# Medication Formulary

Does not include Haz-Mat Protocol medications

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<td>5% Dextrose/Water</td>
<td>44</td>
</tr>
</tbody>
</table>

**Appendix D**

Revised: 6/8/16
Effective: 6/8/16
ADENOSINE  (Adenocard)

**Class**
Antiarrhythmic

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

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

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

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

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

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

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

**Dose / Route**
- Adult: 6 mg rapid IV/IO push - (20 ml flush), / 12mg IV/IO push - (20 ml flush) - second dose
- Pedi: 0.1 mg/kg, rapid IV/IO (6 mg max), / 0.2 mg/kg, IV/IO (12 mg max) - second dose

**Protocols**
- Adult - III.R
- Pedi - P10
### ALBUTEROL (Proventil)

<table>
<thead>
<tr>
<th>Class</th>
<th>Sympathetic Agonist</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Albuterol is a sympathomimetic that is selective for Beta-2 adrenergic receptors.</td>
</tr>
<tr>
<td><strong>Mechanism of Action</strong></td>
<td>Albuterol is a selective Beta-2 agonist with a minimal number of side effects. It causes prompt bronchodilation and has a duration of action of approximately 5 hours.</td>
</tr>
<tr>
<td><strong>Indications</strong></td>
<td>Bronchial asthma, reversible bronchospasm associated with COPD and emphysema.</td>
</tr>
<tr>
<td><strong>Contraindications</strong></td>
<td>Known hypersensitivity to the drug.</td>
</tr>
<tr>
<td><strong>Precautions</strong></td>
<td>Use caution when administering this drug to elderly patients and those with cardiovascular disease or hypertension. If possible, peak flow rate should be measured before and after administration.</td>
</tr>
<tr>
<td><strong>Side Effects</strong></td>
<td>Palpitations, anxiety, dizziness, headache, nervousness, tremor, hypertension, arrhythmias, chest pain, nausea, vomiting.</td>
</tr>
<tr>
<td><strong>Interactions</strong></td>
<td>The possibility of developing unpleasant side effects increases when administered with other sympathetic agonists. Beta blockers may blunt the effects of Albuterol.</td>
</tr>
</tbody>
</table>
| **Dose / Route** | **Adult:** Albuterol (Proventil) 0.083% 2.5 mg (in 3 ml) (unit dose) via **Nebulizer**  
**Pedi:** Albuterol (Proventil) 0.083% 2.5 mg (in 3 ml) (unit dose) < 6 months, ½ unit dose, via **nebulizer.** |
| **Protocols** | **Adult:** III.H, III.I, III.J, III.L  
**Pedi:** P6, P7 |
**AMIODARONE (Cordarone)**

<table>
<thead>
<tr>
<th>Class</th>
<th>Antiarrhythmic Agent / Cardiac Ion channel blocker</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Amiodarone is a Class III antiarrhythmic agent used to treat ventricular arrhythmias unresponsive to other antiarrhythmics.</td>
</tr>
<tr>
<td><strong>Mechanism of Action</strong></td>
<td>Amiodarone prolongs the action potential duration in all cardiac tissues. It blocks potassium, sodium, and calcium channels along with adrenergic beta receptors. Slows heart rate.</td>
</tr>
<tr>
<td><strong>Indications</strong></td>
<td>Management of SVT (A-fib/flutter) and ventricular arrhythmias (V-tach, V-fib.)</td>
</tr>
<tr>
<td><strong>Contraindications</strong></td>
<td>Breast-feeding patients in cardiogenic shock, severe sinus node dysfunction resulting in marked bradycardia, 2nd or 3rd degree AV block, symptomatic bradycardia, or known hypersensitivity.</td>
</tr>
<tr>
<td><strong>Precautions</strong></td>
<td>Amiodarone should be used with caution in patients with latent or manifest heart failure because failure may be worsened by its administration.</td>
</tr>
<tr>
<td><strong>Side Effects</strong></td>
<td>Hypotension, bradycardia, increased ventricular beats, prolonged P-R interval, prolonged QRS complex, prolonged Q-T interval. The patient should also be monitored for signs of pulmonary toxicity such as dyspnea and cough.</td>
</tr>
<tr>
<td><strong>Interactions</strong></td>
<td>Amiodarone may react with Warfarin, Digoxin, Procainamide, Quinidine, and Phenytoin.</td>
</tr>
<tr>
<td><strong>Dose / Route</strong></td>
<td><strong>Adult</strong>: Amiodarone 300 mg IV/IO, - 150 mg IV/IO (2nd dose) - Cardiac arrest - (V-tach / V-Fib) Amiodarone 150 mg (in 100ml D5W) IV/IO - over 10 min - Tachycardia: Pedi: Amiodarone 5 mg/kg IV/IO (max 300 mg) - Cardiac arrest - (V-tach / V-Fib)</td>
</tr>
<tr>
<td><strong>Protocols</strong></td>
<td>Adult - III.N, III.Q, III.R Pedi - P5</td>
</tr>
</tbody>
</table>
## ASPIRIN

### Class
Platelet Aggregation Inhibitor

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

### Mechanism of Action
Aspirin blocks the formation of the substance thromboxane A2, which causes platelets to aggregate and arteries to constrict.

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

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

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

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

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

### Dose / Route
Aspirin 325 mg. PO (chewed)

### Protocols
Adult - III.M
# ATROPINE

## Class
Anticholinergic

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

## Mechanism of Action
Atropine is a potent parasympatholytic and is used to increase the heart rate in hemodynamically significant bradycardias. Atropine acts by blocking acetylcholine receptors, thus inhibiting parasympathetic stimulation. Atropine has little or no inotropic effect. It plays an important role as an antidote in organophosphate poisonings. Reduces respiratory tract secretions.

## Indications
- Hemodynamically unstable bradycardia.
- Organophosphate overdose.

## Contraindications
Known hypersensitivity. Tachycardia or hypothermic bradycardia.

## Precautions
Atropine may worsen the bradycardia associated with second-degree type II and third-degree AV blocks. In these instances, pacing should be attempted prior to administration of Atropine.

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

## Interactions
Few in pre-hospital setting. Potential adverse effects when administered with digitalis. Effects are enhanced by antihistamines, procainamide, quinadine, antipsychotics, benzodiazepines, and antidepressants.

## Dose / Route
| Adult: Bradycardia: | Atropine 0.5 mg **IV/IO** - repeat q 5 min PRN (max 3 mg) |
| Adult: Poisoning: | Atropine 2 mg **IV/IM** - (or **autoinjector**) (repeat as needed) |

## Protocols
Adult - III.S, III.X
Class
Calcium supplement

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

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

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

Contraindications
Calcium may precipitate Digitalis toxicity in patients taking Digoxin.

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

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

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

Dose / Route
Calcium chloride 1gm IV/IO

Protocols
Adult - III.H, III.N, III.O, III.Q, III.S, III.X
**DEXAMETHASONE** (Decadron)

### Class

Synthetic glucocorticoid.

### Description

A potent anti-inflammatory, also modifies the immune response. Prehospital, is generally used in the treatment of allergic reactions and asthma and to reduce swelling in the central nervous system.

### Mechanism of Action

Suppresses acute and chronic inflammation, potentiates the relaxation of vascular and bronchial smooth muscle by beta-adrenergic agonists, and possibly alters airway hyperactivity.

### Indications

Bronchial asthma, COPD exacerbation, and anaphylaxis. Also used for cerebral edema due to head injury or insult, as well as endocrine, rheumatic, dermatologic, ophthalmic, and hematologic disorders.

### Contraindications

Known hypersensitivity, neonates, and patients with systemic fungal infections as it may exacerbate them.

### Precautions

Large doses of dexamethasone may result in blood pressure increases, salt and water retention, and increases in potassium and calcium excretion. Dexamethasone suppresses the immune system and may result in masking of infection or increased susceptibility to infection. Use of dexamethasone in patients with recent MI may result in myocardial rupture.

### Side Effects

Adverse reactions may include anaphylaxis, hypertension, water retention, weakness, seizures, headache, and nausea. Also causes immuno-supression.

### Interactions

Dexamethasone may be less effective in the presence of phenytoin (Dilantin), phenobarbital, ephedrine, and rifampin. Hypokalemia may result if dexamethasone is administered in conjunction

### Dose / Route

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<th>Pedi: Dexamethasone (Decadron)</th>
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<tbody>
<tr>
<td>Adult</td>
<td>12 mg IV/IO/IM</td>
<td>0.6 mg/kg IV/IO</td>
</tr>
</tbody>
</table>

### Protocols

|                | Adult - III.I, III.J, III.L | Pedi - P4 |
## DEXTROSE (D50) (D10)

### Class
Carbohydrate

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

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

### Indications
Hypoglycemia, coma of unknown origin.

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

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

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

### Interactions
There are no interactions in the emergency setting.

In Nassau County - D10w may be used if D50 is unavailable.

### Dose / Route

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<td>D50</td>
<td>25 gm</td>
<td>0.5 gm/kg.</td>
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<tr>
<td>D10</td>
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### Protocols
- Adult: III.O, III.T, III.U, III.V, III.X
- Pedi: P5, P8, P9
DIAZEPAM (Valium)

Class
Anticonvulsant and Sedative

Schedule IV drug

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

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

Indications
Diazepam is used in major motor seizures, status epilepticus, sedation prior to cardioversion and intubation, skeletal muscle relaxant, and sedation in acute anxiety states.

Contraindications
Known hypersensitivity, shock / hypotension, and CNS depression.

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

Side Effects
Hypotension, drowsiness, CNS depression, headache, amnesia, respiratory depression/arrest, blurred vision, nausea, vomiting.

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

Dose / Route
Adult: Diazepam (Valium) 2-10 mg IV/IO/IM - Poison/OD/Behavioral - 5 mg IV/IO/IM/PR - Seizures/ Sedation
Adult: Diazepam (Valium) 5-10 mg IV/IO/IM - Sedation - Medication facilitated Intubation (Paramedics only)
Pedi: Diazepam (Valium) 0.1 mg/kg IV/IO slowly over 2 minutes, PR - (if no access)

Protocols
Class
Calcium Channel Blocker - Class IV antiarrythmic

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

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

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

Contraindications
Hypersensitivity to Calcium channel blocker, severe hypotension, AMI, CHF, cardiogenic shock, ventricular tachycardia, sick-sinus-syndrome, Wolff-Parkinson-White syndrome.

Precautions
Diltiazem can cause systemic hypotension. Caution with renal/hepatic impaired patients.

Side Effects
Diltiazem can cause bradycardia, heart block, hypotension, myocardial depression, asystole, flushing, nausea, vomiting, dizziness, headache,

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

Dose / Route
Diltiazem (Cardizem) 0.25 mg/kg slow IV/IO (over 2 minutes) - (for A-fib / A-flutter)

Protocols
Adult - III.R
## DIPHENHYDRAMINE  (Benadryl)

### Class
- Antihistamine

### Description
Diphenhydramine is a potent antihistamine that blocks $H_1$ and $H_2$ histamine receptors.

### Mechanism of Action
Diphenhydramine blocks the effects of $H_1$ receptor stimulation (bronchoconstriction, visceral contractions) and that of $H_2$ receptor stimulation (peripheral vasodilation and secretion of gastric acids).

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

### Contraindications
- Asthma

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

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

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

### Dose / Route
- **Adult:** Diphenhydramine 50 mg  **IV/IO/IM**
- **Pedi:** Diphenhydramine 1 mg/kg  **IV/IM**

### Protocols
- **Adult - III.L**
- **Pedi - P7**
**DOPAMINE DRIP**

<table>
<thead>
<tr>
<th>Class</th>
<th>Sympathetic Agonist</th>
</tr>
</thead>
</table>

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

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

**Indications**
Hemodynamically significant hypotension / shock - not resulting from hypovolemia.

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

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

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

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

**Dose / Route**
Dopamine drip 5-20 mcg/kg/min IV/IO (titrated to effect)
Mix: 200 mg in 250ml NS or 400 mg in 500ml NS = Solution concentration 800 mcg / ml

**Protocols**
**Advanced Life Support Protocol Manual**

**EPINEPHRINE 1:1000**

<table>
<thead>
<tr>
<th>Class</th>
<th>Sympathetic Agonist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Epinephrine is a naturally occurring catecholamine. It is a potent alpha- and beta-adrenergic stimulant with more profound beta effects.</td>
</tr>
<tr>
<td>Mechanism of Action</td>
<td>Epinephrine works directly on alpha- and beta-adrenergic receptors with effects of increased heart rate, cardiac contractile force, increased electrical activity in the myocardium, systemic vascular resistance, increased blood pressure, and increased automaticity. It also causes bronchodilation. Effects usually appear within 90 seconds of administration, and last only a short duration.</td>
</tr>
<tr>
<td>Indications</td>
<td>Bronchial asthma, bronchospasm, anaphylaxis. Pediatric cardiac arrest,</td>
</tr>
<tr>
<td>Contraindications</td>
<td>Underlying cardiovascular disease, hypertension.</td>
</tr>
<tr>
<td>Precautions</td>
<td>Epinephrine should be protected from light. It also tends to be deactivated by alkaline solutions.</td>
</tr>
<tr>
<td>Side Effects</td>
<td>Palpitations, anxiety, tremulousness, headache, dizziness, nausea, vomiting, myocardial oxygen demand.</td>
</tr>
<tr>
<td>Interactions</td>
<td>Effects can be intensified in patients taking antidepressants</td>
</tr>
</tbody>
</table>
| Dose / Route | Adult: Epinephrine (1:1000) 0.3 mg IM/SQ  
Pedi: Epinephrine (1:1000) 0.01 mg/kg IM (max. 0.3 mg)  
Epinephrine (1:1000) 0.1 mg/kg ET - If no IV/IO - - Repeat every 3-5 minutes  
Epinephrine (1:1000) 0.05 mg/kg in 3cc NS via Nebulizer – in place of Racemic Epinephrine |

| Protocols | Adult - III.I, III.L  
Pedi - P1, P5, P6, P7 (P4) |
### Class
Sympathetic Agonist

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

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

### Indications
Cardiac arrest

### Contraindications
None in cardiac arrest.

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

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

### Interactions
Effects can be intensified in patients taking antidepressants

### Dose / Route
<table>
<thead>
<tr>
<th>Adult: Epinephrine 1:10,000</th>
<th>1 mg IV/IO - Repeat every 3-5 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedi: Epinephrine 1:10,000</td>
<td>0.01 mg/kg IV/IO - Repeat every 3-5 minutes</td>
</tr>
</tbody>
</table>

### Protocols
- **Adult:** III.N, III.O
- **Pedi:** P1, P5, P11
EPINEPHRINE  Auto-injector

Class
Sympathetic Agonist

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

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

Indications
Bronchial asthma, exacerbation of COPD, anaphylaxis.

Contraindications
None in the presence of anaphylaxis
Underlying cardiovascular disease, hypertension.

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

Side Effects
Palpitations, tachycardia, angina, anxiety, tremors, headache, dizziness, nausea, vomiting, hypertension

Interactions
Effects can be intensified in patients taking antidepressants

Dose / Route
Adult: 0.3 mg  IM  Autoinjector
Pediatric: 0.15 mg  IM  Autoinjector

Protocols
Adult - III.L  Pedi - P7
## EPINEPHRINE DRIP

### Class
- Sympathetic Agonist

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

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

### Indications
- Anaphylaxis
- Symptomatic bradycardia refractory to pacing

### Contraindications
- Underlying cardiovascular disease, hypertension.

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

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

### Interactions
Effects can be intensified in patients taking antidepressants.

### Dose / Route
- Epinephrine drip: 2-10 mcg/min IV/IO
- Mix: 1 mg in 500 ml NS = Solution concentration 2 mcg/ml

### Protocols
- Adult - III.L, III.S
Class
A short-acting, intravenously administered sedative / hypnotic.

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

Mechanism of Action
Etomidate is a short acting hypnotic that acts at the level of the reticular activating system.

Indications
For procedural sedation or medication facilitated intubation (Paramedics)

Contraindications
Hypersensitivity.

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

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

Interactions
Concurrent use of antihypertensive agents and Etomidate can result in hypotension. This is particularly true if any of the following agents are used with Etomidate: calcium-channel blockers, diazoxide, mecamylamine. Etomidate potentiates the effects of CNS depressants such as ethanol, general anesthetics, local anesthetics, antidepressants, H1-blockers, opiate agonists, skeletal muscle relaxants, phenothiazines, barbiturates, and benzodiazepines.

Dose / Route
Sedation: Etomidate (Amidate) 0.15 mg/kg IV/IO (max 20 mg)
Intubation: Etomidate (Amidate) 0.3 mg/kg rapid IV/IO push (max 40mg) (Paramedics only)

Protocols
Adult - III.B, III.F
## FENTANYL

<table>
<thead>
<tr>
<th>Class</th>
<th>Narcotic analgesic / opioid</th>
<th>Schedule II drug</th>
</tr>
</thead>
</table>

### Description
Fentanyl citrate is a potent synthetic opioid agonist. 50-100 times more potent than Morphine. Produces effects similar to Morphine. Shorter duration than other narcotic analgesics.

### Mechanism of Action
Fentanyl citrate acts primarily through interaction with opioid mu-receptors located in the brain, spinal cord and smooth muscle. The primary site of therapeutic action is the central nervous system causing analgesia and euphoria, effectively treating moderate to severe pain.

### Indications
Anesthesia for severe pain. Sedation for intubation or procedural sedation.

### Contraindications
Known hypersensitivity, respiratory depression, severe hemorrhage, shock, and Myasthenia Gravis.

### Precautions
Check for the presence of a fentanyl patch prior to administration. Resuscitation equipment and a narcotic agonist such as naloxone should be readily available to manage apnea.

### Side Effects
Hypotension, bradycardia, respiratory depression, apnea, nausea/vomiting, dizziness, sedation, diaphoresis, muscle rigidity and palpitations.

### Interactions
Other CNS depressants drugs (e.g. barbiturates, tranquilizers, narcotics and general anesthetics) will have additive or potentiating effects with Fentanyl and MAOI's.

### Dose / Route
Fentanyl 1 mcg/kg **IV/IO/IM/IN** *(max 100 mcg)*

### Protocols
Adult - III.E, III.F, III.M,
## FUROSEMIDE (Lasix)

<table>
<thead>
<tr>
<th>Class</th>
<th>Diuretic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Furosemide is a potent diuretic that inhibits sodium and chloride reabsorption in the kidneys and causes venous dilation.</td>
</tr>
<tr>
<td><strong>Mechanism of Action</strong></td>
<td>Furosemide is a loop diuretic that inhibits sodium and chloride reabsorption in the kidneys. Furosemide first causes venous dilation within 5 minutes of administration, reducing preload and decreasing cardiac work. Diuretic effects begin 5-15 minutes after administration.</td>
</tr>
<tr>
<td><strong>Indications</strong></td>
<td>Congestive Heart Failure, Pulmonary Edema.</td>
</tr>
<tr>
<td><strong>Contraindications</strong></td>
<td>It should not be administered to patients who are allergic to the sulfa class of medications. Use in pregnancy should be limited to life threatening situations in which the benefits of administration outweigh the risks.</td>
</tr>
<tr>
<td><strong>Precautions</strong></td>
<td>Dehydration, electrolyte depletion, and hypotension can result from excessive doses. Blood pressure should be frequently monitored. Furosemide should be protected from light.</td>
</tr>
<tr>
<td><strong>Side Effects</strong></td>
<td>Headache, dizziness, hypotension, volume depletion, potassium depletion, arrhythmias, diarrhea, nausea, vomiting.</td>
</tr>
<tr>
<td><strong>Interactions</strong></td>
<td>Administration with other diuretics can lead to severe volume depletion and electrolyte imbalance.</td>
</tr>
<tr>
<td><strong>Dose / Route</strong></td>
<td>Furosemide (Lasix) 40-100 mg IV/IO</td>
</tr>
<tr>
<td><strong>Protocols</strong></td>
<td>Adult - III. K</td>
</tr>
</tbody>
</table>
## GLUCAGON

<table>
<thead>
<tr>
<th>Class</th>
<th>Hormone and Anti-hypoglycemic</th>
</tr>
</thead>
</table>

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

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

### Indications
- Hypoglycemia, Beta-Blocker overdoses.

### Contraindications
- Known hypersensitivity.

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

### Side Effects
- Hypotension, dizziness, headache, nausea, vomiting.

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

### Dose / Route

<table>
<thead>
<tr>
<th>Adult: Glucagon 1 mg IM / IN (if no IV access)</th>
<th>1mg IV/IO - Cardiac Arrest</th>
<th>1-2 mg IV/IO - Poisoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedi: Glucagon 0.1 mg/kg IM (if no IV access)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Protocols
- Adult - III.O, III.T, III.U, III.V, III.X
- Pedi - P8, P9
HALOPERIDOL (Haldol)

Class
Antipsychotic Agent / Dopamine receptor antagonist

Description
Haloperidol is a potent tranquilizer.

Mechanism of Action
Inhibits central nervous system (CNS) catecholamine receptors; strong anti-dopaminergic and weak anti-cholinergic. Acts on CNS to depress subcortical areas, mid-brain and ascending reticular activating system in the brain to decrease signs and symptoms of psychosis.

Indications
Adult behavioral emergency, agitated, and aggressive patients who present a danger to themselves or to others and who cannot be safely managed otherwise.

Contraindications
Known hypersensitivity to medication, Parkinson’s Disease, CNS depression, suspected head injury.

Precautions
Administering haloperidol to a patient who has a history of seizures or who is taking anticonvulsant medications may precipitate convulsion activity; haloperidol reduces the convulsion threshold and anticonvulsant medications decrease the effects of haloperidol. Geriatric patients should receive a decreased dose to reduce the possibility of side effects due to decreased liver function.

Side Effects
Respiratory depression, tachycardia, sedation with decreased LOC. Extrapyramidal symptoms (dystonic reaction), restlessness, spasms, Parkinson-like symptoms, drooling, hypotension, tachycardia, orthostatic hypotension, nausea, vomiting, blurred vision. Monitor QT interval.

Interactions
Enhanced CNS depression and hypotension in combination with alcohol, and antagonizes amphetamines and epinephrine. Other CNS depressants may potentiate effects.

Dose / Route
Haloperidol (Haldol) 2-5 mg IM

Protocols
Adult - III.W
<table>
<thead>
<tr>
<th><strong>Hydrocortisone Sodium Succinate (Solu-Cortef)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Mechanism of Action</strong></td>
</tr>
<tr>
<td><strong>Indications</strong></td>
</tr>
<tr>
<td><strong>Contraindications</strong></td>
</tr>
<tr>
<td><strong>Precautions</strong></td>
</tr>
<tr>
<td><strong>Side Effects</strong></td>
</tr>
<tr>
<td><strong>Interactions</strong></td>
</tr>
<tr>
<td><strong>Dose / Route</strong></td>
</tr>
</tbody>
</table>
| **Protocols** | Adult - III.D  
 | Pedi - P10 |
**HYDROXOCOBALAMIN** (Cyanokit)

<table>
<thead>
<tr>
<th>Class</th>
<th>Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antidote. Precursor of vitamin B12.</td>
<td></td>
</tr>
</tbody>
</table>

**Description**

Hydroxocobalamin is the form of vitamin B$_{12}$ that is produced commercially. It is not a form normally found in the human body, but is easily converted in the body to usable coenzyme forms of vitamin B$_{12}$. It is used (because of its affinity for cyanide ion) as a treatment for cyanide poisoning.

**Mechanism of Action**

Hydroxocobalamin will bind circulating and cellular cyanide molecules to form cyanocobalamin which is excreted in the urine.

**Indications**

The treatment of known or suspected cyanide poisoning - including smoke from closed-space fires.

(smoke inhalation)

**Contraindications**

None

**Precautions**

Administer slowly over 15 minutes. Transient hypertension.

**Side Effects**

Anaphylaxis, chest tightness, edema, urticaria, pruritus, dyspnea, nausea, headache, injection site reactions and rash. A substantial increase in blood pressure may occur following Cyanokit therapy.

**Interactions**

There are a number of drugs and blood products that are incompatible with Cyanokit, thus a separate IV line should be used for administration.

**Dose / Route**

Hydroxocobalamin 5g **IV** (over 10 min.) *needs dedicated IV

*Cyanokit 5g (crystalline powder) - reconstitute vials with 0.9% normal saline.*

**Protocols**

Adult - III.X
### IPRATROPIUM (Atrovent)

**Class**
- Anticholinergic

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

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

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

**Contraindications**
Known hypersensitivity.

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

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

**Interactions**
There are few interactions in the prehospital setting.

**Dose / Route**

<table>
<thead>
<tr>
<th>Dose</th>
<th>Route</th>
<th>Adult</th>
<th>Pedi</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 mcg</td>
<td>Nebulizer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250 mcg</td>
<td>Nebulizer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Protocols**
- Adult - III.I, III.J
- Pedi - P6
**Class**
Analgesic, Anti-inflammatory

**Description**
Non-steroidal Anti-inflammatory agent (NSAID)  Non-opiod analgesic

**Mechanism of Action**
Produces peripherally mediated analgesia by inhibiting prostaglandin synthesis.
*Does NOT affect the CNS*

**Indications**
Short term management of moderate to severe non-cardiac pain (trauma/burns), burns without hemodynamic compromise, isolated extremity fractures or dislocations with severe pain and long transport/disentanglements time.

**Contraindications**
Allergy or sensitivity to NSAIDS (ASA, Ibuprofen). Asthma, peptic ulcer, GI bleed, abdominal pain of unknown etiology, advanced renal disease.

**Precautions**
May increase bleeding times when administered to patients taking anticoagulants. May increase effects if lithium and methotrexate.

**Side Effects**
Anaphylaxis, drowsiness, edema, rash/ itch, nausea, headache, bleeding disorders. Burning/pain at the injection site, hypertension

**Interactions**
May increase bleeding time in patients taking anticoagulants.
*For patients on aspirin regiments contact Medical control*

**Dose / Route**
Ketorolac (Toradol)  30 mg **IV** *(over 1 minute)* or **IM** *(ages 14 - 65 only)*

**Protocols**
Adult - III.E
LIDOCAINE (Xylocaine)

**Class**
- Antiarrhythmic (Class I.B)

**Description**
Suppresses ventricular ectopic activity. Increases ventricular fibrillation threshold. Decreases automaticity by slowing the rate of phase 4 depolarization.

**Mechanism of Action**
Suppresses automaticity and raises the defibrillatory threshold of the ventricles. It also causes sedation and analgesic effects.

**Indications**
- In Nassau County - Pediatric Non-traumatic V-tach or V-fib cardiac arrest. An alternate to Amiodarone.

**Contraindications**
- SVT, heart blocks, and bradycardias. Hypersensitive to amide-type local anesthetics.

**Precautions**
- CHF, respiratory depression, hypovolemia, Caution with renal or hepatic impairment due to prolonged metabolic clearance.

**Side Effects**
- Seizures, toxicity, AMS, parasthesia.

**Interactions**

**Dose / Route**
- Pedi: Lidocaine 1 mg/kg IV/IO - if Amiodarone is unavailable

**Protocols**
- Pedi - P5
**LORAZEPAM** (Ativan)

**Class**
- Anticonvulsant, antianxiety, analgesic agent.
- Sedative/Hypnotic
- Schedule IV drug

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

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

**Indications**
Used in the management of status epilepticus and as an adjunct in the management of anxiety or insomnia. Lorazepam is also used for procedural sedation. It also decreases agitation and anxiety.

**Contraindications**
- Hypersensitivity, CNS depression, comatose, uncontrolled severe pain, narrow-angle glaucoma
- and lactation. *(Relative contraindication with pregnancy)*

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

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

**Interactions**
Additive CNS depression with other CNS depressants including alcohol, antihistamines, opioid analgesics, and other sedative/hypnotics including other benzodiazepines. Lorazepam may decrease the efficacy of levodopa.

**Dose / Route**
- **Adult:** Lorazepam (Ativan) 2-4 mg IV/IO/IM
- **Pedi:** Lorazepam (Ativan) 0.05 mg/kg IV/IO/IM *(slow over 2 minutes)*

**Protocols**
- Pedi - P9
**MAGNESIUM SULFATE**

**Class**  
Antiarrhythmic, Mineral, Electrolyte

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

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

**Indications**  
Magnesium Sulfate is used in torsade de pointes (multiaxial ventricular tachycardia), refractory ventricular fibrillation, pulseless ventricular tachycardia. It is also used in severe bronchospasm, and seizures/eclampsia.

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

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

**Side Effects**  
Hypotension, flushing, sweating, bradycardia, decreased deep tendon reflexes, drowsiness, respiratory depression, arrhythmia, hypothermia, itching, and rash.

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

**Dose / Route**  
**Adult:** Magnesium sulfate 1-2 gm **IV/IO** - Cardiac arrest  
**Adult:** Magnesium sulfate 2 gm **IV/IO** - in 100 normal saline (over 10 minutes) - Asthma, COPD, WCT, Sz, eclampsia  
**Pedi:** Magnesium sulfate 25-50 mg/kg **IV/IO** - (max. 2 gm) - for torsades

**Protocols**  
**Adult - III.I, III.N, III.Q, III.U, III.Y**  
**Pedi - P5**
**METHYLPREDNISOLONE**  (Solu-Medrol)

<table>
<thead>
<tr>
<th>Class</th>
<th>Anti-inflammatory</th>
<th>Steroid</th>
</tr>
</thead>
</table>

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

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

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

**Contraindications**
Known hypersensitivity. Fungal infections, measles, varicella.

**Precautions**
Cardiac arrhythmias or circulatory collapse can occur with large rapidly administered dosages.

**Side Effects**
Fluid retention, congestive heart failure, hypertension, bradycardia, abdominal distention, vertigo, headache, and nausea.

**Interactions**
There are few in the prehospital setting.

**Dose / Route**
- Adult: Methylprednisolone 125 mg **IV/IO/IM**
- Pedi: Methylprednisolone 2 mg/kg **IV/IO** (max - 60 mg)

**Protocols**
- Adult - III.I, III.J, III.L
- Pedi - P4, P6, P7
**MIDAZOLAM** (Versed)

<table>
<thead>
<tr>
<th>Class</th>
<th>Sedative and Hypnotic. Anti-anxiety.</th>
<th>Schedule IV drug</th>
</tr>
</thead>
</table>

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

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

**Indications**
Midazolam is used as for procedural sedation for cardioversion or intubation. Also used for seizures and behavioral emergencies / agitation.

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

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

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

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

**Dose / Route**
- Adult: Midazolam (Versed) 1 - 5 mg IV/IO/IM/IN
- Pedi: Midazolam (Versed) 0.2 mg / kg IM/IN *(max 5 mg)* - (IN route preferred)

**Protocols**
- Adult - III.B, III.F, III.U, III.W, III.X III.Y
- Pedi - P9
**MORPHINE SULFATE**

**Class**
Narcotic Analgesic / opioid  
Schedule II drug

**Description**
Morphine is a potent CNS depressant and analgesic.

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

**Indications**
Severe pain associated with myocardial infarction, burns, kidney stones, etc. It is also used for procedural sedation.

**Contraindications**
Volume depletion, severe hypotension, hypersensitivity, respiratory depression, undiagnosed head injury or abdominal pain.

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

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

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

**Dose / Route**
Morphine sulfate 2-10 mg (0.1 mg/kg) IV/IO/IM (max 20 mg)

**Protocols**
Adult - III.E, III.F, III.M
NALOXONE (Narcan)

<table>
<thead>
<tr>
<th>Class</th>
<th>Narcotic Antagonist</th>
</tr>
</thead>
</table>

### Description
Naloxone is an effective narcotic antagonist.

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

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

### Contraindications
Known hypersensitivity.

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

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

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

### Dose / Route
- **Adult**: Naloxone (Narcan) - 0.4-2.0 mg (titrated) IV/IO/IM/IN
- **Pedi**: Naloxone *titrate in increments of* 0.1 mg/kg *until effective* IV/O/ET/IM ≥ 2 y/o - max 2 mg < 2 y/o - max 1 mg

### Protocols
- Pedi: P2, P8
## Nitroglycerin

**Class**
Nitrate

**Description**
Nitroglycerin is a potent smooth muscle relaxant used in the treatment of angina pectoris.

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

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

**Contraindications**
Hypotension, increased intracranial pressure.

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

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

**Interactions**
Nitroglycerin can cause hypotension in patients who have recently ingested alcohol. It can cause orthostatic hypotension when used in conjunction with beta-blockers. Withold if the patient has taken Viagra/Levitra within 24 hours and Cialis/Revatio within 48 hours.

**Dose / Route**
Nitroglycerin 0.4 mg **SL** OR **SL spray**

**Protocols**
Adult - III.K. III.M
## NOREPINEPHRINE DRIP (Levophed)

### Class
Sympathomimetic

### Description
Norepinephrine is a naturally occurring potent vasoconstrictor and inotropic agent.

### Mechanism of Action
Norepinephrine treats severe hypotension and a low total peripheral resistance. It is relatively contraindicated in patients with hypovolemia. It may increase myocardial oxygen requirements, mandating cautious use in patients with ischemic heart disease. Onset 1-3 min. Duration 5-10 min.

### Indications
- Shock - following volume replacement. Especially when the blood pressure is < 70 mmHg.
- Post resuscitation hypotension after medical CPR - when systolic BP < 90 mmHg.

### Contraindications
Hypovolemia, profound hypoxia

### Precautions
- Start IV in antecubital fossa (large vein) to lower risk of infiltration. When administering, continually check IV site for patency and signs/symptoms of infiltration. Continually monitor blood pressure. Do not mix with Sodium Bicarbonate; flush tubing well between drugs.

### Side Effects
Tissue necrosis with infiltration. Hypertension, headache, anxiety, dysrhythmia, tachycardia, reflex bradycardia, chest pain, increased oxygen demand, nausea/vomiting.

### Interactions
Should not be administered in the same line as alkaline agents (such as Sodium Bicarbonate), as alkaline solutions may inactive Norepinephrine.

### Dose / Route
Norepinephrine (Levophed) (2-4 mcg/min - initial dose) IV/IO (max 30 mcg/min) - large vein if possible
Mix: 8 mg in 250 ml NS or 16 mg in 500 ml NS = Solution concentration 32 mcg/ml

### Protocols
- Adult - III.D, III.K, III.L, III.M, III.P
- NOT to be used with Pediatric patients
ONDANSETRON (Zofran)

Class
Anti-emetic / anti-nausea / serotonin receptor antagonist.

Description
Ondansetron helps to prevent nausea and vomiting by blocking 5-HT3 receptors so that serotonin is not able to bind to the receptor site and initiate a vomiting reflex.

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

Indications
For patients experiencing nausea and vomiting.

Contraindications
Known hypersensitivity

Precautions
Caution in liver failure patients.

Side Effects
Headache, malaise, drowsiness, fatigue, fever, rash, diarrhea, bronchospasm, arrhythmias. Rarely seen are angina chest pain, seizures, akathisia and acute dystonic reactions.

Interactions
Apomorphine, methadone, fluconazole, phenytoin, carbamazepine, rifampicin, and tramadol.

Dose / Route
Ondansetron (Zofran) 4 mg IV/IO (over 2 minutes) or 4 mg ODT (Orally Disintegrating Tablet)

Protocols
Adult - III.E, III.F, III.G
PRALIDOXIME (2 PAM) autoinjector

Class
Cholinesterase reactivator

Description
A prefilled auto-injector that provides a dose of the antidote, pralidoxime chloride in a self-contained unit, specially designed for automatic self- or buddy- administration by emergency responders for the treatment of nerve agent intoxication.

Mechanism of Action
Reactivates cholinesterase to effectively act as an antidote to organophosphate pesticide poisoning. This action allows for destruction of accumulated acetylcholine at the neuromuscular junction. Treatment will be most effective if given within a few hours after poisoning.
Onset: minutes  Peak effects: variable  Duration: variable

Indications
As an antidote in the treatment of poisoning by organophosphate pesticides and chemicals. In the prehospital arena, is used when Atropine is, or has become ineffective in management of organophosphate poisoning.

Contraindications
Use with caution in patients with reduced renal function. Patients with myasthenia gravis.

Precautions
Occasionally (usually as a result of rapid injection) may cause laryngospasm and muscle rigidity. Intubation may be required. Cardiac monitoring should be considered in all cases of severe organophosphate poisoning.

Side Effects
Dizziness, blurred vision, diplopia, headache, drowsiness, nausea, tachycardia, hyperventilation, muscular weakness, excitement, and manic behavior.

Interactions
No direct drug interaction. However, patient with organophosphate poisoning should not be given barbiturates, morphine, theophylline, aminophylline, succinylcholine, reserpine, & phenothiazines.

Dose / Route
2 PAM autoinjector  600 mg IM - (up to 1800 mg or 3 auto-injectors)

Protocols
Adult - III.X
**RACEMIC EPINEPHRINE**

<table>
<thead>
<tr>
<th>Class</th>
<th>Sympathomimetic / bronchodilator</th>
</tr>
</thead>
</table>

**Description**
A racemic mixture of Epinephrine. It is a sympathomimetic bronchodilator that is delivered by aerosol.

**Mechanism of Action**

**Indications**
Bronchial asthma, prevention of bronchospasm. Croup, laryngotracheobronchitis, laryngeal edema.

**Contraindications**
Known hypersensitivity., hypertension, underlying cardiovascular disease, epiglottitis.

**Precautions**
May cause tachycardia and other arrhythmias. Monitor vital signs. Excessive use may cause bronchospasm.

**Side Effects**
Tachycardia, arrhythmias, palpitations, headache, nausea, vomiting.

**Interactions**
MAOI’s may lead to hypertensive crisis. Beta blockers may negate therapeutic effects.

**Dose / Route**
Pedi: Racemic Epinephrine, 0.05 mg/kg in 3cc 0.9% saline (Max. 5 ml) via **Nebulizer**
(if unavailable, Epinephrine may be used at the same nebulizer dose)

**Protocols**
Pedi - P4
## SODIUM BICARBONATE

**Class**
Alkalizing Agent / Hydrogen ion buffer.

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

**Mechanism of Action**
Sodium Bicarbonate increases pH by providing the bicarbonate buffer (a weak base). Reacts with hydrogen ions to form water and carbon dioxide. Makes urine more alkaline and enhances Tricyclic Antidepressant excretion.

**Indications**
Tricyclic antidepressant overdose, prolonged cardiac arrest, crushing injuries, Bradycardia, wide-complex tachycardia, severe acidosis refractory to hyperventilation, and known hyperkalemia.

**Contraindications**
There are no absolute contraindications.

**Precautions**
May cause fluid retention, use with caution with CHF patients. Sodium Bicarbonate can cause metabolic alkalosis when administered in large quantities. It is important to calculate the dosage based on weight and size.

**Side Effects**
Extravasation may cause tissue cellulitis or necrosis at the injection site, also tissue slothing.

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

**Dose / Route**
Sodium bicarbonate 1 mEq/kg IV/IO

**Protocols**
- Pedi - P5
### SODIUM THIOSULFATE

#### Class
Sulfate forming compound.

#### Description
Used as an antidote to cyanide poisoning. Thiosulfate acts as a sulfur donor for the conversion of cyanide to thiocyanate (which can then be safely excreted in the urine).

#### Mechanism of Action
Provides sulfane sulfur which is needed by the hepatic enzyme rhodanese to change cyanide into thiocyanate which is then excreted in the urine.

#### Indications
Suspected cyanide or cyanogenic poisoning with severe symptoms.

#### Contraindications
None in acute cyanide toxicity.

#### Precautions
Many patients will vomit and may aspirate if the airway is not protected.

#### Side Effects
Hypotension is the chief adverse reaction. Nausea/vomiting, local pain at injection site.

#### Interactions
None reported

#### Dose / Route
Sodium Thiosulfate 25% sol. 12.5g **IV/IO** (50ml NS - over 10 min.)

#### Protocols
**Adult - III.X**
**TETRACAINE 1/2 % Ophthalmic Drops**

<table>
<thead>
<tr>
<th>Class</th>
<th>Ophthalmic Anesthetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Tetracaine is an ester-type local anesthetic with an intermediate to long duration of action.</td>
</tr>
<tr>
<td>Mechanism of Action</td>
<td>Tetracaine, like all local anesthetics, causes a reversible blockade of nerve conduction by decreasing nerve membrane permeability to sodium. This decreases the rate of membrane depolarization thereby increasing the threshold for electrical excitability.</td>
</tr>
<tr>
<td>Indications</td>
<td>Ophthalmic anesthesia / chemical irritation</td>
</tr>
<tr>
<td>Contraindications</td>
<td>Use Tetracaine with caution in patients with known ester type anesthetic hypersensitivity. (lidocaine or benzocaine)</td>
</tr>
<tr>
<td>Precautions</td>
<td>After Tetracaine is applied to the eye, do not rub or wipe the eye until the anesthetic has worn off and feeling in the eye returns. To do so may cause injury or damage to the eye. <em>Advise patient that the drops may burn for a few seconds.</em></td>
</tr>
<tr>
<td>Side Effects</td>
<td>Minor burning, redness, irritation; dizziness, drowsiness, increased sweating; irregular heartbeat; muscle twitching or trembling; nausea or vomiting; shortness of breath or troubled breathing; unusual excitement, nervousness, or restlessness; unusual tiredness or weakness.</td>
</tr>
<tr>
<td>Interactions</td>
<td>The vagal effects and respiratory depression induced by opiate agonists may be increased by local anesthetics. Use of local anesthetics with rapid onset vasodilators, such as nitrates, may result in hypotension. Local anesthetics may enhance the effect of CNS depressive agents.</td>
</tr>
<tr>
<td>Dose / Route</td>
<td>Tetracaine eye drops - 2 drops in affected eye(s) before irrigation</td>
</tr>
<tr>
<td>Protocols</td>
<td>Adult - III.X</td>
</tr>
</tbody>
</table>
## Class
Isotonic crystalloid solution

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

## Mechanism of Action
Normal saline replaces water and electrolytes.

## Indications
- IV access for emergency drugs; for dilution of concentrated drugs for IV infusion.
- Hypovolemia, heat related problems, diabetic ketoacidosis, keep vein open.

## Contraindications
Caution in patients with congestive heart failure as circulatory overload can be easily induced

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

## Side Effects
Rare in therapeutic doses.

## Interactions
Few in the emergency setting

## Dose / Route
IV / IO

## Protocols
**Class**
Hypotonic dextrose-containing solution

**Description**

**Mechanism of Action**
D5W provides nutrients in the form of dextrose as well as free water

**Indications**
IV access for emergency drugs; for dilution of concentrated drugs for IV infusion. In Nassau county - 100 ml bag for Amiodarone administration

**Contraindications**
D5W should not be used as a fluid replacement for hypovolemic states.

**Precautions**
None

**Side Effects**
Rare in therapeutic doses.

**Interactions**
Not to be used with phenytoin (Dilantin) or amrinone (Inocor)

**Dose / Route**
IV / IO

**Protocols**
III.Q, III.R