contractibility. It is a potent bronchodilator when bronchoconstriction has been induced by parasympathomimetics. Atropine does not block acetylcholine release, only the receptor sites.

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- Indications**
- Symptomatic bradycardias.
  - Asystole.
  - PEA (with an underlying relative or absolute bradycardic rate).
  - Reversal of cholinergic drug overdoses.
  - Reversal of the effects of organophosphate poisoning.
- Contraindications**
- None in cardiac arrest or similar emergency situation.
  - Hypersensitivity
  - Glaucoma
  - CHF
  - Second degree Mobitz II heart block and third degree heart block with wide ventricular complexes.
- Side Effects**
- CNS: headache, restlessness, ataxia, excitement, agitation, disorientation, hallucinations, delirium, coma, insomnia, confusion and dizziness.
  - CV: tachycardia, palpitations and angina.
  - EENT: "sandy eyes" 1 mg - slight mydriasis and photophobia; 2 mg - blurred vision and mydriasis.
  - GI: dry mouth (even at low doses), thirst, constipation, nausea and vomiting.
  - GU: urinary retention.
  - SKIN: hot and flushed skin.
- Precautions / Interactions**
- Can produce short lasting reflex bradycardia (4 - 8 beats per minute) in small doses (less than 0.4 mg) or in recommended dose if given slowly. Must be given rapid IVP.
  - Do not delay external pacing for IV placement when treating a critically unstable patient.

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<b>CALCIUM CHLORIDE</b>	<b>Other Names</b>	NA
	<b>Class</b>	Electrolyte
	<b>Pharmacological</b>	Calcium chloride increases myocardial contractility by direct effect and can increase automaticity, especially

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<b>Effects</b>	in the ventricles. It is involved in the regulation of cell membrane permeability to sodium and potassium (excitability).
<b>Indications</b>	<ul style="list-style-type: none"><li>• Reversal of magnesium sulfate.</li><li>• Calcium channel blocker overdose (with bradycardia or cardiac arrest).</li><li>• Acute hypocalcemia.</li><li>• Acute hyperkalemia.</li></ul>
<b>Contraindications</b>	<ul style="list-style-type: none"><li>• Hypercalcemia.</li><li>• Hypokalemia.</li><li>• Ventricular fibrillation.</li><li>• Digitalis toxicity</li></ul>
<b>Side Effects</b>	<ul style="list-style-type: none"><li>• CV: vasodilatation, moderate hypotension, bradycardia and cardiac arrest</li><li>• ECG: shortening of S-T segment and the Q-T interval.</li><li>• CNS: syncope.</li><li>• OTHER: hypokalemia, hypophosphatemia, venous irritation during administration and muscle pain.</li></ul>
<b>Precautions / Interactions</b>	<ul style="list-style-type: none"><li>• Rapid administration can produce bradycardia, cardiac arrest and sustained asystole.</li><li>• Precipitates as carbonate in the presence of sodium bicarbonate. Flush IV line well before and after administration of either drug.</li><li>• Expect a drop in blood pressure after administration.</li><li>• Use with caution, if at all, when patients are taking digitalis preparations.</li></ul>

#### DEXAMETHASONE SODIUM PHOSPHATE

**Other Names** *Decadron*

**Class** Adrenocorticosteroid

**Pharmacological Effects** Synthetic long-acting glucocorticoid that depresses formation, release, and activity of endogenous mediators of inflammation, including prostaglandins, kinins, histamine, liposomal enzymes, and complement expression. Also modifies body's

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	immune response.
<b>Indications</b>	<ul style="list-style-type: none"><li>• Acute Pediatric Asthma / COPD</li><li>• Acute Pediatric croup.</li></ul>
<b>Contraindications</b>	<ul style="list-style-type: none"><li>• None in the emergency setting</li></ul>
<b>Side Effects</b>	<ul style="list-style-type: none"><li>• GI: Gastrointestinal bleeding</li><li>• OTHER: Prolonged wound healing.</li></ul>
<b>Precautions / Interactions</b>	<ul style="list-style-type: none"><li>• Store the drug out of direct light and protect from extremes in temperature.</li></ul>

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#### DEXTROSE 50%

<b>Other Names</b>	<i>D50</i>
<b>Class</b>	Carbohydrate
<b>Pharmacological Effects</b>	Six-carbon sugar d-glucose, it is the principle form of carbohydrate used by the body. It rapidly elevates blood glucose level by releasing glucose into the blood stream for metabolism.
<b>Indications</b>	<ul style="list-style-type: none"><li>• Unresponsive diabetic patient.</li><li>• Hypoglycemia (below 70 mg/dL).</li><li>• Altered level of consciousness of unknown etiology.</li><li>• Seizure of unknown etiology.</li></ul>
<b>Contraindications</b>	<ul style="list-style-type: none"><li>• None in the pre-hospital emergency setting when the drug is indicated.</li></ul>
<b>Side Effects</b>	<ul style="list-style-type: none"><li>• CNS: may precipitate severe neurologic symptoms in alcoholics and hyperosmolar syndrome.</li><li>• CV: congestive heart failure, pulmonary edema, phlebitis and venous sclerosis if vein is not flushed well following administration.</li><li>• LOCAL: tissue necrosis if infiltration occurs.</li><li>• METABOLIC: hyperglycemia, hypokalemia and hyperosmolarity.</li></ul>
<b>Precautions / Interactions</b>	<ul style="list-style-type: none"><li>• Always draw blood for blood glucose level and other lab tests prior to administration.</li><li>• Flush vein well with IV solution following administration.</li></ul>

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- Can precipitate severe neurological symptoms (Wernicke's encephalopathy) in thiamine-deficient patients, such as alcoholics. Patients with a history of alcoholism should receive thiamine before dextrose is administered.
- Should be given slowly to pediatric and neonatal patient groups. Research has found that fast administration may cause a neurological insult.
- Not indicated with intracranial hemorrhage, especially space occupying lesions.

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<b>DEXTROSE 5%</b> (in water)	<b>Other Names</b>	<i>D<sub>5</sub>W</i>
	<b>Class</b>	Hypotonic water solution; carbohydrate
	<b>Pharmacological Effects</b>	An isotonic IV fluid, D <sub>5</sub> W provides calories for some metabolic needs and supplies water for hydration. Depending on the presence of insulin, glucose enters cells and is broken down to pyruvate. With adequate oxygen, it enters the Krebs' cycle in the mitochondria and is converted into energy (ATP), CO <sub>2</sub> and H <sub>2</sub> O. After administration, the dextrose is quickly metabolized in the body, leaving only water, a hypotonic fluid.
	<b>Indications</b>	<ul style="list-style-type: none"><li>• Vehicle for mixing medications, such as Amiodarone, for IV delivery.</li></ul>
	<b>Contraindications</b>	<ul style="list-style-type: none"><li>• None for patients who require the administration of a medication that needs D5W as a medium.</li></ul>
	<b>Side Effects</b>	<ul style="list-style-type: none"><li>• Hyperglycemia.</li><li>• Fluid overload.</li></ul>
	<b>Precautions / Interactions</b>	<ul style="list-style-type: none"><li>• Since the tonicity is low, avoid using in head injury patients.</li><li>• Use sterile technique in venipuncture and equipment assembly.</li><li>• Do not administer quantity in excess of that required to administer appropriate dose of medication.</li><li>• Do not use solution if outdated, cloudy or the seal is not intact.</li></ul>

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<b>DIAZEPAM</b>	<b>Other Names</b>	<i>Valium</i>
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**PHARMACUTICALS****Drug Formulary**

<b>Class</b>	Sedative-hypnotic (benzodiazepine); anticonvulsant
<b>Pharmacological Effects</b>	A CNS depressant, diazepam depresses the limbic system (emotional intensity) and ascending RAS (level of alertness) thereby alleviating anxiety and inducing amnesia. It suppresses the spread of seizure activity in the epileptogenic foci in the cortex, thalamus and limbic structures by enhancing presynaptic inhibition. Relaxation of the skeletal muscles is believed to be caused by inhibiting polysynaptic afferent pathways. Diazepam has no autonomic actions and does not inhibit conditioned reflexes.
<b>Indications</b>	<ul style="list-style-type: none"><li>• Sustained and/or recurrent grand-mal seizures.</li><li>• Sedation prior to cardioversion.</li><li>• Sedation for acute stress anxiety reactions.</li><li>• Isolated musculoskeletal injuries.</li><li>• Sedation for emergent intubation situations.</li></ul>
<b>Contraindications</b>	<ul style="list-style-type: none"><li>• Hypersensitivity to the drug.</li><li>• Respiratory depression.</li><li>• Acute narrow angle glaucoma.</li></ul>
<b>Side Effects</b>	<ul style="list-style-type: none"><li>• CNS: drowsiness, lethargy, ataxia, depression, dizziness, syncope, headache, euphoria, fainting, slurred speech, tremor, confusion and vertigo.</li><li>• CV: transient hypotension, dysrhythmias, bradycardia and cardiovascular collapse.</li><li>• EENT: photophobia and blurred vision.</li><li>• GI: nausea and vomiting.</li><li>• RESP: respiratory depression.</li><li>• SKIN: pain and phlebitis at injection site.</li></ul>
<b>Precautions / Interactions</b>	<ul style="list-style-type: none"><li>• Administer only in Normal Saline IV. Benzodiazepines are incompatible with any other medication or solution. Mixing with other substances will cause precipitation.</li><li>• Has a cumulative and potentiating effect with alcohol and other sedative drugs.</li><li>• Respiratory depression is generally caused by rapid IV administration. The rate of injection should not exceed 2 mg/min.</li></ul>

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- Irritating to the vein and tissue, which may cause pain during administration.
- Doses should be reduced by 50% for elderly patients.
- Use with caution for shock states, during pregnancy, head injury patients and comatose patients.

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#### DILTIAZEM

**Other Names** *Cardizem*

**Class** Antiarrhythmic

**Pharmacological Effects** Diltiazem binds (blocks) only to open calcium channels, especially the voltage-sensitive channels, preventing repolarization until the drug dissociates from the channel. It decreases the discharge rate of SA node and AV nodal conduction while increasing AV nodal refractory period, thereby decreasing myocardial contractility and oxygen demand. Producing vasodilation, diltiazem relieves coronary artery vasospasm and reduces afterload.

**Indications**

- Stable uncontrolled Atrial flutter or fibrillation.
- Stable narrow complex PSVT refractory to Adenosine.
- Variant angina.

**Contraindications**

- Severe hypotension.
- Second or third degree heart block.
- Sick sinus syndrome, unless functioning ventricular pacemaker is in place.
- Wolff-Parkinson-White syndrome.
- Severe heart failure.
- Any wide complex tachycardia until proven not to be ventricular tachycardia.
- Hypersensitivity.

**Side Effects**

- CNS: syncope, headache, drowsiness, nervousness, dizziness and paresthesia.
- CV: transient hypotension, heart failure, bradycardia, bundle branch block, AV block, ventricular flushing, asystole and peripheral edema.

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- GI: nausea and vomiting.
- Precautions / Interactions**
- Should not be used in patients receiving IV beta-blockers because of increased risk of CHF, bradycardia and asystole.
  - Should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.
  - Avoid in nursing mothers.

#### DIPHENHYDRAMINE

**Other Names**

*Benadryl*

**Class**

Antihistamine

**Pharmacological Effects**

Diphenhydramine strongly opposes the action of histamine on the capillary bed by binding with the histamine H<sub>1</sub> receptor site. It decreases vessel dilation and leakiness during an allergic reaction by opposing histamine at the receptor sites. It also may inhibit mast cell damage, preventing the release of more histamine. There is an anticholinergic effect as well, thus mucous membranes become dry and oral secretions are decreased.

**Indications**

- Allergic reactions.
- Anaphylactic shock (first-line medication of choice is epinephrine).
- Antidote for phenothiazine extrapyramidal (dystonic) side effects.

**Contraindications**

- Acute asthma.
- Nursing mothers.
- Hypersensitivity.

**Side Effects**

- CNS: sedation, drowsiness, dizziness, fever, ataxia, excitement, confusion and headache.
- CV: hypotension, palpitations, and tachycardia.
- EENT: blurred vision, photosensitivity, dry nose and throat, and nasal stuffiness.
- GI: nausea and vomiting.
- RESP: thickening of bronchial secretions, tightness of the chest and wheezing.

**Precautions /**

- Potentiates action of atropine and other

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- Interactions** anticholinergics, alcohol and CNS depressant drugs.
- Inhibits action of anticoagulants and some corticosteroids.
  - Incompatible with barbiturates, Dilantin, Decadron, Solu-medrol, Lasix and many other agents. Give IV direct and do not mix with any other drug.
  - Use with caution for patients with a history of bronchial asthma and lower respiratory disease.

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**DOBUTAMINE**

**Other Names** *Dobutrex*

**Class** Sympathomimetic

**Pharmacological Effects** Dobutamine is a synthetic catecholamine. It is a selective beta<sub>1</sub>-adrenergic agonist with alpha<sub>1</sub> activity, but cannot activate dopamine receptors or cause norepinephrine release. Dobutamine has positive inotropic effects with little chronotropic effects.

- Indications**
- Significant hemodynamic imbalances present in non-hypovolemic shock syndromes.
  - Cardiogenic shock.
  - Symptomatic bradycardia when patient is refractory to atropine administration and external pacing.
  - CHF when increased cardiac output without increased heart rate is desired

- Contraindications**
- Hypovolemic shock without complete fluid resuscitation.
  - Idiopathic hypertrophic subaortic stenosis.
  - Hypersensitivity.

- Side Effects**
- CNS: anxiety, nervousness, tremors and headache.
  - CV: ectopic beats, tachycardia, anginal pain, palpitations, hypotension, bradycardia, widening of QRS complex, conduction disturbances and vasoconstriction.
  - GI: nausea and vomiting.
  - RESP: dyspnea.
  - OTHER: necrosis and tissue sloughing with extravasation.

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#### Precautions / Interactions

- Tissue necrosis may occur if drug infiltrates.
- Becomes inactivated when mixed with or administered with alkaline solutions.
- Should not be administered in the presence of uncorrected tachydysrhythmias or ventricular fibrillation.
- May be ineffective when administered to patients on beta blockers.
- May cause hypertension in patients taking tricyclic antidepressants.,

#### DOPAMINE

##### *Other Names*

*Intropin*

##### **Class**

Sympathomimetic

##### **Pharmacological Effects**

Dopamine is a natural catecholamine with dopaminergic, alpha and beta properties. At low doses, there is an increase of renal and mesenteric blood flow by direct stimulation of the dopaminergic receptor sites. With moderate doses dopamine increases myocardial contractility by direct stimulation of the beta<sub>1</sub> adrenergic receptors and norepinephrine release, increasing stroke volume and cardiac output. Alpha-adrenergic receptor stimulation and norepinephrine release are caused by high doses, producing peripheral vasoconstriction.

##### **Indications**

- Significant hemodynamic imbalances present in non-hypovolemic shock syndromes.
- Cardiogenic shock.
- Symptomatic bradycardia when patient is refractory to atropine administration and external pacing.

##### **Contraindications**

- Hypovolemic shock without complete fluid resuscitation.
- Pheochromocytoma (tumor of the sympathadrenal system).
- Hypersensitivity.

##### **Side Effects**

- CNS: anxiety, nervousness, tremors and headache.
- CV: ectopic beats, tachycardia, anginal pain, palpitations, hypotension, bradycardia, widening of QRS. complex, conduction disturbances and

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vasoconstriction.

- GI: nausea and vomiting.
- RESP: dyspnea.
- OTHER: necrosis and tissue sloughing with extravasation.

#### Precautions / Interactions

- Tissue necrosis may occur if drug infiltrates.
- Becomes inactivated when mixed with or administered with alkaline solutions.
- Should not be administered in the presence of uncorrected tachydysrhythmias or ventricular fibrillation.
- Patients on MAO inhibitors (Marplan, Eutonyl, Parnate and Nardil) should receive a significantly reduced dose.

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#### DUODOTE™ KIT

##### *Other Names*

##### **Content**

- Auto-injectable containing:
  - Atropine Sulfate 2 mg equivalences in 0.7 ml.
  - Pralidoxime Chloride (2-PAM C1) 600 mg in 2 ml.

##### **Class**

- ATROPINE – Parasympatholytic.
- PRALIDOXIME – Cholinesterase reactivator.

##### **Pharmacological Effects**

- ATROPINE - see formulary.
- PRALIDOXIME – Attaches to the nerve agent that is inhibiting the cholinesterase and breaks the agent-enzyme bond to restore the normal activity of the enzyme. This is noticeable in organs with sympathetic receptors, like skeletal muscle. The effects are not apparent for systems with parasympathetic receptors, and will not cause a decrease in secretions.

##### **Indications**

- Known history of a nerve agent or cholinergic poisoning with severe presenting signs and symptoms (i.e. salivation, lacrimation, rhinorrhea, urination, defecation, vomiting, cardiac dysrhythmias, respiratory depression, seizures, paralysis).

##### **Contraindications**

- None in the case of severe nerve agent or cholinergic poisoning.

##### **Side Effects**

- ATROPINE – see formulary.

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#### Precautions / Interactions

- PRALIDOXIME – CNS: excitement, manic behavior
- ATROPINE – see formulary.
- PRALIDOXIME - Laryngospasm, tachycardia and muscle rigidity have occurred following rapid administration. Should only be administered following atropine.
- Benzodiazepine should be made available for treatment of post-exposure seizures.
- Always assure safety and protection of rescue personnel.

#### EPINEPHRINE

#### Other Names

*Adrenalin*

#### Class

Sympathomimetic hormone

#### Pharmacological Effects

Epinephrine is a natural catecholamine with alpha and beta-adrenergic properties, stimulating alpha, beta<sub>1</sub> and beta<sub>2</sub> adrenergic receptors in dose-related fashion. The alpha effects cause vasoconstriction of peripheral vasculature, bronchial arterioles, renal and mesenteric vessels, and possibly the coronary arteries. The beta response increases: heart rate, myocardial contractility, stroke volume and cardiac output; automaticity of all pacemaker cells; conduction velocity of AV node, bundle of His, Bundle Branches and Purkinje fibers; and excitability of the myocardial cell membrane to electrical stimulus. Epinephrine causes relaxation of the respiratory bronchioles, alleviating bronchospasm, and decreases chemical mediator release (histamine, SRS-A, bradykinin, serotonin) during anaphylactic reaction.

#### Indications

- Cardiac arrest.
- Acute asthma attacks.
- Severe allergic reactions and anaphylactic shock.
- Symptomatic bradycardias (after atropine, dopamine and external pacing).

#### Contraindications

- Narrow angle glaucoma.
- Hypovolemic shock.
- Hypertension.

#### Side Effects

- CNS: restlessness, euphoria, anxiety, vertigo,

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headache, and cerebral hemorrhage.

- CV: palpitations, hypertension, tachycardia, ventricular fibrillation, angina, syncope and ECG changes.
- GI: nausea and vomiting.
- RESP: respiratory weakness, apnea, pulmonary edema and dyspnea.
- SKIN: pallor and diaphoresis.

#### Precautions / Interactions

- Effects can be potentiated by antidepressants.
- May be deactivated by alkaline solutions (i.e. sodium bicarbonate, furosemide).
- Use with caution in pregnancy.
- Store the drug out of direct light and protect from extremes in temperature.

#### EPINEPHRINE, RACEMIC

##### Other Names

*Racemic epinephrine hydrochloride, MicroNEFRIN, Vaponephrine*

##### Class

Sympathomimetic hormone

##### Pharmacological Effects

Effects same as Epinephrine, however use is by **oral inhalation only**. Inhalation causes local effects on the upper airway as well as systemic effects from absorption. Vasoconstriction may reduce swelling in the upper airway, and beta<sub>2</sub> effects on bronchial smooth muscle may relieve bronchospasm. Rapid response in croup (within 10 minutes) and effect dissipates in 2 hours.

##### Indications

- Life-threatening airway obstruction suspected secondary to croup (Laryngotracheobronchitis)

##### Contraindications

- Should not be used in the management of epiglottitis (cough usually present in croup).

##### Side Effects

- Effects same as Epinephrine. Most common experienced:
  - CNS: restlessness
  - CV: palpitations, tachycardia

##### Precautions / Interactions

- Same as Epinephrine
- Discoloration is an indication to discard the medication.

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## PHARMACUTICALS

### Drug Formulary

#### ETOMIDATE

**Other Names**

*Amidate*

**Class**

Hypnotic anesthetic

**Pharmacological Effects**

Etomidate is a short acting, nonbarbiturate hypnotic, with no analgesic effects and, because it does not cause histamine release, few cardiovascular or respiratory effects. It facilitates GABAergic neurotransmission by increasing the number of available GABA receptors, displacing endogenous inhibitors of GABA binding. Clinical responses include hypnosis, elevations in arterial carbon dioxide tension, reduced cortisol plasma levels and a transient decrease in cerebral blood flow.

**Indications**

- To induce sedation for emergent endotracheal intubation.

**Contraindications**

- Hypersensitivity.

**Side Effects**

- CNS: myoclonic and tonic skeletal muscle movements.
- CV: hypertension, hypotension, tachycardia, bradycardia, and arrhythmias.
- GI: nausea and vomiting.
- RESP: apnea, hyperventilation, hypoventilation, hiccups, snoring and laryngospasm.

**Precautions / Interactions**

- Potentiates the effects of CNS depressants such as alcohol, antidepressants, H<sub>1</sub> blockers, opiate agonists, muscle relaxants, phenothiazines, barbiturates and benzodiazepines.
- Concurrent use with antihypertensive agent can result in hypotension, especially calcium-channel blockers, diazoxide and mecamylamine.
- Concurrent use with verapamil may cause prolonged respiratory depression and apnea
- Use with caution in the elderly and patients with hepatic disease.
- Use with caution in patients with marked hypotension, severe asthma or severe cardiovascular disease.
- It has no analgesic properties and should be administered with an analgesic for any painful

# APPENDIX - 4.1

## PHARMACUTICALS

### Drug Formulary

procedures.

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**FUROSEMIDE****Other Names**

*Lasix*

**Class**

Diuretic

**Pharmacological Effects**

Furosemide inhibits sodium and chloride reabsorption in the kidneys, which promotes the excretion of sodium, chloride, water and potassium. It produces peripheral venodilation, reducing cardiac preload.

**Indications**

- Congestive heart failure.
- Pulmonary edema.
- Hypertension.

**Contraindications**

- Anuria.
- Hypersensitivity (patients with sulfa allergy may be sensitive to this medication).
- Hypotension.
- Dehydration and significant electrolyte imbalance.

**Side Effects**

- CV: volume depletion, dehydration, orthostatic hypotension and ECG changes.
- EENT: transient deafness with too rapid IV injection.
- GI: abdominal discomfort and pain.
- METABOLIC: hypokalemia, hypochloremic alkalosis, asymptomatic hyperuricemia, fluid and electrolyte imbalances including dilutional hyponatremia, hypocalcemia, hypomagnesemia, hyperglycemia and impairment of glucose tolerance.

**Precautions / Interactions**

- Should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.
- Potentiates other antihypertensive drugs.
- Hypotension and circulatory collapse may occur following rapid diuresis and subsequent hypovolemia.
- Incompatible with other medications; do not mix with other agents.
- Store the drug out of direct light.

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## PHARMACUTICALS

### Drug Formulary

#### GLUCAGON

**Other Names**

**Class** Hormone (antihypoglycemic)

**Pharmacological Effects** Glucagon is a hormone secreted from the alpha cells of the pancreas, which enhances the conversion of liver glycogen stores to glucose and inhibits the synthesis of glycogen from glucose. It is only effective if there is liver glycogen available for conversion. Glucagon increases cardiac contractility and heart rate.

**Indications**

- Acute hypoglycemia.
- Beta-blocker overdose.

**Contraindications** • Hypersensitivity.

**Side Effects**

- CNS: lightheadedness and dizziness.
- CV: hypotension, ventricular ectopy and tachycardia.
- GI: nausea and vomiting.
- SKIN: Stevens-Johnson syndrome (rare).
- OTHER: allergic and anaphylactic reactions.

**Precautions / Interactions**

- Draw blood glucose before administration.
- Use caution if patient has a pheochromocytoma (it releases catecholamines).
- Not effective if patient does not have adequate glycogen stores in the liver (i.e. starvation, juveniles or unstable diabetics) when used to treat hypoglycemia.
- Use with caution in patients with a history of cardiovascular or renal disease.

#### IPRATROPIUM

**Other Names** *Atrovent*

**Class** Parasympatholytic bronchodilator

**Pharmacological Effects** Chemically similar to atropine, ipratropium causes cholinergic inhibition in bronchial smooth muscle, by blocking acetylcholine receptors, resulting in relaxation and dilation. It has little or no systemic anticholinergic effects. Ipratropium also dries respiratory secretions.

**Indications**

- Asthma.
- Reversible bronchospasm due to COPD.

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## PHARMACUTICALS

### Drug Formulary

- Contraindications**
- Hypersensitivity to ipratropium, atropine, belladonna alkaloids, bromide, or fluorocarbons.
  - Acute treatment of bronchospasm.
- Side Effects**
- CNS: nervousness, insomnia, fatigue, dizziness and headache.
  - EENT: blurred vision, dry mouth, hoarseness and sore throat.
  - RESP: cough and bronchospasm.
  - CV: arrhythmias, angina, palpitations and hypertension.
  - GI: nausea and vomiting.
- Precautions / Interactions**
- Use with extreme caution in patients with cardiovascular disorders, especially coronary insufficiency, dysrhythmias and hypertension.
  - Use with caution in elderly patients

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#### LABETALOL

**Other Names** *Normodyne, Trandate*

**Class** Antihypertensive

**Pharmacological Effects** Labetolol selectively blocks alpha<sub>1</sub> receptors and nonselectively blocks beta-receptors. The alpha blocking actions lead to general vasodilation and reduced peripheral vascular resistance. The beta<sub>1</sub> blocking actions on the SA node, AV node and ventricular tissue cause negative chronotropic, dromotropic and inotropic effects. The beta<sub>2</sub> blocking actions cause bronchoconstriction. The net cardiovascular effects are a decrease in blood pressure without reflex tachycardia or significant reduction in heart rate.

**Indications**

- Hypertensive emergency

**Contraindications**

- Asthma and COPD.
- Bradycardia.
- Hypotension.
- CHF or cardiogenic shock.
- Heart block greater than first degree.

**Side Effects**

- CNS: dizziness, headache and fatigue.

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## PHARMACUTICALS

### Drug Formulary

- CV: postural hypotension, angina, bradycardia and CHF.
  - GI: nausea and vomiting.
  - RESP: wheezing, dyspnea, increased airway resistance and bronchospasm.
- Precautions / Interactions**
- Monitor vital signs, ECG and lung sounds continuously. Be alert for signs of CHF, heart block, bradycardia, postural hypotension or bronchospasm.
  - Should not be administered to patients who have received IV verapamil.
  - Use with caution in patients taking antihypertensive agents.

<b>LIDOCAINE</b>	<b>Other Names</b>	<i>Xylocaine</i>
	<b>Class</b>	Antiarrhythmic
	<b>Pharmacological Effects</b>	Lidocaine binds (blocks) sodium channels, shortening phase-4 repolarization. It decreases the duration of the action potential, depressing automaticity of ventricular pacemaker cells and elevating the ventricular fibrillation threshold. Lidocaine reduces non-uniformity of repolarization in the purkinje fibers and alters conduction velocity in these fibers to abolish re-entrant ventricular dysrhythmias and unidirectional ventricular tachycardia. Lidocaine is also an amide-type local anesthetic.
	<b>Indications</b>	<ul style="list-style-type: none"> <li>• Malignant premature ventricular ectopy (in underlying non-bradycardic supraventricular rhythms.)</li> <li>• Ventricular fibrillation.</li> <li>• Ventricular tachycardia.</li> <li>• Wide-complex tachycardia of uncertain etiology.</li> <li>• Post resuscitation management, depending upon etiology and presentation.</li> </ul>
	<b>Contraindications</b>	<ul style="list-style-type: none"> <li>• Hypersensitivity (NOT chemically related to Novocain).</li> <li>• Stokes - Adams syndrome (transient heart block with syncope).</li> <li>• Wolff-Parkinson-White syndrome (may block aberrant pathway).</li> </ul>

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## PHARMACUTICALS

### Drug Formulary

- Second or third degree heart blocks.
- Bradycardia.
- Torsades de Pointes.
- 

#### Side Effects

- CNS: tremors, lethargy, restlessness, slurred speech, nervousness, euphoria, depression, light-headedness, paresthesias, muscle twitching and seizures.
- CV: myocardial depression, hypotension and bradycardia.
- EENT: tinnitus and blurred vision.
- OTHER: anaphylaxis, edema, pain at injection site, sensations of cold and diaphoresis.

#### Precautions / Interactions

- Use with caution in patients with liver disease, CHF, low cardiac output states or diseased sinus node.
- Be alert for signs of CNS toxicity.
- Use with caution when administered with procainamide and beta-blockers as drug toxicity may result.

### LORAZEPAM

#### Other Names

*Ativan*

#### Class

Sedative-hypnotic (benzodiazepine); anticonvulsant

#### Pharmacological Effects

A CNS depressant, lorazepam depresses the limbic system (emotional intensity) and ascending RAS (level of alertness) thereby alleviating anxiety and inducing amnesia. It suppresses the spread of seizure activity in the epileptogenic foci in the cortex, thalamus and limbic structures by enhancing presynaptic inhibition. Relaxation of the skeletal muscles is believed to be caused by inhibiting polysynaptic afferent pathways. Lorazepam has no autonomic actions and does not inhibit conditioned reflexes.

#### Indications

- Sustained and/or recurrent grand-mal seizures.
- Sedation prior to cardioversion.
- Sedation for acute stress anxiety reactions.

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## PHARMACUTICALS

### Drug Formulary

- Isolated musculoskeletal injuries.

#### Contraindications

- Hypersensitivity to the drug.
- Respiratory depression.
- Acute narrow angle glaucoma.

#### Side Effects

- CNS: anterograde amnesia, drowsiness, lethargy, ataxia, depression, dizziness, syncope, headache, euphoria, fainting, slurred speech, tremor, confusion and vertigo.
- CV: hypotension, dysrhythmias, bradycardia and cardiovascular collapse.
- EENT: photophobia and blurred vision.
- GI: nausea and vomiting.
- RESP: respiratory depression and possible apnea.
- SKIN: pain and phlebitis at injection site.

#### Precautions / Interactions

- Administer only in Normal Saline IV. Benzodiazepines are incompatible with any other medication or solution. Mixing with other substances will cause precipitation.
- Has a cumulative and potentiating effect with alcohol, other sedative drugs and antidepressants.
- Respiratory depression is generally caused by rapid IV administration. The rate of injection should not exceed 2 mg/min.
- Irritating to the vein and tissue, which may cause pain during administration.
- Doses should be reduced by 50% for elderly patients.
- Use with caution for shock states, during pregnancy, head injury patients and comatose patients.

### MAGNESIUM SULFATE

#### *Other Names*

#### Class

Electrolyte

#### Pharmacological Effects

Magnesium sulfate acts at the myoneural junction to prevent the presynaptic release of acetylcholine, which decreases the motor endplate potential. It depresses the CNS and suppresses the spread of seizure activity

## **PHARMACUTICALS**

### **Drug Formulary**

in the cerebral cortex. As an antiarrhythmic, magnesium sulfate performs as a "physiological" calcium-channel blocker, producing negative chronotropic and dromotropic effects and increasing the ventricular fibrillation threshold. It also causes peripheral vasodilation.

#### **Indications**

- Torsades de Pointes.
- Refractory ventricular fibrillation.
- Refractory pulseless ventricular tachycardia.
- Eclamptic seizures (toxemia of pregnancy).
- Severe Bronchospasm.

#### **Contraindications**

- Heart block.
- Shock.
- Respiratory depression.
- Eclamptic patients two (2) hours preceding an induced delivery.
- Renal failure (dialysis patients).
- Known hypocalcemia.

#### **Side Effects**

- CNS: sweating, drowsiness, depressed reflexes, flaccid paralysis and hypothermia.
- CV: hypotension, flushing, circulatory collapse, depressed cardiac function, bradycardia and heart block.
- METABOLIC: hypocalcemia.
- RESP: respiratory depression or paralysis.
- OTHER: pain at injection site.

#### **Precautions / Interactions**

- Hypermagnesemia causes a prolonged P-R interval, QRS and Q-T interval.
- Administration rate should be slowed or discontinued if respirations fall below 12/minute or no patellar reflexes are observed.
- Can cause cardiac conduction abnormalities if administered in patients taking digitalis.
- Calcium chloride should be available as an antidote for significant adverse reactions.

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## PHARMACUTICALS

### Drug Formulary

#### MARK I KIT

##### *Other Names*

##### **Content**

- Auto-injectable Atropine Sulfate 2 mg equivalences in 0.7 ml.
- Auto-injectable Pralidoxime Chloride (2-PAM C1) 600 mg in 2 ml.

##### **Class**

- ATROPINE – Parasympatholytic.
- PRALIDOXIME – Cholinesterase reactivator.

##### **Pharmacological Effects**

- ATROPINE - see formulary.
- PRALIDOXIME – Attaches to the nerve agent that is inhibiting the cholinesterase and breaks the agent-enzyme bond to restore the normal activity of the enzyme. This is noticeable in organs with sympathetic receptors, like skeletal muscle. The effects are not apparent for systems with parasympathetic receptors, and will not cause a decrease in secretions.

##### **Indications**

- Known history of a nerve agent or cholinergic poisoning with severe presenting signs and symptoms (i.e. salivation, lacrimation, rhinorrhea, urination, defecation, vomiting, cardiac dysrhythmias, respiratory depression, seizures, paralysis).

##### **Contraindications**

- None in the case of severe nerve agent or cholinergic poisoning.

##### **Side Effects**

- ATROPINE – see formulary.
- PRALIDOXIME – CNS: excitement, manic behavior

##### **Precautions / Interactions**

- ATROPINE – see formulary.
- PRALIDOXIME - Laryngospasm, tachycardia and muscle rigidity have occurred following rapid administration. Should only be administered following atropine.
- Benzodiazepine should be made available for treatment of post-exposure seizures.
- Always assure safety and protection of rescue personnel.

#### METHYLPREDNISOLONE *Other Names*

*Solu-Medrol*

##### **Class**

Glucocorticosteroid (synthetic)

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## PHARMACUTICALS

### Drug Formulary

<b>Pharmacological Effects</b>	As a synthetic steroid, methylprednisolone acts as a potent anti-inflammatory agent and will suppress immune responses. It may stabilize cell membranes by decreasing permeability and prevent the release of histamine, bradykinin, and myocardial depressant factor and prevent excess lactic acid accumulation. Methylprednisolone increases the blood pressure by increased sodium and water reabsorption.
<b>Indications</b>	<ul style="list-style-type: none"><li>• Severe asthma or COPD.</li><li>• Anaphylaxis.</li><li>• Acute spinal cord injury</li></ul>
<b>Contraindications</b>	<ul style="list-style-type: none"><li>• None for short-term pre-hospital use</li></ul>
<b>Side Effects</b>	<ul style="list-style-type: none"><li>• CNS: euphoria, headache, psychotic behavior, restlessness and nervousness.</li><li>• CV: hypertension, congestive heart failure and edema.</li><li>• GI: bleeding, irritation and nausea.</li><li>• METABOLIC: hypokalemia, fluid retention and hyperglycemia.</li></ul>
<b>Precautions / Interactions</b>	<ul style="list-style-type: none"><li>• Administer with caution in diabetes mellitus.</li><li>• Incompatible with any other drug. Must be administered in .9% Normal Saline, flushing IV line well before and after administration</li></ul>

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## MIDAZOLAM

<b>Other Names</b>	<i>Versed</i>
<b>Class</b>	Sedative-hypnotic (benzodiazepine); anticonvulsant
<b>Pharmacological Effects</b>	A CNS depressant, midazolam depresses the limbic system (emotional intensity) and ascending RAS (level of alertness) thereby alleviating anxiety and inducing amnesia. It suppresses the spread of seizure activity in the epileptogenic foci in the cortex, thalamus and limbic structures by enhancing presynaptic inhibition. Relaxation of the skeletal muscles is believed to be caused by inhibiting polysynaptic afferent pathways. Midazolam has no autonomic actions and does not inhibit conditioned reflexes.
<b>Indications</b>	<ul style="list-style-type: none"><li>• Sustained and/or recurrent grand-mal seizures.</li><li>• Sedation prior to cardioversion.</li></ul>

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## PHARMACUTICALS

### Drug Formulary

- Sedation for acute stress anxiety reactions.
- Sedation for emergent intubation situations.

- Contraindications**
- Hypersensitivity.
  - Respiratory depression.
  - Acute narrow angle glaucoma.

- Side Effects**
- CNS: amnesia, tonic-clonic activity, lethargy, ataxia, depression, dizziness, syncope, headache, euphoria, fainting, slurred speech and yawning.
  - CV: tachycardia and hypotension.
  - EENT: photophobia, miosis, blurred vision, nystagmus and "blocked" ears.
  - GI: nausea, vomiting, depressed gag reflex, acid taste and hiccups.
  - RESP: bronchospasm, respiratory depression or arrest.
  - OTHER: chills and fluctuations in vital signs.

- Precautions / Interactions**
- This agent is 3 - 4 times as potent as diazepam on a milligram-to-milligram basis. It has a more rapid onset and shorter half-life than Valium.
  - Has a cumulative and potentiating effect with alcohol, other sedative drugs and antidepressants.
  - Respiratory depression is more common than in other benzodiazepines. The rate of injection should not exceed 2 mg/min.
  - Irritating to the vein and tissue, which may cause pain during administration.
  - Doses should be reduced by 50% for elderly patients.
  - Use with caution for shock states, during pregnancy, head injury patients and comatose patients.

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#### MORPHINE SULFATE *Other Names*

**Class** Analgesic (narcotic)

**Pharmacological Effects** Morphine has a combination of actions in the CNS. It depresses respiratory, cough and vasomotor center in the medulla. Respiratory bronchioles are constricted, but morphine has no effect on pulmonary vascular

## **PHARMACUTICALS**

### **Drug Formulary**

resistance. Pain and anxiety are relieved by central effect, which raises the pain threshold, and produces euphoria and sedation. Morphine stimulates the vomiting center in the medulla and the parasympathetic nervous system. This results in decreased peripheral resistance, increased venous capacitance, venous pooling and venous return to the heart, potentially causing a decrease in heart rate and myocardial oxygen consumption.

**Indications**

- Pain and anxiety associated with an AMI
- Burns and isolated traumatic injuries.
- CHF and acute pulmonary edema.

**Contraindications**

- Hypersensitivity.
- Respiratory depression, acute bronchial asthma or upper airway obstruction.
- Multi-systems trauma.
- Head injury.
- Acute abdomen.
- Hypotension.

**Side Effects**

- CNS: sedation, confusion, headache, euphoria and seizures with large doses.
- CV: tachycardia, asystole, hypertension, syncope, edema, hypotension and bradycardia.
- EENT: miosis.
- GI: nausea, vomiting and dry mouth.
- RESP: respiratory depression.
- SKIN: flushing, rashes and pruritus.

**Precautions /  
Interactions**

- Closely monitor level of consciousness and airway patency.
- Use with extreme caution for patients with COPD and cor pulmonale.
- Correct volume depletion or hypotension before administering this agent.
- Use cautiously in elderly patients.
- Use cautiously in the presence of bradycardia and heart blocks.

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## PHARMACUTICALS

### Drug Formulary

- Use with caution in pregnancy.

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#### NALOXONE

**Other Names**

*Narcan*

**Class**

Narcotic antagonist

**Pharmacological Effects**

Naloxone is a competitive antagonist for certain opiate receptor sites, reversing the effects of narcotics (or opiate-like medications). It has a greater affinity for some receptors than others, which may explain the reversal of respiratory depression, sedation and hypotension without changing analgesic effects. Naloxone can precipitate withdrawal symptoms in patients dependent on narcotics.

**Indications**

- Reverse effects of narcotic overdose or undesirable side effects of narcotics.
- To rule out narcotics in coma of unknown origin.

**Contraindications**

- Hypersensitivity.

**Side Effects**

- GI: (With higher than recommended doses) nausea and vomiting.
- Narcotic dependent patients: nausea, vomiting, sweating, tachycardia, increased BP and tremors.

**Precautions / Interactions**

- Be prepared to manage combative patients in withdrawal. If violence is anticipated after the total reversal of an opiate overdose, and current ventilatory status is found to be adequate, smaller increments may be considered.
- Since most narcotics have longer durations of action, repeated doses may be required.

---

#### NITROGLYCERIN

**Other Names**

*2% Ointment, Nitrostat, Nitro-Bid, Nitrolingual Spray*

**Class**

Nitrate

**Pharmacological Effects**

Nitroglycerin relaxes smooth muscle, resulting in dilation of both arterial and venous beds. The dilation of the post-capillary vessels, including large veins, promotes peripheral pooling of blood and decreases venous return to the heart, which reduces left ventricular and diastolic pressure, possibly minimizing infarction size by reducing preload. Myocardial oxygen consumption or demand is also decreased. The direct dilation of the large coronary arteries antagonizes

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## PHARMACUTICALS

### Drug Formulary

vasospasm and increases blood flow to ischemic myocardium. Nitroglycerin causes reduction in systolic, diastolic and mean arterial blood pressure.

**Indications**

- Chest pain (secondary to angina and AMI).
- CHF and acute pulmonary edema.
- Hypertensive crisis.

**Contraindications**

- Hypotension.
- Increased intracranial pressure, head trauma or cerebral hemorrhage.
- Hypersensitivity.

**Side Effects**

- CNS: headache, dizziness and weakness.
- CV: hypotension, tachycardia, palpitations and syncope.
- EENT: blurred vision.
- GI: sublingual burning, nausea and vomiting.
- SKIN: flushing.

**Precautions / Interactions**

- Protect from direct light, temperature changes and exposure to air.
- Discontinue the drug if blurred vision or drying of mouth occurs.
- Hypotensive effects can be potentiated in patients who have ingested alcohol.
- Use cautiously in patients receiving antihypertensive drugs, beta-blockers, phenothiazines or nitrates.
- Use with caution during pregnancy.
- Use with extreme caution, if at all, when the patient has ingested sildenafil citrate (Viagra), due to extreme vasodilation caused by the cGMP phosphodiesterase inhibition.

<b>NORMAL SALINE</b>	<b>Other Names</b>	<i>0.9% Sodium Chloride</i>
	<b>Class</b>	Isotonic crystalloid salt solution
	<b>Pharmacological Effects</b>	An isotonic IV fluid, normal saline expands circulating volume by approximating sodium content of the blood.
	<b>Indications</b>	• Trauma and burns.

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## PHARMACUTICALS

### Drug Formulary

- Hypovolemia.
- Hypotension.
- Heat related emergencies.
- IV medication administration.
- Dilution of medications.
- Irrigation solution for eyes and wounds.

**Contraindications** • Congestive heart failure.

**Side Effects** • CV: hypertension, fluid overload and congestive heart failure.

• Metabolic: electrolyte imbalance and hyperchloremic acidosis.

**Precautions / Interactions** • Auscultate breath sounds frequently for rales.

• In patients where sodium losses exceed chloride losses, it can cause hyperchloremia.

## OXYTOCIN

**Other Names** *Pitocin*

**Class** Hormone (oxytocic)

**Pharmacological Effects** Oxytocin exerts a selective action on uterine smooth muscle by increasing the sodium permeability of uterine myofibrils. It stimulates rhythmic contractions of the uterus, increasing the frequency of contractions and raising the tone of the uterine musculature. Oxytocin constricts uterine blood vessels, controlling post-partum hemorrhage. It also causes lactation stimulation by contracting the myoepithelial cells surrounding the alveoli of the breasts which forces milk into the larger ducts and facilitates milk ejection.

**Indications** • Post-partum hemorrhage.

**Contraindications** • Hypersensitivity.

• Non or only partial delivery of the placenta.

**Side Effects** • CNS: subarachnoid hemorrhage (from hypertension) and coma or seizures (from water intoxication).

• CV: hypertension, hypotension, dysrhythmias and tachycardia.

• GI: nausea and vomiting.

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## PHARMACUTICALS

### Drug Formulary

- Precautions / Interactions**
- OTHER: increased water reabsorption (ADH effect).
  - Should not be administered in the field prior to delivery of the placenta (due to possibility of undiagnosed twin). Remember that there is also the possibility of twins with separate placentas.
  - Fundal massage must be tried before using this agent.
  - Do not use the medication if the contents of the vial are discolored or cloudy.
  - Can cause hypertension when administered with other vasoconstrictors.

#### PHENYLEPHRINE

- |                                   |   |
|-----------------------------------|---|
| <b>Other Names</b>                | <i>Neo-Synephrine</i>   |
| <b>Class</b>                      | Vasoconstrictor (topical)   |
| <b>Pharmacological Effects</b>    | Phenylephrine stimulates alpha-adrenergic receptors of the nasal mucosa, causing vasoconstriction of the local vessels. This vasoconstrictive action decreases mucosal edema and the risk of nasal bleeding.  |
| <b>Indications</b>                | <ul style="list-style-type: none"> <li>• Facilitation of nasotracheal intubation.</li> </ul>  |
| <b>Contraindications</b>          | <ul style="list-style-type: none"> <li>• Hypersensitivity.</li> <li>• Severe hypertension.</li> <li>• Ventricular tachycardia.</li> </ul>   |
| <b>Side Effects</b>               | <ul style="list-style-type: none"> <li>• CV: hypertension, palpitations, arrhythmias and reflex bradycardia.</li> <li>• CNS: headache, excitability, restlessness and tremors.</li> <li>• EENT: miosis and blurred vision.</li> </ul>   |
| <b>Precautions / Interactions</b> | <ul style="list-style-type: none"> <li>• Air or strong light causes potency loss. Do not use solution if it is brown in color or a precipitate has formed in the bottle.</li> <li>• Use with extreme caution in geriatric patients, bradycardia and partial heart blocks.</li> <li>• Atropine blocks the vagal reflex bradycardia and increases the pressor effect.</li> <li>• Use with diuretics can cause decreased arterial responsiveness to vasopressor agents.</li> </ul> |

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## PHARMACUTICALS

### Drug Formulary

- Can cause severe persistent hypertension if administered with Oxytocin.

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#### PROCAINAMIDE

**Other Names**

*Pronestyl*

**Class**

Antiarrhythmic

**Pharmacological Effects**

Procainamide binds (blocks) sodium channel, slowing phase-0 depolarization. It increases the effective refractory period of the atria, and to a lesser extent the bundle of His-Purkinje system and the ventricles. Myocardial excitability and automaticity is reduced, especially in ectopic sites, possibly elevating the fibrillation threshold. Procainamide causes peripheral vasodilation and slight negative inotropic effects, particularly in damaged myocardial tissue.

**Indications**

- Premature ventricular complexes refractory to lidocaine.
- Ventricular tachycardia and fibrillation after lidocaine administration.
- Perfusing ventricular tachycardia refractory to lidocaine.
- Wide complex tachycardia with uncertain etiology.

**Contraindications**

- High degree heart blocks.
- Torsades de Pointes.
- Ventricular escape rhythms.
- Prolonged Q-T interval.
- Hypersensitivity.

**Side Effects**

- CNS: hallucinations, dizziness, confusion, convulsion and depression.
- CV: severe hypotension, bradycardia, AV block and ventricular fibrillation.
- GI: nausea, vomiting, and diarrhea.
- OTHER: fever and myalgia.

**Precautions / Interactions**

- Rapid administration may result in hypotension.
- Administer cautiously for patients suspected of experiencing an AMI.
- Monitor EKG for QRS widening, prolongation of the

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## PHARMACUTICALS

### Drug Formulary

P-R interval or any signs of heart block.

- Chance of neurologic toxicity can be increased by both lidocaine and procainamide when administered together.

#### SODIUM BICARBONATE

**Other Names**

*Bicarb*

**Class**

Electrolyte (alkalinizing)

**Pharmacological  
Effects**

Sodium bicarbonate reacts with hydrogen ions to form water and carbon dioxide to buffer metabolic acidosis. It shifts the oxyhemoglobin saturation curve to the left, inhibiting the release of oxygen, and inducing hyperosmolarity and hypernatremia. Sodium bicarbonate produces paradoxical acidosis due to the production of carbon dioxide, which is freely diffusible into myocardial and cerebral cells.

**Indications**

- Severe metabolic acidosis.
- Cardiac arrest refractory to defibrillation, effective CPR, airway management and hyperventilation with 100% oxygen, and the use of other ACLS medications.
- Tricyclic antidepressant overdose.
- Hyperkalemia.

**Contraindications**

- None when used for indicated life-threatening emergencies.

**Side Effects**

- CNS: altered level of consciousness.
- CV: fluid retention and worsening congestive heart failure.
- GI: gastric distention, belching and flatulence.
- METABOLIC (especially with overdose): alkalosis, hypernatremia, hyperkalemia and hyperosmolarity.

**Precautions /  
Interactions**

- Monitor cardiac and pulmonary status.
- Flush IV line and vein before and after administering.
- Do not mix with catecholamines and vasopressors (i.e. epinephrine or dopamine), as these medications are deactivated in alkaline solutions.
- Forms a precipitate in the presence of calcium chloride.

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## PHARMACUTICALS

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- Use cautiously in renal failure.

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**SUCCINYLBCHOLINE****Other Names***Anectine***Class**

Neuromuscular blocker (depolarizing)

**Pharmacological Effects**

Succinylcholine is a depolarizing skeletal muscle relaxant. It combines with the cholinergic receptors (same as acetylcholine) of the motor end plate to produce depolarization. This depolarization may be observed as fasciculations. Subsequent neuromuscular transmission is inhibited so long as concentrations of succinylcholine remain at the receptor site. The paralysis following administration is selective, initially involving consecutively the levator muscles of the face, muscles of the glottis, and finally the intercostals, diaphragm and all other muscles.

**Indications**

- To facilitate emergent endotracheal intubation.

**Contraindications**

- Hypersensitivity.
- Penetrating eye injuries.
- Patients at risk for hyperkalemia (e.g. patients  $\geq 7$  days post burn, severe renal failure).

**Side Effects**

- CV: cardiac arrest, dysrhythmias, bradycardia, tachycardia, hypertension and hypotension.
- GI: increased intragastric pressure.
- HEMA: hyperkalemia and myoglobinemia.
- RESP: respiratory depression and apnea.
- SKIN: rash and flushing.
- OTHER: hyperthermia, increased intraocular pressure, renal failure and excessive salivation.

**Precautions / Interactions**

- Patient completely paralyzed and in respiratory arrest for 2 - 7 minutes following administration, complete airway control and management will be necessary. All necessary intubation equipment, oxygen and resuscitation medications must be readily available prior to administration.
- Causes a slight, transient increase in intraocular pressure.
- No effect on consciousness, cerebation or pain threshold. Consider administering an analgesic or

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sedative prior to administration.

- May increase intragastric pressure, which could result in vomiting.
- Use with many disease states or medications can cause prolonged apnea.
- Use with caution in patients with severe burns and crush injuries.
- Effects are potentiated if used concurrently with Lidocaine, Procainamide, beta-blockers, magnesium sulfate and other neuromuscular blockers.

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#### TERBUTALINE

**Other Names** *Brethine, Bricanyl*

**Class** Sympathomimetic (synthetic)

**Pharmacological Effects** Terbutaline is beta<sub>2</sub> selective, acting directly on beta<sub>2</sub> receptors to relax bronchial smooth muscle, relieving bronchospasm and reducing airway resistance. It also relaxes uterine smooth muscle, which inhibits uterine contractions.

**Indications**

- Bronchial asthma.
- Reversible bronchospasm associated with COPD.
- Preterm labor.

**Contraindications** • Hypersensitivity.

**Side Effects**

- CNS: tremors, dizziness, headache, anxiety, restlessness, vertigo, and drowsiness.
- CV: tachycardia, palpitations, dysrhythmias, hypotension and angina.
- GI: nausea and vomiting.
- RESP: bronchoconstriction, dyspnea, wheezing and drying of oropharynx.
- OTHER: sweating, tinnitus, and unusual taste.

**Precautions / Interactions**

- Use caution when administering to elderly patients and those with cardiovascular disease or hypertension.
- Chance of side effects increases if the patient is already taking other sympathomimetic agents.
- Beta blockers may decrease the efficacy of this medication.

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- Not recommended for children under 12 years of age.

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**TETRACAINE  
HYDROCHLORIDE ½%****Other Names****Class** Ophthalmic anesthetic**Pharmacological Effects** Tetracaine is an ester-type local anesthetic that causes a reversible blockade of the 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 prior to eye irrigation.

**Contraindications**

- Hypersensitivity to ester-type anesthetics.

**Side Effects**

- CNS: dizziness, drowsiness, twitching, tremors, nervousness, restlessness, lethargy and weakness.
- CV: dysrhythmias.
- EENT: burning, stinging and redness of the eye.
- GI: nausea and vomiting.
- RESP: dyspnea and bronchoconstriction.
- OTHER: increased perspiration.

**Precautions / Interactions**

- Do not rub or wipe the eye until the anesthetic has worn off to prevent accidental injury or damage to the eye.
- Vagal effects and respiratory depression induced by opiate agonists may be increased.
- Concurrent use with rapid onset vasodilators (i.e. nitrates) may result in hypotension.
- May enhance the effects of CNS depressants.

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**VASOPRESSIN****Other Names** *Pitressin***Class** Hormone (antidiuretic)**Pharmacological Effects** Vasopressin is a polypeptide hormone, which, depending on the concentration, acts on the V<sub>1</sub> and V<sub>2</sub> receptors. Vasopressin possesses pressor and antidiuretic properties. It causes vasoconstriction of

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the splanchnic and portal vessels, and to a lesser extent the peripheral, cerebral, pulmonary and coronary vessels. Small doses may cause anginal pain, while larger doses may precipitate AMI, decrease heart rate and cardiac output, and increase pulmonary arterial pressure and BP. In extremely high doses, vasopressin acts as a non-adrenergic vasoconstrictor by direct stimulation of smooth muscle receptors. It produces concentrated urine by increasing tubular reabsorption and preserving up to 90% of available water. While vasopressin may increase sodium and decrease potassium reabsorption, it plays no causative role in edema formation.

- Indications**
- To increase peripheral vascular resistance in refractory VF (class IIb agent).
- Contraindications**
- Vascular disease (especially coronary arteries).
  - Angina pectoris.
  - Chronic nephritis.
  - Ischemic heart disease.
- Side Effects**
- CNS: vertigo, tremor, convulsions, drowsiness, headache and coma.
  - CV: hypertension, bradycardia, arrhythmias, PVCs, heart block, peripheral vascular collapse, coronary insufficiency and AMI.
  - GI: increased intestinal activity, nausea and vomiting.
  - RESP: bronchoconstriction and anaphylaxis.
  - SKIN: pallor and sweating.
- Precautions / Interactions**
- Increased peripheral vascular resistance may provoke cardiac ischemia and angina. Administration is not recommended for responsive patients with coronary artery disease.
  - Response may be decreased by high doses of epinephrine, heparin and ethanol.
  - Vasopressor effects may be increased in the presence of guanethidine and neostigmine.
  - Antidiuretic activity may be increased in patients taking chlorpropamide, clofibrate, carbamazepine and thiazide diuretics.

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#### VECURONIUM

<b>Other Names</b>	<i>Norcuron</i>
<b>Class</b>	Neuromuscular blocker (non-depolarizing)
<b>Pharmacological Effects</b>	Vecuronium is an intermediate acting, non-depolarizing skeletal muscle relaxant. It acts by competing for cholinergic receptors that prevent acetylcholine from binding to the receptors on the muscle end plate, thus blocking depolarization. Vecuronium creates negligible histamine release and has only minimal direct effect on the cardiovascular system.
<b>Indications</b>	<ul style="list-style-type: none"><li>• To facilitate emergent endotracheal intubation.</li></ul>
<b>Contraindications</b>	<ul style="list-style-type: none"><li>• Hypersensitivity.</li></ul>
<b>Side Effects</b>	<ul style="list-style-type: none"><li>• CV: transient increase in heart rate.</li><li>• RESP: respiratory depression and apnea.</li><li>• SKIN: redness and itching at IV site.</li></ul>
<b>Precautions / Interactions</b>	<ul style="list-style-type: none"><li>• Patient completely paralyzed and in respiratory arrest for 20 - 30 minutes following administration, complete airway control and management will be necessary. All necessary intubation equipment, oxygen and resuscitation medications must be readily available prior to administration.</li><li>• The agent has no effect on consciousness, cerebration or pain threshold. Consider administering an analgesic or sedative prior to using this agent.</li><li>• Many disease states or medications can cause this agent to produce prolonged apnea.</li><li>• Use with caution in patients with altered circulation time from cardiovascular disease, old age, edematous states, hepatic disease, severe obesity, bronchogenic carcinoma, and myasthenia gravis.</li><li>• Neuromuscular blocking effects may be enhanced by prior administration of succinylcholine.</li></ul>

#### VERAPAMIL

<b>Other Names</b>	<i>Isoptin, Calan</i>
<b>Class</b>	Antiarrhythmic (calcium channel blocker)
<b>Pharmacological Effects</b>	Verapamil binds (blocks) only to open calcium channels, especially the voltage-sensitive channels, preventing repolarization until the drug dissociates

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from the channel. It decreases the discharge rate of the SA node, decreases AV nodal conduction (while increasing AV nodal refractory period), and decreases activity in spontaneously active fibers by reducing the slope of phase 4 of the action potential. Verapamil produces vasodilation in most peripheral vascular beds, reducing afterload. It decreases myocardial contractility by inhibiting calcium ion influx through the slow channels at conductile and contractile myocardial cells.

**Indications**

- Stable uncontrolled atrial flutter or fibrillation.
- Stable narrow complex PSVT refractory to adenosine.

**Contraindications**

- Concomitant IV beta-blocker administration.
- Shock or hypotensive states.
- Second or third degree heart block.
- Sick sinus syndrome, unless functioning ventricular pacemaker is in place.
- Wolff-Parkinson-White syndrome.
- Severe heart failure.
- Ventricular tachycardia (any wide complex tachycardia until proven not to be ventricular tachycardia).
- Hypersensitivity.

**Side Effects**

- CNS: dizziness, headache and fatigue.
- CV: transient hypotension, heart failure, bradycardia, AV block, ventricular asystole and peripheral edema.
- GI: nausea and vomiting.

**Precautions /  
Interactions**

- Monitor for AV block or bradycardia.
- Avoid using for patients taking intravenous beta-blockers due to an increased risk of CHF, bradycardia, and heart block.
- Increases toxicity of digoxin, carbamazepine, cyclosporine and lithium.
- Can cause transient hypotension due to peripheral vasodilation and potentiates the effects of other antihypertensive agents.
- Should be used during pregnancy only if the

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potential benefit justifies the potential risk to the fetus.

- Avoid in nursing mothers.