

State of Delaware  
Paramedic Standing Orders

# Pharmacology Manual



**Edition: 2015**

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## **GENERAL INFORMATION**

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All medications in this manual listed as IV may also be administered IO.

In the case of any dosing discrepancies in these manual vs the dose listed in the standing orders, the dose listed in the standing orders shall be considered correct.

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## **ANAPHYLACTIC PRECAUTIONS**

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**Anaphylaxis:**

A generalized reaction occurring with dramatic suddenness (usually within a few minutes) after a patient has been exposed to some foreign material.

**Cause:**

Any drug has the potential to precipitate anaphylaxis. Generally those administered intravenously or parenterally are more likely to result in life-threatening or fatal anaphylaxis than those ingested or applied to the skin or mucous membranes.

**Clinical features:**

The patient with anaphylaxis may develop laryngeal edema and bronchospasm which cause respiratory distress and anoxia. The sooner the symptoms develop after the initiating stimulus the more intense the reaction. The symptoms include the following: generalized flush, urticaria, pruritus, anxiety, dyspnea, wheezing, choking, orthopnea, vomiting, cyanosis, paresthesias, shock, and loss of consciousness. Anoxia, shock, and death may occur within 5-10 minutes.

**Prevention:**

- A. Know the patient's allergy history by asking the patient or family before giving a new medication.
- B. Know the precautions listed for each drug.

**Treatment:**

- A. Stop the infusion of the medication but keep the IV line open.
- B. Maintain the airway.
- C. Be prepared to treat anaphylactic shock according to *The Statewide Standard Treatment Protocol*
- D. Call the medical command physician.
- E. After the emergency episode is over, calm the patient. Be certain that the patient has been informed of the allergy and that the allergy is documented on the report form. Verbally report the episode on arrival to hospital personnel and complete a variance report.

## **INFILTRATION PRECAUTIONS**

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Before administering any IV medication or solution, the paramedic must check the IV site for patency and signs of infiltration and/or phlebitis. If infiltration occurs, stop the drug but do not remove the IV device. Contact the medical control physician immediately for orders.

### **FACTORS THAT INCREASE THE RISK OF INFILTRATION**

- A. Sclerotic vascular disease
- B. Venous obstruction in the arm (check for edema)
- C. Radiation treatment near the site of injection
- D. High drug concentration
- E. Limited choice for vein selection
- F. Multiple venipunctures
- G. Elderly or debilitated
- H. Superior vena cava syndrome
- I. Specific characteristics of the drug
- J. Uncooperative/irrational individual

### **SYMPTOMS OF AN INFILTRATION**

If pain, burning or stinging occurs at the injection site, evaluate the site for swelling, redness, and inflammation. The presence of a blood return or absence of edema does not negate the possibility of the infusate being spread outside the vein to surrounding tissue. Drug leakage may occur at the site of a previous vessel injury while the needle/catheter is still in the vein.

### **IRRITANTS (DEXTROSE, DIAZEPAM)**

- A. **Definition:** An irritant is a medication that induces a local inflammatory reaction within the vein at the IV site.
- B. **Guidelines for reducing irritation:** The local irritation may be reduced by decreasing the infusion rate or by decreasing the drug concentration (increasing the diluent and/or increasing the intravenous solution flow rate while injecting the drug).

### **VESICANTS (i.e. DOPAMINE)**

- A. **Definition:** A vesicant is a medication that induces blistering of tissues and may lead to tissue necrosis if the medication extravasates (infiltrates) from the vein into the surrounding tissue.
- B. **Guidelines to reduce the danger of infiltration**  
Because the consequences may be severe to the patient, every effort to prevent infiltration must be implemented. The IV site must be observed frequently so that an infiltration can be identified early and further damage prevented.
- C. **Treatment Guidelines for Vesicant Infiltration**
  - 1) **STOP INJECTION IMMEDIATELY:** If possible leave the IV device in place. It may be possible to aspirate the drug or an antidote may be given through the device.
  - 2) **CALL MEDICAL CONTROL PHYSICIAN FOR INSTRUCTIONS**
  - 3) Report the reaction on arrival to the hospital and note infiltration on report form.
  - 4) Apply cold compress if possible.

## **ADENOSINE (ADENOCARD®)**

**Class** - Antidysrhythmics

**Pharmacologic Action** - Slows conduction through AV node and interrupts AV reentry pathways, which restore normal sinus symptoms

**Indications** – Conversion of regular, narrow complex tachycardia – stable supraventricular tachycardia (SVT) or regular, monomorphic wide complex tachycardia

**Contraindications** – Hypersensitivity, second or third degree AV Block (except those on pacemakers), sick sinus syndrome, atrial flutter or fibrillation, ventricular tachycardia

### **Warnings**

Adenosine may produce a short period of first-, second-, or third-degree AV block as well as transient or prolonged asystole. Adenosine should be used with caution in patients taking digoxin and/or verapamil as cases of ventricular fibrillation have been reported. Adenosine administration may produce new arrhythmias during conversion. Adenosine may cause bronchoconstriction and/or respiratory compromise in asthma or COPD patients.

### **Drug Interactions**

Adenosine should be used with caution in the presence of digoxin or verapamil due to the potential for additive or synergistic effects. Methylxanthines such as caffeine and theophylline antagonize the action of adenosine and may require higher doses. Dipyridamole (Persantine®, Aggrenox®) potentiates the effect of adenosine; reduced doses may be effective. Carbamazepine (Tegretol®) may increase the degree of heart block following adenosine administration.

### **Adverse Reactions**

Adenosine may result in facial flushing, diaphoresis, headache, chest pain, palpitations, hypotension, and shortness of breath, lightheadedness, paresthesia, or nausea.

### **Dosage**

**Adult Stable Tachycardia:** If the rhythm is a **narrow complex tachycardia**, other than sinus tachycardia, atrial fibrillation or atrial flutter, at a rate exceeding 150 bpm:

- Administer 6 mg adenosine (Adenocard®) IV rapidly.
- If there is no response to the initial 6 mg dose, administer 12 mg adenosine.
- If there is no response to the second dose, administer 12 mg adenosine.

**Adult Unstable Tachycardia:** Consider adenosine administration for narrow complex tachycardia if IV access is readily available.

- Administer 6 mg adenosine (Adenocard®) IV rapidly.
- If there is no response to the initial 6 mg dose, administer 12 mg adenosine.
- If there is no response to the second dose, administer 12 mg adenosine.

**Pediatric Tachycardia:** If the rhythm is a narrow complex tachycardia (SVT) at a rate exceeding 180 in children > 1 year old or 220 in infants less than 1, administer adenosine (Adenocard®) 0.1mg/kg IV max dose 6mg. May repeat at 0.2mg/kg IV max dose of 12mg.

## **ALBUTEROL SULFATE (PROVENTIL<sup>®</sup>, VENTOLIN<sup>®</sup>)**

**Name** – Proventil<sup>®</sup>, Ventolin<sup>®</sup>, Proair<sup>®</sup>, Accuneb<sup>®</sup>

**Class** – Beta-2 agonist

**Pharmacologic Action** – Beta-2 receptor agonist with some beta-1 activity; relaxes bronchial smooth muscle with little effect on heart rate

**Indications** – Bronchospastic lung disease

**Contraindications** - Albuterol sulfate is contraindicated in patients with tachycardic dysrhythmias (rate greater than 150 BPM) or a known hypersensitivity to albuterol or any of its components.

### **Warnings**

The use of beta-adrenergic agonist bronchodilators alone may not adequately control asthma; consider corticosteroids. Like other beta agonists, albuterol may cause a significant cardiovascular effect (increased pulse rate or blood pressure, ECG changes) as well as pronounced hypokalemia. Immediate hypersensitivity reactions may occur, such as urticaria, angioedema, and anaphylaxis. Large doses of albuterol have been reported to worsen preexisting diabetes and ketoacidosis.

### **Drug Interactions**

There are no known drug interactions with albuterol.

### **Adverse Reactions**

Side effects of albuterol administration may include tremors, dizziness, headache, nausea, nasal congestion, tachycardia, arrhythmias, hypertension, bronchospasm, and cough.

### **Dosage**

**Adult Respiratory Distress:** If the patient who is short of breath has a history of asthma, emphysema, or is actively wheezing, administer up to 5 mg of albuterol via nebulized aerosol. Consider the administration of 0.5 mg nebulized ipratropium bromide (Atrovent<sup>®</sup>) with albuterol. If wheezing continues after first albuterol treatment is completed, you may administer a second dose of up to 5 mg of albuterol via nebulized aerosol if the patient's heart rate remains less than 150 BPM.

**Pediatric Acute Respiratory Distress:** *Contact medical control prior to medication administration if the patient's heart rate is greater than 180 beats per minute.*

If the patient who is short of breath has a history of asthma or is actively wheezing, administer up to <10kg - 1.25mg, 10-20 kg - 2.5mg, >20kg – 5mg of albuterol via nebulized aerosol in combination with nebulized ipratropium bromide (Atrovent<sup>®</sup>) using the following scale:

- <12 yrs. 0.25 mg
- ≥12 yrs. 0.5 mg

For continued respiratory distress administer up to <10kg - 1.25mg, 10-20 kg - 2.5mg, >20kg – 5mg of albuterol via nebulized aerosol.

## **AMIODARONE (CORDARONE®)**

**Name** – Pacerone®, Cordarone®, Nexterone®

**Class** - Class III antidysrhythmics

**Pharmacologic Action** - Class III antidysrhythmic agent, which inhibits adrenergic stimulation; affects sodium, potassium, and calcium channels; markedly prolongs action potential and repolarization; decreases AV conduction and sinus node function

**Indications** – Management of regular wide complex tachycardia in stable patients, irregular wide complex tachycardia in stable patients, and as antidysrhythmic for the management of ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT)

**Contraindications** - Amiodarone is contraindicated in patients with cardiogenic shock, marked sinus bradycardia, and second- or third-degree AV block (unless a pacemaker is available). It is also contraindicated in patients with a known hypersensitivity to amiodarone or its components.

### **Warnings**

Drug-related bradycardia or worsening of existing arrhythmias may also occur with amiodarone administration. Use in pregnancy should only occur if “the potential benefit to the mother justifies the risk to the fetus.” (PDR 2001, pg. 3359)

### **Drug Interactions**

Amiodarone may significantly increase the effects of warfarin, digoxin, quinidine, procainamide, disopyramide (Norpace®), fentanyl, lidocaine, and cyclosporine. Cholestyramine and phenytoin (Dilantin®) may decrease levels of amiodarone in the body, whereas cimetidine may increase levels. Amiodarone use with beta- or calcium channel blockers may worsen hypotension or result in bradycardia.

### **Adverse Reactions**

Hypotension is the most common adverse effect. Other adverse effects include cardiac arrest, asystole, PEA, cardiogenic shock, CHF, bradycardia, V-Tach, and AV block. Angioedema and anaphylaxis may also occur.

### **Dosage**

**Adult Acute Coronary Syndrome:** If patient displays persistent ventricular ectopy (defined as runs of V-Tach or R-on-T PVCs) refractory to oxygen and NTG administration, consider administration of 150 mg amiodarone (Cordarone®) IV infused over 10 minutes. Withhold amiodarone if the heart rate or pulse is less than 50 beats per minute.

**Adult ST ELEVATION MYOCARDIAL INFARCTION (STEMI):** If patient displays persistent ventricular ectopy (defined as runs of V-Tach or R-on-T PVCs) refractory to oxygen and NTG administration, consider administration of 150 mg amiodarone (Cordarone®) IV infused over 10 minutes. Withhold amiodarone if the heart rate or pulse is less than 50 beats per minute.

**Adult Stable Tachycardia:** If the rhythm is a **wide complex tachycardia** at a rate exceeding 150 Bpm: Administer 150 mg amiodarone (Cordarone®) IV infused over 10 minutes.

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**Adult Unstable Tachycardia:** For **wide complex** tachycardia, administer 150 mg amiodarone (Cordarone<sup>®</sup>) IV infused over 10 minutes: If there is no response to cardioversion, OR upon successful conversion, AND if needed for a recurrence.

**Adult VENTRICULAR FIBRILLATION (VF) and/or PULSELESS VENTRICULAR TACHYCARDIA (VT):** Administer 300 mg amiodarone (Cordarone<sup>®</sup>) IV, with a repeat dose of 150 mg after 10 minutes. **With return of spontaneous circulation:** Administer 150 mg amiodarone (Cordarone<sup>®</sup>) IV infused over 10 minutes if patient has received one dose or less of amiodarone (Cordarone<sup>®</sup>).

**Pediatric Tachycardia : Contact medical control for the consideration of:** If the rhythm is a wide complex tachycardia at a rate exceeding 180 in children > 1 year old or 220 in infants less than 1, administer 5mg/kg Amiodarone IV (up to a max of 150mg) infused over 20 minutes.

**Pediatric VENTRICULAR FIBRILLATION (VF) AND/OR PULSELESS VENTRICULAR TACHYCARDIA (VT):** Administer 5 mg/kg amiodarone (Cordarone<sup>®</sup>) bolus IV (maximum 300 mg per dose). May be repeated twice every ten minutes if VF/VT continues. Total of all doses not to exceed 450 mg or a max total dose of 15 mg/kg.

**With return of spontaneous circulation:**  
Administer 5 mg/kg amiodarone (Cordarone<sup>®</sup>) IV infused over 20 minutes (maximum 300 mg). Total of all doses not to exceed 450 mg or a max total dose of 15 mg/kg.

## **AMYL NITRATE**

**Name** – component of the Cyanide Antidote Kit®

**Class** – Cyanide antidote

**Pharmacologic Action** - Reacts with hemoglobin to form methemoglobin, an oxidized form of hemoglobin incapable of oxygen transport but with high affinity for cyanide. Cyanide preferentially binds to methemoglobin over cytochrome a<sub>3</sub>, forming the nontoxic cyanomethemoglobin

**Indications** - Acute cyanide toxicity

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**Contraindications** – None in the case of suspected pure cyanide toxicity noted, documented hypersensitivity, suspected or confirmed smoke inhalation and/or carbon monoxide poisoning **WARNING:** There is a risk of worsening hypoxia due to methemoglobin formation

### **Warnings**

Amyl Nitrate vapors are extremely flammable, do not use near open flame or intense heat. Use in children has not been studied.

### **Drug Interactions**

May potentiate the effects of prescribed nitrates – profound hypotension may result.

### **Adverse Reactions**

Adverse reactions may include: headache, dizziness, weakness, orthostatic hypotension, tachycardia, and nausea/vomiting.

### **Dosage: TOXMEDIC**

**Cyanide Exposure:** Prior to IV access initiate Amyl Nitrite inhalation. Allow inhalation from ampule for 30 seconds of each minute. Ampules should be changed every 3 minutes. Deliver via assisted ventilations if necessary.

**Sulfide Exposure:** Prior to IV access initiate Amyl Nitrite inhalation. Allow inhalation from ampule for 30 seconds of each minute. Ampules should be changed every 3 minutes. Deliver via assisted ventilations if necessary.

## **ASPIRIN**

### **Aspirin**

**Name** – Multiple over-the-counter medications, as well as scheduled drugs, include aspirin as an active ingredient. These include, but are not limited to, Bayer Buffered Aspirin®, Alka-Seltzer with Aspirin®, Ascriptin®, Bayer Women's Low Dose®, Ecotrin®

**Class** – Antiplatelet agent, non-steroidal anti-inflammatory drug (NSAID).

**Pharmacologic Action** - Inhibits synthesis of prostaglandin by cyclooxygenase; inhibits platelet aggregation; has antipyretic and analgesic activity.

**Indications** – Antiplatelet agent for the care of patients suspected of suffering from an acute coronary syndrome.

**Contraindications** - Hypersensitivity to aspirin or NSAIDs (aspirin-associated hypersensitivity reactions include aspirin-induced urticarial or aspirin-intolerant asthma), bleeding GI ulcers, hemolytic anemia from pyruvate kinase (PK) and glucose-6-phosphate dehydrogenase (G6PD) deficiency, hemophilia, hemorrhagic diathesis, hemorrhoids, lactating mother, nasal polyps associated with asthma, sarcoidosis, thrombocytopenia, ulcerative colitis.

### **Warnings**

By inhibiting platelet function, aspirin may lead to an increase in bleeding for patients with bleeding disorders. Patients with peptic ulcer disease should avoid aspirin, as it may result in irritation and bleeding.

### **Drug Interactions**

Aspirin may diminish effects of ACE inhibitors by affecting the renin-angiotensin conversion pathway. Aspirin can interfere with warfarin, prolonging prothrombin and bleeding times. Aspirin can increase the risk of bleeding when combined with heparin and coumadin. Aspirin can decrease concentration of phenytoin and increase concentration of valproic acid. Beta blockers and diuretics may be less effective when administered with aspirin, due to decreased renal blood flow and retention of salt and fluid. Aspirin inhibits clearance of methotrexate, which may result in toxicity. Aspirin may increase effectiveness of oral hypoglycemics, resulting in hypoglycemia.

### **Adverse Reactions**

Adverse reactions may include anaphylaxis, bronchospasm, dysrhythmias, hypotension, tachycardia, agitation, cerebral edema, intracranial hemorrhage, dehydration, hyperkalemia, and renal failure.

### **Dosage**

**Adult Acute Coronary Syndromes (ACS):** Administer 324 mg aspirin PO if the patient has not taken an equivalent dosage within the last 60 minutes, even if patient is pain free.

**Adult ST Elevation Myocardial Infarction (STEMI):** Administer 324 mg aspirin PO if the patient has not taken an equivalent dosage within the last 60 minutes, even if patient is pain free.

## **ATROPINE SULFATE**

**Name** - Atropen®, a component of Mark I® kits and DuoDote®

**Class** – Anticholinergic, toxicity antidotes

**Pharmacologic Action** - Competitively inhibits action of acetylcholinesterase on autonomic effectors innervated by postganglionic nerves

**Indications** – Management of nerve agent toxicity, symptomatic bradycardia (primary or related to toxin ingestion), organophosphate and carbamate insecticide toxicity

*NOTE:* Ineffective in hypothermic bradycardia

**Contraindications** - No absolute contraindications for ACLS, documented hypersensitivity in non-ACLS/nerve agent/organophosphate scenarios

*RELATIVE CONTRAINDICATIONS:* Narrow-angle glaucoma, GI obstruction, severe ulcerative colitis, toxic megacolon, bladder outlet obstruction, myasthenia gravis, hemorrhage w/ cardiovascular instability, thyrotoxicosis

### **Warnings**

Ventricular fibrillation and tachycardia have occurred following intravenous administration of atropine. Atropine may induce tachycardia harmful to patients suffering acute myocardial ischemia or infarction due to increased myocardial oxygen demand. Doses less than 0.5 mg in an adult can induce paradoxical bradycardia and ventricular arrhythmias.

### **Drug Interactions**

Use with other anticholinergics may increase effects of vagal blockade. Atropine may be enhanced by antihistamines, procainamide, quinidine, and psychotropic medications.

### **Adverse Reactions**

Excessive doses of atropine can cause delirium, tachycardia, coma, flushed and hot skin, ataxia and blurred vision. Paradoxical bradycardia may result from doses less than 0.5 mg. Side effects may include palpitations, dysrhythmias, headache, dizziness, nausea and vomiting.

### **Dosage**

**Adult Hemodynamically compromising Bradycardia:** Administer 0.5 mg atropine IV. Repeat 0.5 mg atropine IV every 3-5 minutes until a maximum of 3 mg of atropine is administered or the pulse rate is 50 bpm or greater.

**Pediatric Bradycardia:** Administer 0.02 mg/kg atropine. Minimum dose is 0.1 mg IV. Maximum single dose is 0.5 mg IV. May be repeated once in 3-5 minutes.

**Pediatric and Adult Airway Management (DFI):** For all patients less than or equal to 1 years of age, administer 0.02 mg/kg atropine IV (minimum 0.1 mg).

**Cholinesterase Inhibitor exposure:** Administer Atropine 2mg IV every 5 minutes until bronchorrhea, bronchospasm, and bradycardia resolve. Atropine may be given IM via autoinjector if situation prevents IV access attempts. If venous access difficult or unattainable consider the use of the DuoDote for initial dosing. Additional Atropine 2mg q5min may be required.

**Nerve agents:** Administer atropine 2 mg every 3 – 5minutes as needed for reduction of severe secretions and to reduce ventilatory resistance (may require between 10 and 20 mgs of atropine).

## **BUMETANIDE (BUMEX®)**

**Description** - Bumetanide is a potent loop diuretic.

**Pharmacology** - Bumetanide is both chemically and functionally similar to furosemide although it is more potent (1 mg bumetanide = 40 mg furosemide); however, bumetanide does not share any of furosemide's venous dilatory effects. Like furosemide, bumetanide acts on the loop of Henle by inhibiting passive reabsorption of sodium. Bumetanide can also increase renal flow by as much as 40%.

**Indications** - Bumetanide is indicated for the management of acute pulmonary edema and congestive heart failure. Bumetanide can be used to treat patients who are allergic to furosemide.

**Contraindications** - Bumetanide is contraindicated for patients with a known hypersensitivity to the medication, an allergy to sulfa drugs, or dehydration. and for patients who are dehydrated. Bumetanide is also contraindicated for patients suffering from anuria, but can be used for patients with renal insufficiency.

### **Warnings**

Use for managing pregnant patients should be limited to life threatening situations because of the significant human fetal risk. Bumetanide may result in dehydration and electrolyte depletion.

### **Drug Interactions**

Bumetanide may result in hypokalemia, which may cause patients who are also taking digitalis to develop digitalis toxicity.

### **Adverse Reactions**

Adverse reactions may include muscle cramps, dizziness, headache, nausea, vomiting, and orthostatic hypotension.

### **Dosage and Routes of Administration**

Bumex is similar to Lasix; however, it may be administered IM or IV (intravenous is preferable). The recommended adult dose of Bumex is 0.5 – 2 mg IV administered over one to two minutes; additional medication may be given as needed with medical direction.

## **CALCIUM CHLORIDE**

### **Calcium Chloride**

**Name** – Calcium Chloride

**Class** – Antidotes, other; calcium salts

**Pharmacologic Action** - Bone mineral component; cofactor in enzymatic reactions, essential for neurotransmission, muscle contraction, and many signal transduction pathways

**Indications** – For use in topical burns (hydrofluoric acid) or for use in calcium channel blocker overdose *All Rights Reserved V.11-14 261*

**Contraindications** – Hypercalcemia, documented hypersensitivity, life-threatening cardiac arrhythmias may occur in known or suspected severe hypokalemia

**WARNING:** There is a risk for digitalis toxicity. Be cautious of peripheral IV use as significant tissue necrosis at injection site may occur

### **Warnings**

Rapid injection may result in bradycardia. Calcium administration may produce coronary and cerebral artery spasm.

### **Drug Interactions**

Use with caution on patients taking digitalis as calcium may increase ventricular irritability and precipitate digitalis toxicity. If given with sodium bicarbonate, calcium salts will precipitate from solution. Calcium may antagonize vasodilatory action of verapamil.

### **Adverse Reactions**

Calcium may cause bradycardia, asystole, and hypotension.

### **Dosage**

**Adult Altered Mental Status:** *Contact medical control for consideration of calcium chloride for calcium channel blocker overdose.*

**Adult Hemodynamically Compromising Bradycardia:** *Contact medical control for orders to administer calcium chloride, if the patient has a history of chronic renal failure and either hemodialysis or peritoneal dialysis.*

**Adult Stable Tachycardia:** *Contact medical control for orders to administer calcium chloride, if the patient has a history of chronic renal failure and either hemodialysis or peritoneal dialysis.*

**Adult Unstable tachycardia:** *Contact medical control for orders to administer calcium chloride, if the patient has a history of chronic renal failure and either hemodialysis or peritoneal dialysis.*

**Adult Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT):** *Contact medical control for orders to administer calcium chloride, if the patient has a history of chronic renal failure and either hemodialysis or peritoneal dialysis.*

**Adult Asystole / Pulseless Electrical Activity:** *Contact medical control for orders to administer calcium chloride, if the patient has a history of chronic renal failure and either hemodialysis or peritoneal dialysis.*

**Pediatric Altered Mental Status:** *Contact medical control for consideration of calcium chloride for calcium channel blocker overdose.*

## **CALCIUM GLUCONATE**

### **Calcium Gluconate**

**Name** – Gluconate®

**Class** – Antidotes, other; calcium salts

**Pharmacologic Action** - Bone mineral component; cofactor in enzymatic reactions, essential for neurotransmission, muscle contraction, and many signal transduction pathways

**Indications** - For use in topical burns (hydrofluoric acid) or for use in calcium channel blocker overdose

**Contraindications** – Hypercalcemia, documented hypersensitivity, sarcoidosis, and life-threatening cardiac arrhythmias may occur in known or suspected severe hypokalemia

**WARNING:** There is a risk for digitalis toxicity

### **Warnings**

SQ or IM administration can cause severe tissue necrosis and tissue sloughing. Can induce serious cardiac dysrhythmias.

### **Drug Interactions**

None known in this setting.

### **Adverse Reactions**

Usually adverse reactions are seen in calcium over dosage. Clinical manifestation includes constipation, mouth drying, headache, anxiety, thirst, appetite loss, depression, metal taste, fatigue, and weakness. In fast parenteral injection nausea, vomiting, diarrhea, bradycardia, hypotension and, rarely, collapse may appear.

### **Dosage: TOXMEDIC**

#### **Hydrofluoric Acid Exposure:**

For Hydrofluoric acid skin burns apply topical calcium gluconate gel after copious skin irrigation.

Consider subcutaneous injection of calcium gluconate 0.5ml per cm<sup>2</sup> titrated to pain relief.

Consider IV calcium gluconate 10 – 30mls titrated to control cardiac dysrhythmias.

## **DEXAMETHASONE (DECADRON®)**

**Name** – Decadron®, Dexasone®

**Class** – Corticosteroid, anti-inflammatory drugs

**Pharmacologic Action** - Potent glucocorticoid with minimal to no mineralocorticoid activity

Decreases inflammation by suppressing migration of polymorphonuclear leukocytes (PMNs) and reducing capillary permeability; stabilizes cell and lysosomal membranes, increases surfactant synthesis, increases serum vitamin A concentration, and inhibits prostaglandin and proinflammatory cytokines; suppresses lymphocyte proliferation through direct cytolysis, inhibits mitosis, breaks down granulocyte aggregates, and improves pulmonary microcirculation

**Indications** - Used in the management of croup and bronchospasm, as well as the management of patients suffering from high altitude cerebral edema (HACE)

**Contraindications** – Documented hypersensitivity, systemic fungal infection, cerebral malaria

**Warnings** - Risks to the fetus if used in pregnancy are unknown. 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.

### **Drug 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 with potassium-depleting diuretics.

### **Adverse Reactions**

Adverse reactions may include anaphylaxis, hypertension, weakness, seizures, headache, and nausea.

### **Dosage and Routes of Administration**

By protocol, dexamethasone may be substituted for methylprednisolone, 20 mg of dexamethasone for 125 mg of methylprednisolone

Conversion Chart for Dexamethasone as approved by EMS Medical Director

Methylprednisolone		Dexamethasone
20 mg	Give	4 mg
40 mg	Give	8 mg
60 mg	Give	12 mg
125 mg	Give	20 mg

## **DEXTROSE**

**Name** – D50W, DGlucose®, glucose

**Class** – Glucose-elevating agents; metabolic and endocrine, other *All Rights Reserved* V.11-14 262

**Pharmacologic Action** - Parenteral dextrose is oxidized to carbon dioxide and water, and provides 3.4 kilocalories/gram of d-glucose. Dextrose administration results in a rapid increase in blood glucose.

**Indications** – Used for the management of hypoglycemia

**Contraindications** - Hyperglycemia, anuria, diabetic coma, intracranial or intraspinal hemorrhage, dehydrated patients with delirium, glucose-galactose malabsorption syndrome, and documented hypersensitivity

### **Warnings**

Extravasation may result in tissue necrosis. Dextrose may worsen hyperglycemia and may induce acute thiamine deficiency (Wernicke-Korsakoff syndrome) in malnourished patients and chronic alcoholics.

### **Drug Interactions**

There are no known drug interactions.

### **Adverse Reactions**

Adverse reactions may include warmth, pain, burning, or phlebitis secondary to injection.

### **Dosage**

**Adult Altered Mental Status:** If blood sugar is less than 60 mg/dl, administer up to 25 g of dextrose IV. *Dextrose may be mixed in a 100 ml bag of NSS and run wide open as an alternative to direct push of D50.*

**Adult Suspected Stroke:** If blood sugar is less than 60 mg/dl, administer up to 25 g of dextrose IV.

**Adult Seizures (Active):** If blood sugar is less than 60 mg/dl, administer up to 25 g of dextrose IV.

**Pediatric Altered Mental Status:** If blood sugar is less than 60 mg/dl (40 mg/dl for neonate) via glucometer, administer 0.5 g/kg dextrose IV at the following dilutions (max dose 25 g):

- Dextrose 25% (D<sub>25</sub>) at 2 ml/kg
- Dextrose 10% (D<sub>10</sub>) at 5 ml/kg for neonates

**Pediatric Seizures (ACTIVE):** If blood sugar is less than 60 mg/dl (40 mg/dl for neonate) via glucometer, administer 0.5 g/kg dextrose IV at the following dilutions (max dose 25 g):

- Dextrose 25% (D<sub>25</sub>) at 2 ml/kg
- Dextrose 10% (D<sub>10</sub>) at 5 ml/kg for neonates

**DIAZEPAM (VALIUM®)**

**Name** – Valium®, Diastat®, AcuDial®

**Class** – Benzodiazepine, anticonvulsants, skeletal muscle relaxants, anxiolytic

**Pharmacologic Action** - Modulates postsynaptic effects of GABA-A transmission, resulting in an increase in presynaptic inhibition. Appears to act on part of the limbic system, as well as on the thalamus and hypothalamus, to induce a calming effect

**Indications** – For use in agitated or violent patients, as well as for the management of seizures

**Contraindications** – Documented hypersensitivity, severe respiratory depression

**Warnings**

See drug interactions below.

**Drug Interactions**

Diazepam may result in significant CNS depression when administered with other CNS depressants. Diazepam should not be administered with other IV medications as it may form a precipitate.

**Adverse Reactions**

Adverse reactions may include hypotension, tachycardia, respiratory depression, confusion, nausea, and impairment.

**Dosage: Toxmedic**

**Cholinesterase Inhibitor Exposure:** If the patient is exhibiting seizure activity, administer 10 mg Valium IM via autoinjector.

## **DILTIAZEM HYDROCHLORIDE (CARDIZEM®)**

**Name** – Includes Cardizem®, Dilacor®, Diltiaz®

**Class** – Calcium channel blocker, antidysrhythmic type IV

**Pharmacologic Action** - Inhibits extracellular calcium ion influx across membranes of myocardial cells and vascular smooth muscle cells, resulting in inhibition of cardiac and vascular smooth muscle contraction and thereby dilating main coronary and systemic arteries; no effect on serum calcium concentrations; substantial inhibitory effects on cardiac conduction system, acting principally at AV node, with some effects at sinus node

**Indications** – For management of narrow complex tachycardias

**Contraindications** – Documented hypersensitivity, Wolff-Parkinson-White syndrome, Lown-Ganong-Levine syndrome, symptomatic severe hypotension (systolic BP < 90 mm Hg), sick sinus syndrome (if no pacemaker), second and third degree heart block (if no pacemaker present), and complete heart block. Contraindications for IV administration: Use in newborns (because of benzyl alcohol), concomitant beta-blocker therapy, cardiogenic shock, ventricular tachycardia (must determine whether origin is supraventricular or ventricular)

### **Warnings**

Prolongation of AV node conduction may result in second- or third-degree AV block. Diltiazem should not be administered to patients with a compromised myocardium, i.e. those with severe CHF, AMI, or cardiomyopathy. Use caution when giving diltiazem to hypotensive patients. Diltiazem may result in hepatic injury.

### **Drug Interactions**

Intravenous diltiazem and beta blockers should not be administered together or within a few hours. Diltiazem may potentiate the effects of anesthetics on cardiac contractility, conductivity, and automaticity. Diltiazem may elevate levels of carbamazepine (Tegretol®), which could result in toxicity. Use Diltiazem (Cardizem) with caution when patients are on digoxin.

### **Adverse Reactions**

Adverse reactions to diltiazem may include hypotension, asystole, AV block, bradycardia, chest pain, CHF, ventricular arrhythmias, flushing, injection site reactions, nausea, vomiting, and dizziness.

### **Dosage**

**Adult Stable Tachycardia: If the rhythm is a narrow complex tachycardia, other than sinus tachycardia, atrial fibrillation or atrial flutter, at a rate exceeding 150 bpm:**

- Administer 0.25 mg/kg diltiazem (Cardizem®) IV (maximum dose is 25 mg) over 2 minutes. If there is no response to the initial dose of diltiazem after 15 minutes, **contact medical control** for consideration of administration of 0.35 mg/kg diltiazem IV (maximum dose of 35 mg) over 2 minutes.

**Adult Stable Tachycardia: If the rhythm is a narrow complex atrial fibrillation or atrial flutter at a sustained rate exceeding 120 bpm and the patient is without signs or symptoms of congestive heart failure:**

- o Administer 0.25 mg/kg diltiazem (Cardizem®) IV (maximum dose is 25 mg) over 2 minutes. If there is no response to the initial dose of diltiazem after 15 minutes, contact medical control for consideration of administration of 0.35 mg/kg diltiazem IV (maximum dose of 35 mg) over 2 minutes.

## **DIPHENHYDRAMINE HYDROCHLORIDE (BENADRYL®)**

**Name** – Benadryl®

**Class** - Antihistamine – first generation

**Pharmacologic Action** - Histamine H<sub>1</sub>-receptor antagonist of effector cells in respiratory tract, blood vessels, and GI smooth muscle

**Indications** – For urticarial and/or pruritis in the management of patients suffering from allergic reaction as well as for the management of patents suffering from dystonia/akasthesia

**Contraindications** – Documented hypersensitivity, use controversial in lower respiratory tract disease (such as acute asthma), premature infants and neonates *All Rights Reserved V.11-14 263*

### **Description**

Diphenhydramine is an antihistamine.

### **Pharmacology**

Diphenhydramine prevents the symptomatic physiologic effects of histamine by blocking H<sub>1</sub> and H<sub>2</sub> receptor sites.

### **Warnings**

Diphenhydramine should be used with caution in patients with severe vomiting, asthma, and alcohol intoxication.

### **Drug Interactions**

MAO inhibitors may prolong and potentiate diphenhydramine.

### **Adverse Reactions**

Adverse reactions may include drowsiness, thickening of bronchial secretions, hypotension, tachycardia, bradycardia, and dry mouth.

### **Dosage**

**Adult Allergic Reactions: Moderate:** Consider the administration of 25-50 mg diphenhydramine (Benadryl®) IV, IM, or PO.

**Adult Allergic Reactions: Severe:** Administer 50 mg diphenhydramine (Benadryl®) IV. If unable to obtain intravenous access, diphenhydramine may be given IM.

**Pediatric Allergic Reactions: Moderate:** In patients over the age of two (2) years, consider the administration of 12.5 - 25 mg diphenhydramine (Benadryl®) PO without the necessity of intravenous access.

**Pediatric Allergic Reactions: Severe:** Administer 1 mg/kg diphenhydramine (Benadryl®) IV, or IM (maximum dose is 50 mg).

## **DOPAMINE HYDROCHLORIDE (INTROPIN®)**

**Name** - Intropin®

**Class** – Inotropic agent; catecholamine; pressor

**Pharmacologic Action** - Endogenous catecholamine, acting on both dopaminergic and adrenergic neurons. Low dose stimulates mainly dopaminergic receptors, producing renal and mesenteric vasodilation; higher dose stimulates both beta-1-adrenergic and dopaminergic receptors, producing cardiac stimulation and renal vasodilation; large dose stimulates alpha-adrenergic receptors

**Indications** – As a pressor agent used in the management of shock

**Contraindications** - Hypersensitivity to dopamine, pheochromocytoma, ventricular fibrillation, uncorrected tachyarrhythmias

**WARNING:** Dopamine is a vesicant and can cause severe tissue damage if extravasation occurs

### **Warnings**

At high doses, dopamine may cause profound vasoconstriction which may compromise blood flow to vital organs or extremities. Dopamine may result in increased myocardial oxygen demand and may also promote supraventricular and ventricular arrhythmias. Do not add dopamine to an alkaline solution since the drug is inactivated in alkaline solution. Patients with pheochromocytoma are extremely sensitive to dopamine and may develop profound hypertension in response to minimal doses.

The recommended adult doses via IV drip are as follows:

- For a dopaminergic response: 1 – 2 mcg/kg/min
- For a beta adrenergic response: 2 – 10 mcg/kg/min
- For an alpha adrenergic response: 10 – 20 mcg/kg/min

### **Drug Interactions**

Patients receiving monoamine oxidase (MAO) inhibitors are extremely sensitive to the effects of dopamine and should receive a much lower dose than is usually given.

### **Adverse Reactions**

Adverse reactions may include nausea, vomiting, tachycardia, anginal pain and hypertension.

### **Dosage**

**Adult Non-Traumatic Hypotension:** Consider a 5-20 mcg/kg/min dopamine infusion for continued hypotension not due to hypovolemia.

**Adult Sepsis:** Consider a 10-20 mcg/kg/min dopamine infusion for continued hypotension not due to hypovolemia.

**Adult Hemodynamically Compromising Bradycardia:** Consider a 5-20 mcg/kg/min dopamine infusion for continued hypotension not due to hypovolemia.

**Pediatric Shock and Hypotension:** **Contact medical control** for consideration of additional fluid bolus and/or a 5-20 mcg/kg/min dopamine infusion for continued hypotension not due to hypovolemia.

**Pediatric and Adult Post Resuscitation Care with Induced Hypothermia:** Maintain a MAP of 90-100 mmHg using a 10-20 mcg/kg/min Dopamine infusion.

*The infusion rate for both adults and pediatrics should be adjusted to blood pressure and clinical response in the prehospital setting.*

## **DUODOTE™**

### **Description**

The DuoDote Auto-Injector provides a single intramuscular dose of atropine and pralidoxime chloride. It is to be used as a self-administered therapy for symptomatic exposure to anticholinergic nerve agents and organophosphorus pesticides.

Each DuoDote Auto-Injector contains 2.1 mg. of Atropine Sulfate and 600 mg of Pralidoxime Chloride.

### **Pharmacology**

Atropine competitively blocks the effects of acetylcholine at muscarinic cholinergic receptors on smooth muscle, cardiac muscle, secretory gland cells and in peripheral autonomic ganglia and the central nervous system.

Pralidoxime reactivates acetylcholinesterase which has been inactivated by phosphorylation due to some organophosphorus nerve agents or pesticides. Pralidoxime does not reactivate phosphorylated acetylcholinesterase that has undergone the aging process.

**Indications** - DuoDote is indicated for the treatment of poisoning by organophosphorus nerve agents and pesticides.

### **Onset/Duration**

Onset of action for both drugs is rapid (peak effect achieved in  $\leq 5$  minutes). Both drugs last for approximately an hour.

**Contraindications** - None in the presence of life-threatening organophosphorus poisoning.

**Warnings** Pralidoxime is secreted in the urine – impaired renal function may result in higher blood levels.

### **Drug Interactions**

When administered together, pralidoxime may potentiate the effects of atropine. This could result in signs of atropinization (flushing, mydriasis, tachycardia, dryness of mouth and nose) occurring earlier than when atropine is given alone.

Succinylcholine is metabolized by cholinesterases. Since pralidoxime reactivates cholinesterase, use of pralidoxime may accelerate reversal of neuromuscular blocking effects of succinylcholine.

### **Adverse Reactions**

Temporary hypertension caused by pralidoxime.

Signs of atropinization may occur earlier when both drugs given together

### **Dosage and Routes of Administration**

Moderate symptoms: Administer 1 DuoDote IM  
Severe symptoms: Administer 3 DuoDotes IM

## **EPINEPHRINE**

### **Epinephrine**

**Name** – EpiPen®, TwinJect®, AdrenaClick®, Auvi-Q, Adrenalin®, AsthmaNefrin®, Vaponefrin®

**Class** - Alpha/beta adrenergic agonist

**Pharmacologic Action** - Strong alpha-adrenergic effects, which cause an increase in cardiac output and heart rate, a decrease in renal perfusion and peripheral vascular resistance, and a variable effect on BP, resulting in systemic vasoconstriction and increased vascular permeability. Strong beta-1- and moderate beta-2-adrenergic effects, resulting in bronchial smooth muscle relaxation

Secondary relaxation effect on smooth muscle of stomach, intestine, uterus, and urinary bladder

**Indications** – For use in the management of patients suffering anaphylaxis, shock, cardiac arrest, bradycardia, or in the nebulized form for croup/bronchiolitis and IM form for refractory acute asthma

**Contraindications** – Hypersensitivity, cardiac dilatation and coronary insufficiency *All Rights Reserved*  
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### **Warnings**

Epinephrine causes a dramatic increase in myocardial oxygen demand and its use in the setting of an acute MI should be restricted to cardiac arrest.

### **Drug Interactions**

Do not mix with sodium bicarbonate as this inactivates epinephrine. MAO inhibitors and bretylium may potentiate epinephrine. Beta antagonists may negatively affect epinephrine. Sympathomimetics and phosphodiesterase inhibitors may act as proarrhythmics in conjunction with epinephrine.

### **Adverse Reactions**

Adverse reactions may include headache, nausea, restlessness, weakness, dysrhythmias, hypertension, and angina.

### **Dosage**

**Adult Allergic reactions (Severe):** Give 0.3 - 0.5 mg epinephrine (1:1,000) IM, may repeat every 5 minutes times three (3), as needed. Reassess patient -- if acute respiratory obstruction persists or systolic blood pressure is less than 90 mmHg with clinical evidence of shock, consider administration of 0.25 mg epinephrine (1:10,000)\* IV over a one-minute interval. *\*Epinephrine 0.25 mg (1:10,000) may be mixed in a 100 ml bag of NSS and run wide open as an alternative to direct push of epinephrine.*

**Adult Hemodynamically Compromising Bradycardia:** Consider epinephrine IV infusion at 2-10 mcg per minute.

**Adult Ventricular Fibrillation (VF) and/or pulseless Ventricular Tachycardia (VT):** Administer 1 mg epinephrine (1:10,000) IV. Repeat 1 mg epinephrine (1:10,000) IV every 3-5 minutes if VF or pulseless VT persists.

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**Adult Asystole/Pulseless electrical activity (PEA):** Administer 1 mg epinephrine (1:10,000) IV. Repeat 1 mg epinephrine (1:10,000) IV every 3 to 5 minutes if asystole or PEA continues.

**Pediatric Acute Respiratory Distress:** Consider the administration of 0.01 mg/kg epinephrine 1:1,000 IM for patients in severe respiratory distress (maximum dose of intramuscular epinephrine is 0.3 mg). For patients suspected of having croup, consider administration of up to 6ml nebulized saline for inhalation. For continued distress, **contact medical control** for consideration of the administration of 5 ml of epinephrine 1:1,000 via nebulizer.

**Pediatric Allergic Reaction (Severe):** Give 0.15 - 0.3 mg epinephrine (1:1,000) IM, may repeat every 5 minutes times three (3), as needed. **Call Medical Control** for consideration of administration of 0.01 mg/kg (0.1 ml/kg) epinephrine (1:10,000), (maximum 0.25 mg) IV over a one-minute interval if no response to IM epinephrine. If respiratory distress and clinical shock are still present and there is no evidence of supraventricular tachycardia, ventricular ectopy, or ventricular tachycardia: repeat 0.01 mg/kg epinephrine 1:10,000, (maximum 0.25 mg) IV over a one-minute interval. *\*Epinephrine 0.25 mg (1:10,000) may be mixed in a 100 ml bag of NSS and run wide open as an alternative to direct push of epinephrine.*

**Pediatric Bradycardia:** Administer 0.01 mg/kg epinephrine (1:10,000) IV. Repeat every 3-5 minutes.

**Pediatric Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT):** Administer 0.01 mg/kg epinephrine (1:10,000) IV. Repeat every 3-5 minutes for the duration of resuscitation.

**Pediatric Asystole / Pulseless Electrical Activity (PEA):** Administer 0.01 mg/kg epinephrine (1:10,000) IV. Repeat epinephrine every 3-5 minutes.

## **ETOMIDATE (AMIDATE®)**

**Description** - Etomidate is a general anesthetic and hypnotic without analgesic properties.

**Pharmacology** - Etomidate appears to act similar to GABA by depressing the activity of the brain stem reticular activating system.

**Indications** - Etomidate is indicated for induction of general anesthesia and sedation of critically ill patients and prior to cardioversion or intubation.

### **Onset/Duration**

Onset occurs within one minute and lasts 3-10 minutes.

**Contraindications** - Etomidate is contraindicated in known hypersensitivity.

### **Warnings**

Etomidate is not intended for prolonged infusion due to suppression of cortisol and aldosterone production. **Causes respiratory paralysis; supportive airway control must be continuous and under direct observation at all times.**

### **Drug Interactions**

The most common interaction of etomidate with many prescription medications, such as alpha blockers, beta blockers, and antipsychotics, to name a few, is the increased risk of hypotension. Administration of etomidate to patients taking Verapamil may also result in increased hypotension as well as AV delay.

### **Adverse Reactions**

Adverse reactions may include myoclonic skeletal muscle movements, post-operative nausea and vomiting, pain at the injection site, apnea, hypoventilation or hyperventilation, laryngospasm, hypertension or hypotension, and tachycardia or bradycardia.

### **Dosage**

**Adult unstable tachycardia:** Consider, only if IV is already established, the administration of up to 0.1 mg/kg (up to a max of 10 mg) etomidate (Amidate®) IV prior to cardioversion of an alert patient.

**Pediatric unstable tachycardia:** Consider sedation but not to delay cardioversion, 0.2mg/kg etomidate (Amidate®) to a max dose of 10mg.

#### **Pediatric and Adult Airway Management:**

**Not utilizing DFI:** For systems not utilizing DFI, **contact medical control** for consideration of administration of up to 0.4 mg/kg etomidate (Amidate®) IV as needed prior to intubation.

**Pediatric and Adult Airway Management: Utilizing DFI:** Administer 20 mg etomidate (Amidate®) IV, for large patients consider up to 0.3 mg/kg etomidate IV. For pediatric patients 0.3 mg/kg with a maximum dose of 20 mg.

## **FENTANYL CITRATE (SUBLIMAZE®)**

### **Fentanyl**

**Name** –Currently only available in the generic form (formerly Sublimaze®)

**Class** – Synthetic opioid, opioid analgesics

**Pharmacologic Action** - Narcotic agonist-analgesic of opiate receptors; inhibits ascending pain pathways, thus altering response to pain; increases pain threshold; produces analgesia, respiratory depression, and sedation

**Indications** – Management of acute pain

**Contraindications** – Hypersensitivity

**WARNING:** Should be used with caution in the elderly and in patients with hypotension, suspected gastrointestinal obstruction, head injury, and concomitant CNS depressants

### **Warnings**

Fentanyl citrate may result in respiratory depression. It has been rarely linked to muscle rigidity, particularly involving the muscles of respiration. This rigidity has been reported to occur or recur infrequently in the extended postoperative period usually following high dose administration.

### **Drug Interactions**

Fentanyl citrate may be potentiated by CNS depressants. Paradoxical excitation may result if given in conjunction with MAO inhibitors.

### **Adverse Reactions**

Adverse reactions may include bradycardia, restlessness, circulatory depression, respiratory depression, and euphoria.

### **Dosage**

**Adult Acute Coronary Syndromes (ACS):** consider administration of up to 200 mcg fentanyl (administered in up to 100 mcg increments given every five (5) minutes).

**Adult ST Elevation Myocardial Infarction (STEMI):** Consider administration of up to 200 mcg fentanyl (administered in up to 100 mcg increments given every five (5) minutes.) if systolic BP is greater than 100 mmHg (may be administered as soon as IV is established).

**Adult Pain Management:** For moderate to severe pain, consider administration of 50 - 100 mcg Fentanyl IV/IM/IN. After five (5) minutes and with continued moderate to severe pain, administer 50 - 100 mcg Fentanyl IV/IM/IN. Contact medical control for additional doses of Fentanyl.

**Pediatric Pain management:** For moderate to severe pain, consider administration of 2 mcg/kg Fentanyl IV/IM/IN up to a max dose of 50 mcg. For continued moderate to severe pain, may administration of an additional 2 mcg/kg Fentanyl IV/IM/IN to a max dose of 50 mcg in five (5) minutes. Contact medical control for additional doses of Fentanyl.

## **FUROSEMIDE (LASIX®)**

**Description** - Furosemide is a potent loop diuretic.

**Pharmacology** - Furosemide inhibits reabsorption of sodium in the proximal tubule and descending loop of Henle.

**Indications** - Furosemide is indicated for acute pulmonary edema and congestive heart failure.

**Contraindications** - Furosemide is contraindicated in known hypersensitivity, anuria, hypovolemia, dehydration, and electrolyte depletion.

### **Warnings**

The administration of furosemide may aggravate dehydration, hypovolemia, hypotension, hypersomolality, and hypokalemia.

### **Drug Interactions**

Furosemide may result in sodium and potassium depletion and may potentiate digitalis and lithium toxicity.

### **Adverse Reactions**

Adverse reactions may include hypotension, ECG changes, chest pain, hypokalemia, hyponatremia, and hyperglycemia.

### **Dosage**

**Adult Pulmonary Edema due to Congestive Heart Failure:** consider the administration of furosemide IV in a dose equivalent to the patient's **total** daily dose (maximum furosemide dose is up to 100 mg. Withhold if systolic blood pressure is less than 120 mmHg. **Contact medical control to administer doses in excess of 100 mg IV or if the patient is not on furosemide.** If the daily dose is unknown, administer 40 mg furosemide IV.

## **GLUCAGON**

**Name** – GlucaGen®, Glucagon Emergency Kit®, GlucaGen HypoKit®

**Class** - Hypoglycemia antidotes, glucose-elevating agents, other antidotes (e.g. beta-blocker or calcium channel blocker overdose)

**Pharmacologic Action** - Insulin antagonist. Stimulates cAMP synthesis to accelerate hepatic glycogenolysis and gluconeogenesis. Glucagon also relaxes smooth muscles of GI tract

**Indications** – For the management of hypoglycemic patients as well as patients suffering symptomatic bradycardia after beta blocker or calcium channel blocker overdose

**Contraindications** – Hypersensitivity, pheochromocytoma, insulinoma

**WARNING:** Nausea and vomiting are common adverse effects following the administration of glucagon

### **Drug Interactions**

There are no known drug interactions with glucagon.

### **Adverse Reactions**

Glucagon may cause nausea and vomiting.

### **Dosage**

**Adult Altered Mental Status:** If blood sugar is less than 60 mg/dl by glucometer and intravenous access is not obtainable, administer 1 mg glucagon IM, IN. Contact medical control for consideration of glucagon for beta blocker overdose. *If a glucometer fails or is not immediately available, proceed with appropriate dosage Glucagon.*

**Adult Suspected Stroke:** Administer 1mg Glucagon IM, IN if the blood sugar is less than 60 mg/dl and an IV cannot be established.

**Adult seizures (active):** Administer 1mg Glucagon IM, IN if the blood sugar is less than 60 mg/dl and an IV cannot be established.

**Adult Hemodynamically compromising Bradycardia:** *Contact medical control for consideration of glucagon IV if a beta-blocker overdose is suspected.*

**Pediatric Altered Mental Status:** Administer glucagon dose is 0.5 mg if the pt. is < 20 kg or 1mg if ≥ 20 kg IM, if unable to obtain intravenous access. Contact medical control for consideration of glucagon for beta blocker overdose. *If a glucometer fails or is not immediately available, proceed with appropriate dosage Glucagon.*

**Pediatric seizures (active):** Administer glucagon dose is 0.5 mg if the patient is < 20 kg or 1mg if ≥ 20 kg IM, if unable to obtain intravenous access.

## **HALOPERIDOL (HALDOL®)**

**Name** – Haldol®, Haldol Decanoate®, Haloperidol LA®, Peridol®

**Class** – First generation antipsychotic

**Pharmacologic Action** - Antagonizes dopamine-1 and dopamine-2 receptors in brain; depresses reticular activating system and inhibits release of hypothalamic and hypophyseal hormones

**Indications** – For the management of acute psychosis or agitated/violent behavior refractory to non-pharmacologic interventions

**Contraindications** – Documented hypersensitivity, Severe CNS depression (including coma), neuroleptic malignant syndrome, poorly controlled seizure disorder, Parkinson's disease *All Rights Reserved V.11-14*  
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**WARNING:** Risk of sudden death, torsades de pointes, and prolonged QT interval from off-label IV administration of higher than recommended dose. Continuous cardiac monitoring is required if administering IV

### **Drug Interactions**

Haldol is also contraindicated in patients who are taking Talwin®. Talwin® is a potent analgesic combination; its use with haloperidol will result in additive depression. Antihypertensive medications may have an additive effect with haloperidol, increasing the possibility of orthostatic hypotension.

### **Adverse Reactions**

Adverse reactions may include physical and mental impairment, dystonic reactions, akathisia, dry mouth, blurred vision, and orthostatic hypotension.

### **Dosage**

**Patient Restraint:** Administration of up to 2.5-5 mg (use lower dose for elderly) haloperidol (Haldol®) IM/IV for sedation. Call medical control for haloperidol (Haldol) dosing for patients ≤ 3 yrs.

## **HYDROXOCOBALAMIN (CYANOKIT®)**

**Name** – Cyanokit®

**Class** – Cyanide antidote

**Pharmacologic Action** - Vitamin B12 with hydroxyl group complexed to cobalt which can be displaced by cyanide resulting in cyanocobalamin that is renally excreted

**Indications** – For the management of cyanide toxicity

**Contraindications** – Documented hypersensitivity

*WARNING:* Will cause discoloration of the skin and urine, can interfere with pulse oximetry. Due to its interference with certain diagnostic blood tests, the performance of prehospital phlebotomy is preferable prior to the administration of hydroxocobalamin

### **Drug Interactions**

Administration of the following drugs through the same IV line as hydroxocobalamin may result in particle formation: diazepam, dopamine, and fentanyl. Chemical incompatibility was observed with sodium thiosulfate, sodium nitrite and ascorbic acid.

### **Adverse Reactions**

Red colored urine, redness at the infusion site and erythema were frequently reported. Other adverse reactions include: hypertension, rash, nausea, headache, dizziness.

### **Dosage**

**Pediatric and Adult Smoke Inhalation:** If patient remains unconscious or in cardiac arrest, consider administration of 5 g (2.5 g for children ages 3 to 12 years, and 1.25 g for children 3 years of age and younger) hydroxocobalamin (Cyanokit®) over 15 minutes if available.

- Prior to administering hydroxocobalamin:
  - Draw venous blood sample
  - Estimate body surface area burn percentage

Contact medical control for the consideration of direct transport to a hyperbaric center with emergent hyperbaric capabilities.

## **IPRATROPIUM BROMIDE (ATROVENT®)**

**Name** – Atrovent®

**Class** – Anticholinergics, respiratory

**Pharmacologic Action** - Anticholinergic (parasympatholytic) agent; inhibits vagally mediated reflexes by antagonizing acetylcholine action; prevents increase in intracellular calcium concentration that is caused by interaction of acetylcholine with muscarinic receptors on bronchial smooth muscle

**Indications** – For the management of asthma and COPD

**Contraindications** - Documented hypersensitivity to ipratropium, atropine, or derivatives.

### **Warnings**

Ipratropium bromide should be used with caution in patients with hepatic and renal insufficiency due to lack of research. It should also be used with caution in patients with narrow-angle glaucoma, prostatic hypertrophy, and bladder obstruction.

### **Drug Interactions**

There are no known drug interactions with ipratropium bromide.

### **Adverse Reactions**

Side effects may include palpitations, dizziness, anxiety, headache, eye pain, urinary retention, and nervousness.

### **Dosage**

**Adult Acute Respiratory Distress:** Consider the administration of 0.5 mg nebulized ipratropium bromide (Atrovent®) with albuterol.

**Pediatric Acute Respiratory Distress:** If the patient who is short of breath has a history of asthma or is actively wheezing, administer up to <10kg - 1.25mg, 10-20 kg - 2.5mg, >20kg – 5mg of albuterol via nebulized aerosol in combination with nebulized ipratropium bromide (Atrovent®) using the following scale:

- <12 yrs. 0.25 mg
- ≥12 yrs. 0.5 mg

**LABETALOL (Trandate®)**

**Class** - Beta adrenergic antagonist, antianginal, antihypertensive

**Pharmacologic Action** - Binds with both the beta<sup>1</sup> and beta<sup>2</sup> receptors and alpha<sup>1</sup> receptors in vascular smooth muscle. Inhibits the strength of the heart's contractions, as well as heart rate. This results in a decrease in cardiac oxygen consumption.

**Indications** - ACS, SVT, severe hypertension.

**Contraindications** - Hypotension, cardiogenic shock, acute pulmonary edema, heart failure, severe bradycardia, sick sinus syndrome, second- or third-degree heart block, asthma or acute bronchospasm, cocaine-induced ACS, known sensitivity. Use caution in Pheochromocytoma, cerebrovascular disease or stroke, poorly controlled diabetes, with hepatic disease. Use with caution at lowest effective dose in chronic lung disease.

**Adverse Effects** - Usually mild and transient; hypotensive symptoms, nausea/vomiting, bronchospasm, arrhythmia, bradycardia, AV block.

**Dosage**

**Adult Hypertensive Crisis:** Contact medical control for consideration of the administration of 10 mg Labetalol (Trandate®) IV slowly over two (2) minutes. Reassess vital signs. If after ten (10) minutes of initial dose the diastolic BP remains  $\geq 120$  mmHg, contact medical control for the consideration of administration of a repeat dose of 10-20 mg Labetalol (Trandate®) IV slowly over two (2) minutes.

*Withhold Labetalol for CHF, any heart block, bradycardia, suspected cocaine abuse, patients in cardiogenic shock, CVA, or asthmatics.*

**LEVALBUTEROL HYDROCHLORIDE (Xopenex®)**

**Description** - This drug is classified as a sympathomimetic bronchodilator.

**Pharmacology** - Beta-adrenergic agonist causing bronchodilation and relaxation of smooth muscles of all airways.

**Indications** - Treatment for bronchospasm

**Onset/Duration** - Duration of up to 8 hours.

**Contraindications** - Hypersensitivity to Xopenex or racemic albuterol.

**Warnings**

Should be discontinued if QT prolongation, ST segment depression, paradoxical bronchospasm or hypersensitivity reaction occurs, such as urticaria, angioedema, rash or oral edema.

**Drug Interactions**

Can have undesirable effects with beta-blockers, diuretics and digoxin. Patients taking Monoamine Oxidase Inhibitors (MAOI's) and Tricyclic antidepressants (TCA's) should have been discontinued for 2 weeks prior to administration of Levalbuterol.

**Adverse Reactions**

Adverse reactions may include: tachycardia, arrhythmias, anginal pain, restlessness, anxiety dizziness, headache, and hypokalemia.

**Dosage**

**Adult Acute Respiratory Distress:** *For patients prescribed and taking levalbuterol (Xopenex®) via nebulizer, the substitution of the patient's own medication in place of albuterol is acceptable.*

*Usual Xopenex doses: 0.31 mg/3 ml; 0.63 mg/3 ml; 1.25 mg/3 ml*  
Levalbuterol (Xopenex®)..... may be substituted for albuterol (1 unit dose for 1)

**Pediatric Acute Respiratory Distress:** *For patients prescribed and taking levalbuterol (Xopenex®) via nebulizer, the substitution of the patient's own medication in place of albuterol is acceptable.*

*Usual Xopenex doses: 0.31 mg/3 ml; 0.63 mg/3 ml; 1.25 mg/3 ml*  
Levalbuterol (Xopenex®)..... may be substituted for albuterol (1 unit dose for 1)

## **LIDOCAINE (XYLOCAINE®)**

**Name** – Lidocaine CV®, Lidopen®, Xylocaine®

**Class** – Class Ib antidysrhythmics *All Rights Reserved V.11-14 267*

**Pharmacologic Action** - Class 1b antidysrhythmic; combines with fast sodium channels and thereby inhibits recovery after repolarization, resulting in decreasing myocardial excitability and conduction velocity

**Indications** – For the management of refractory or recurrent ventricular fibrillation or pulseless VT

**Contraindications** - Hypersensitivity to lidocaine or amide-type local anesthetic, Adams-Stokes syndrome, SA/AV/intraventricular heart block in the absence of artificial pacemaker. CHF, cardiogenic shock, second and third degree heart block (if no pacemaker is present), Wolff-Parkinson-White Syndrome

### **Warnings**

Symptoms of lidocaine toxicity progress in the following predictable pattern. It begins with numbness of the tongue, lightheadedness, and visual disturbances and progresses to muscle twitching, unconsciousness, and seizures, then coma, respiratory arrest, and cardiovascular depression.

There are several conditions that increase the potential for lidocaine toxicity:

1. **Liver dysfunction** increases the risk of toxicity due to lidocaine being metabolized by the liver.
2. **Low protein** increases the risk of toxicity because lidocaine is protein bound.
3. **Acidosis** can also increase the risk of toxicity since acidosis increase the potential of lidocaine to dissociate from plasma proteins.

### **Drug Interactions**

Beta blockers may decrease metabolism of lidocaine. Cardiac depression may occur if given in conjunction with phenytoin (Dilantin®). Administration with procainamide may result in additive neurologic effects.

### **Adverse Reactions**

Adverse reactions may include lightheadedness, altered mental status, hypotension, and bradycardia.

### **Dosing**

**Adult General Patient Care:** (Intraosseous accesses post IO access) Administer 20 – 40 mg lidocaine IO over 1 minute in the conscious patient if not contraindicated.

**Pediatric and Adult Airway Management:** Pretreatment medications should be administered as soon as determined to be indicated. For suspected intracranial insult, administer 1.5 mg/kg lidocaine IV.

## **MAALOX**

### **Aluminum Hydroxide with Magnesium Hydroxide**

**Name** – Simethicone

**Class** – Antacid

**Pharmacologic Action** - They combine with stomach acid and neutralize it. Aluminum Hydroxide, Magnesium Hydroxide is available without a prescription.

**Indications** – Treat the symptoms of gas such as uncomfortable or painful pressure, fullness, and bloating.

**Contraindications** – Allergy or sensitivity

### **Warnings**

**Use with in patients with Renal insufficiency (magnesium) or gastric outlet obstruction.**

### **Drug Interactions**

Interferes with the absorption of benzodiazepines, chloroquine, digoxin, naproxen, mycophenolate, phenytoin, quinolones ( e.g. ciproflaxin), tetracyclines and Iron.

### **Adverse Reactions**

Side effects from Aluminum Hydroxide, Magnesium Hydroxide are not common. May cause constipation, decreased bowel motility, encephalopathy, and phosphorus depletion.

### **Dosage**

**Adult Acute respiratory Distress:** For mild respiratory distress, consider the administration of prednisone 60 mg PO in combination with Maalox<sup>®</sup> 50 mg or other PO fluid.

**Adult Allergic Reaction:** Consider the administration of prednisone 60 mg PO in combination with Maalox<sup>®</sup> 50 mg or other PO fluid.

**Pediatric Acute Respiratory Distress:** Consider the administration of prednisone 2 mg/kg PO (up to 60 mg) in combination with Maalox<sup>®</sup> or other PO fluid.

**Pediatric Allergic reaction:** Consider the administration of prednisone 2 mg/kg up to 60 mg PO in combination with Maalox<sup>®</sup> or other PO fluid.

## **MAGNESIUM SULFATE**

### **Magnesium sulfate**

**Name** - MgSO<sub>4</sub>

**Class** – Class V antidysrhythmic, electrolyte

**Pharmacologic Action** - Depresses CNS, blocks peripheral neuromuscular transmission, produces anticonvulsant effects; decreases amount of acetylcholine released at end-plate by motor nerve impulse. Slows rate of sino-atrial (SA) node impulse formation in myocardium and prolongs conduction time. Promotes movement of calcium, potassium, and sodium in and out of cells and stabilizes excitable membranes

**Indications** – For the management of torsades de pointes or for severe bronchoconstriction with impending respiratory failure, seizure during the third trimester of pregnancy or in the postpartum patient

**Contraindications** – Hypersensitivity, myocardial damage, diabetic coma, heart block, hypermagnesemia, hypercalcemia

### **Warnings**

Respiratory depression may occur with rapid intravenous administration.

### **Drug Interactions**

Magnesium sulfate may have additive CNS effects when administered with other CNS depressants.

### **Adverse Reactions**

Adverse reactions may include flushing, loss of tendon reflexes, impairment of mental and psychomotor function, confusion, and apnea with high doses.

### **Dosage and Routes of Administration**

**Adult Acute Respiratory Distress:** For pending respiratory failure consideration of administration of 2 g magnesium sulfate IV over 10 minutes for severe respiratory distress secondary to asthma or COPD.

**Adult Seizures (active):** Administer 5 g magnesium sulfate IV infused over 10 minutes for seizures secondary to eclampsia.

**Adult Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT):** Consider administration of 2 g magnesium sulfate IV if Torsade de Pointes is identified.

**Pediatric Acute Respiratory Distress: Contact medical control** for consideration of administration of 25 mg/kg magnesium sulfate (up to a max dose of 2 g) IV infused over 10 minutes for continued severe respiratory distress.

**Pediatric Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT):** Consider administration of 25 mg/kg magnesium sulfate IV if Torsade de Pointes is identified.

## **METHYLPREDNISOLONE SODIUM SUCCINATE (SOLU-MEDROL®)**

### **Methylprednisolone**

**Name** – Medrol®, Medrol Dosepak®, DepoMedrol®, SoluMedrol ®

**Class** – Corticosteroid, anti-inflammatory agent

**Pharmacologic Action** - Potent glucocorticoid with minimal to no mineralocorticoid activity. Modulates carbohydrate, protein, and lipid metabolism and maintenance of fluid and electrolyte homeostasis. Controls or prevents inflammation by controlling rate of protein synthesis, suppressing migration of polymorphonuclear leukocytes (PMNs) and fibroblasts, reversing capillary permeability, and stabilizing lysosomes at cellular level

**Indications** – For the management of acute bronchospastic disease as well as for adrenal insufficiency

**Contraindications** - Untreated serious infections, documented hypersensitivity, IM route is contraindicated in idiopathic thrombocytopenic purpura, traumatic brain injury (high doses)

### **Warnings**

Methylprednisolone should be used with caution in pregnant patients and patients with GI bleeding. It should also be used with caution in patients with diabetes mellitus, as hypoglycemic responses to insulin and oral hypoglycemic agents may be blunted. Hold steroids for suspected pneumonia, CHF or “metabolic hyperventilation” (DKA, sepsis, etc.).

### **Drug Interactions**

Potassium-depleting agents may potentiate hypokalemia induced by corticosteroids.

### **Adverse Reactions**

Adverse reactions may include headache, hypertension, sodium and water retention, hypokalemia, alkalosis, gastritis, and steroid-induced psychosis.

### **Dosage**

#### **Adult Acute Respiratory Distress:**

For moderate respiratory distress consider PO prednisone(60mg) or if IV established administer Solu-Medrol (125mg).

For severe respiratory distress secondary to asthma or COPD, administer 125 mg methylprednisolone (Solu-Medrol®) IV.

**Hold all steroids for suspected pneumonia, CHF or “metabolic hyperventilation” (DKA, sepsis, etc.).**

**Adult Allergic reaction (Severe):** Administer 125 mg methylprednisolone (Solu-Medrol®) IV.

**Pediatric Acute Respiratory Distress:** 2 mg/kg methylprednisolone (Solu-Medrol®) IV (up to a max dose of 125 mg) for severe respiratory distress secondary to asthma.

**Pediatric Allergic Reaction (Severe):** Administer 2 mg/kg methylprednisolone (Solu-Medrol®) IV up to a max dose of 125 mg.

## **MIDAZOLAM (VERSED®)**

**Name** – Versed®

**Class** - Anticonvulsants, other; antianxiety agent; anxiolytics; benzodiazepines

**Pharmacologic Action** - Binds receptors at several sites within the CNS, including the limbic system and reticular formation; effects may be mediated through gamma-aminobutyric acid (GABA) receptor system; increase in neuronal membrane permeability to chloride ions enhances the inhibitory effects of GABA; the shift in chloride ions causes hyperpolarization (less excitability) and stabilization of the neuronal membrane

**Indications** – For the management of seizures, uncontrolled shivering in hypothermia, and for the management of agitated or violent patients suffering behavioral emergencies

**Contraindications** - Documented hypersensitivity, severe respiratory depression, sleep apnea

### **Warnings**

Midazolam should be used with caution with patients with altered mental status. Respiratory depression may occur.

### **Drug Interactions**

Midazolam may be potentiated by CNS depressants, such as alcohol, narcotics, and barbiturates.

### **Adverse Reactions**

Adverse reactions may include lightheadedness, motor impairment, ataxia, impairment of mental and psychomotor function, confusion, slurred speech, and amnesia.

### **Dosage**

**Adult Seizures (active):** Administer up to 5 mg midazolam (Versed®) IV (slowly) for continued seizure activity. If unable to obtain intravenous access, midazolam should be given IM or IN. *Contact medical control for consideration of additional midazolam (Versed®) if the patient continues to have seizures following the initial dose.*

**Adult Hemodynamically Compromising Bradycardia:** If the patient is experiencing discomfort due to pacing and the systolic blood pressure is greater than or equal to 100 mmHg, administer up to 5 mg midazolam (Versed®) IV or IN for sedation.

**Pediatric Seizures (active):** Administer 0.2 mg/kg midazolam (Versed®) up to a max dose of 5 mg IV, IN, or IM for continued seizure activity.

**Pediatric and Adult Post Resuscitation Care with Induced Hypothermia:** For visible shivering. Administer up to 5 mg midazolam (Versed) may repeat in 10 minutes for a maximum dose of 10mg.

**Patient Restraint:** 2.5-5 mg (use lower dose for elderly) midazolam (Versed®) IV/IM/IN as a chemical restraint.

**Pediatric and Adult Airway management; Post Intubation Maintenance:** Consider the administration of up to 5 mg midazolam (Versed®) (0.2 mg/kg midazolam for patients under the age of 14 years) IV for continued sedation unless there is a systolic blood pressure less than 100 mmHg or as

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appropriate per Broselow tape for pediatric patients. A repeat dose is approved for continued sedation of patient if systolic blood pressure is >100 mmHg.

Rate the patient's neurological status (Glasgow Coma Scale). For continued paralysis of the intubated patient, consider administration of 0.1 mg/kg vecuronium. Vecuronium (in combination with up to 5 mg of midazolam (Versed<sup>®</sup>)) may be repeated once if the patient exhibits any signs of cessation of paralysis.

**Pediatric and Adult Airway management; Failed Intubation:** Consider sedation with up to 5 mg of midazolam (Versed<sup>®</sup>). With successful OEMS approved rescue airway device placement and with adequate ventilation and oxygenation, consider administration of 0.1 mg/kg vecuronium. Vecuronium (in combination with up to 5 mg of midazolam (Versed<sup>®</sup>)) may be repeated once if the patient exhibits any signs of cessation of paralysis.

## **MORPHINE SULFATE**

**Name** – MS Contin®, Avinza®, Depodur®, Duramorph®, Infumorph®, Astramorph®, Kadian®, MSO4

**Class** – Opioid analgesic

**Pharmacologic Action** - Narcotic agonist-analgesic of opiate receptors; inhibits ascending pain pathways, thus altering response to pain; produces analgesia, respiratory depression, and sedation; suppresses cough by acting centrally in medulla

**Indications** – Management of acute pain

**Contraindications** – Hypersensitivity, paralytic ileus, toxin-mediated diarrhea, respiratory depression, acute or severe bronchial asthma, upper airway obstruction, GI obstruction (extended release), hypercarbia (immediate release tablets/solution), upper airway obstruction (epidural/intrathecal), heart failure due to chronic lung disease, head injuries, brain tumors, deliriums tremens, seizure disorders, during labor when premature birth anticipated (injectable formulation), cardiac arrhythmia, increased intracranial or cerebrospinal pressure, acute alcoholism, use after biliary tract surgery, surgical anastomosis (suppository formulation)

### **Warnings**

Morphine sulfate may result in respiratory depression and hypotension (especially in patients who are volume depleted or those with increased systemic vascular resistance).

### **Drug Interactions**

Morphine sulfate may be potentiated by CNS depressants and chlorpromazine (Thorazine®). Paradoxical excitation may result if given in conjunction with MAO inhibitors.

### **Adverse Reactions**

Adverse reactions may include hypotension, tachycardia, bradycardia, palpitations, syncope, flushing, respiratory depression, and euphoria.

### **Dosage**

*If fentanyl is unavailable, morphine may be substituted for Fentanyl® (1 mg = 10 mcg).*

## **NALOXONE (NARCAN®)**

### **Naloxone**

**Name** – Narcan®, Evzio®

**Class** – Opioid reversal agent

**Pharmacologic Action** - Competitive opioid antagonist; synthetic congener of oxymorphone

**Indications** – Reversal of acute opioid toxicity

**Contraindications** - Hypersensitivity

*WARNING:* Administration of naloxone can result in the sudden onset of opiate withdrawal (agitation, tachycardia, pulmonary edema, nausea, vomiting, and, in neonates, seizures)

### **Drug Interactions**

Naloxone is incompatible with bisulfite and alkaline solutions.

### **Adverse Reactions**

Adverse reactions may include tachycardia, hypertension, dysrhythmias, nausea, vomiting, and diaphoresis.

### **Dosage**

**Adult Altered Mental Status:** Consider the administration of 0.25 - 2 mg naloxone (Narcan®) IV, IN, or IM to provide for a patent, self-maintained airway and adequate respirations. An additional dose of up to 2mg Narcan may be administered to maintain adequate respirations.

**Pediatric Altered Mental Status:** Consider the administration of up to 0.1 mg/kg naloxone (Narcan®) IV, IN, or IM (maximum dose is 2 mg) for suspected drug overdose. Naloxone (Narcan®) is not indicated for neonates suspected of narcotic induced apnea.

## **NITROGLYCERIN**

### **Nitroglycerin**

**Name** – Nitrostat®, Nitrolingual Pumpspray®, NitroQuick®

**Class** – Nitrates, anti-anginal

**Pharmacologic Action** - Organic nitrate which causes systemic venodilation, decreasing preload. Cellular mechanism: nitrate enters vascular smooth muscle and converted to nitric oxide (NO) leading to activation of cyclic guanosine monophosphate (cGMP) and vasodilation. Relaxes smooth muscle via dose-dependent dilation of arterial and venous beds to reduce both preload and afterload, and myocardial O<sub>2</sub> demand. Also improves coronary collateral circulation. Lower BP, increases heart rate, occasional paradoxical bradycardia

**Indications** – As an anti-anginal medication for the management of chest pain as well as a reducer of preload for patients suffering from acute pulmonary edema

**Contraindications** - Hypersensitivity, acute myocardial infarction, severe anemia, recent use of erectile dysfunction medications (sildenafil (Viagra® – within last 24 hours), tadalafil (Cialis® – within last 48 hours), vardenafil (Levitra® – within last 48 hours), or other phosphodiesterase-5 inhibitors). There is potential for dangerous hypotension, narrow angle glaucoma (controversial: may not be clinically significant). Nitrates are contraindicated in the presence of hypotension (SBP < 90 mm Hg or ≥30 mm Hg below baseline), extreme bradycardia (< 50 bpm), tachycardia in the absence of heart failure (> 100 bpm), and right ventricular infarction

### **Warnings**

Nitroglycerin may cause hypotension, especially if given in conjunction with other vasodilators.

### **Adverse Reactions**

Adverse reactions are dose-related but may include headache, hypotension, nausea, vomiting, and dizziness.

### **Dosage**

**Adult Pulmonary Edema due to Congestive Heart Failure: IV must be established prior to NTG administration for patients not currently prescribed and taking NTG.** Administer 0.4 mg nitroglycerin (NTG) SL. Repeat NTG at a higher dose of 0.8 mg NTG every 3-5 minutes. If systolic blood pressure (SBP) is less than 120 mmHg, discontinue NTG administration until SBP recovers to greater than 120 mmHg. Apply 1" nitroglycerin paste if systolic blood pressure is greater than 120 mmHg.

**Adult Acute Coronary Syndrome: IV must be established prior to NTG administration for patients not currently prescribed and taking NTG.** Administer 0.4 mg nitroglycerin (NTG) SL. Repeat 0.4 mg NTG every 3-5 minutes until pain, signs of ischemia, or injury resolves. If systolic blood pressure (SBP) is less than 100 mmHg, discontinue NTG administration until SBP recovers to greater than 100 mmHg.

Apply 1" nitroglycerin paste early in patient contact, even if patient is pain free. If chest pain, signs of ischemia or anxiety continue after the administration of three (3) nitroglycerin and if systolic BP is greater than 100 mmHg, consider administration of up to 200 mcg fentanyl (administered in up to 100 mcg increments given every five (5) minutes).

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**Adult ST Elevation Myocardial Infarction (STEMI): : IV must be established prior to NTG administration for patients not currently prescribed and taking NTG.** Administer 0.4 mg nitroglycerin (NTG) SL. Repeat 0.4 mg NTG every 3-5 minutes until pain, signs of ischemia, or injury resolves. If systolic blood pressure (SBP) is less than 100 mmHg, discontinue NTG administration until SBP recovers to greater than 100 mmHg. Apply 1" nitroglycerin paste early in patient contact, even if patient is pain free. If chest pain, signs of ischemia or anxiety continue after the administration of three (3) nitroglycerin and if systolic BP is greater than 100 mmHg, consider administration of up to 200 mcg fentanyl (administered in up to 100 mcg increments given every five (5) minutes).

## **ONDANSETRON (ZOFRAN®)**

**Name** – Zofran®, Zofran ODT®, Zuplenz®

**Class** – Antiemetic, selective 5-HT<sub>3</sub> antagonist

**Pharmacologic Action** - Mechanism not fully characterized; selective 5-HT<sub>3</sub> receptor antagonist; binds to 5-HT<sub>3</sub> receptors both in periphery and in CNS, with primary effects in GI tract. Has no effect on dopamine receptors and therefore does not cause extrapyramidal symptoms

**Indications** – For the management of nausea or vomiting

*NOTE:* EKG monitoring is recommended in patients who have electrolyte abnormalities, CHF, or bradyarrhythmias or who are also receiving other medications that cause QT prolongation

**Contraindications** – Hypersensitivity, coadministration with apomorphine; combination reported to cause profound hypotension and loss of consciousness

*WARNING:* May cause dose-dependent QT prolongation, avoid in patients with congenital long QT syndrome

### **Drug Interactions**

There are no drug interactions with Ondansetron.

### **Adverse Reactions**

Adverse reactions are diarrhea, headache, fever, Rarely seen are angina chest pain, seizures, akathisia and acute dystonic reactions.

### **Dosage**

**Adult General Patient Care:** Consider the administration of 8 mg Zofran (Ondansetron®) ODT, IV or IM for nausea or vomiting.

**Pediatric General patient care:** Consider the administration of 2 mg (older than 2 years and under the age of 6 years) or 4 mg (6 years or older) Zofran (Ondansetron®) ODT, IV or IM for nausea and vomiting.

## **OXYGEN**

**Description** - Oxygen is a naturally occurring gas.

**Pharmacology** - Oxygen is present in room air at a concentration of approximately 21%. Providing supplemental oxygen elevates oxygen tension and increases oxygen content in the blood, thus improving tissue oxygenation, promoting aerobic metabolism, and reversing hypoxemia.

**Indications** - Oxygen is indicated for acute coronary syndromes, suspected hypoxemia of any etiology, cardiopulmonary arrest, and trauma.

**Onset/Duration** - The onset of action occurs within minutes and the duration is depended upon constant provision.

**Contraindications** - There are no known contraindications in providing oxygen.

### **Warnings**

The main precaution is not administering enough oxygen to patients who need it. Never withhold oxygen from those in obvious need, but keep in mind that oxygen should be given with caution to patients with COPD and chronic carbon dioxide retention.

### **Drug Interactions**

There are no drug interactions with oxygen.

### **Adverse Reactions**

Decreased levels of consciousness and respiratory depression may result from administering high levels of oxygen to patients with COPD and chronic carbon dioxide retention.

### **Dosage and Routes of Administration**

The recommended adult and pediatric dosages are 1-15 L/min via nasal cannula, nebulizer, nonrebreather mask, or bag-valve mask.

## **PRALIDOXIME (2-PAM)**

### **Pralidoxime chloride (2-PAM)**

**Name** – Protopam®, 2PAM Antidote®, Pralidoxime Auto Injector®, a component of Mark I® kits and DuoDote®

**Class** – Cholinergic, toxicity antidote

**Pharmacologic Action** - Binds to organophosphates and breaks alkyl phosphate-cholinesterase bond to restore activity of acetylcholinesterase

**Indications** – For the management of toxicity caused by organophosphate insecticides and related nerve gases (e.g. tabun, sarin, soman)

**Contraindications** – Documented hypersensitivity

### **Warnings**

Occasionally (usually as a result of rapid injection) may cause laryngospasm and muscle rigidity. Intubation may be required.

### **Drug Interactions**

None reported

### **Adverse Reactions**

Pralidoxime rarely causes dizziness, headache, blurred visions, nausea and diplopia (although these signs and symptoms may be related to the underlying poisoning as well).

### **Dosage: TOXMEDIC**

**Cholinesterase Inhibitor Exposure:** Administer Pralidoxime (2-PAM) 1-2 grams over 5-10 minutes. Pralidoxime may be given IM via autoinjector if situation prevents IV access attempts.

## **PREDNISOLONE (PREDNISONE®)**

**Description** - Prednisolone is a corticosteroid.

**Pharmacology** - Prednisolone suppresses acute and chronic inflammation, potentiates vascular smooth muscle relaxation, and may alter airway hyperactivity.

**Indications** - Prednisolone is indicated for bronchodilation and anaphylaxis.

**Onset/Duration** - The onset of action may not occur for several hours if given PO; however, studies have shown that early administration is beneficial. The duration is 8 to 24 hours.

**Contraindications** - Prednisolone is contraindicated for patients with a known hypersensitivity to prednisolone.

### **Warnings**

Prednisolone should be used with caution in patients with diabetes mellitus, as the hypoglycemic responses to insulin and oral hypoglycemic agents may be blunted. Potassium-depleting agents may potentiate hypokalemia induced by corticosteroids. Prednisolone should be used with caution in pregnant patients and patient with GI bleeding. Hold steroids for suspected pneumonia, CHF or "metabolic hyperventilation" (DKA, sepsis, etc.).

### **Drug Interactions**

See above warnings; prednisolone may also enhance or inhibit actions of anticoagulants.

### **Adverse Reactions**

Adverse reactions may include headache, hypertension, sodium and water retention, hypokalemia, alkalosis, and gastritis.

### **Dosage**

**Adult Acute Respiratory Distress:** For mild respiratory distress, consider the administration of prednisone 60 mg PO in combination with Maalox® 50 mg or other PO fluid For moderate respiratory distress consider PO prednisone (60mg).

**Adult Allergic Reaction (Moderate):** Consider the administration of prednisone 60 mg PO in combination with Maalox® 50 mg or other PO fluid.

**Pediatric Acute Respiratory Distress:** Consider the administration of prednisone 2 mg/kg PO (up to 60 mg) in combination with Maalox® or other PO fluid for mild to moderate respiratory distress.

**Pediatric Allergic Reaction (Moderate):** Consider the administration of prednisone 2 mg/kg up to 60 mg PO in combination with Maalox® or other PO fluid.

## **SODIUM BICARBONATE**

**Description** - Sodium bicarbonate is a buffer.

**Class** - Antidote, other

**Pharmacology** - Sodium bicarbonate reacts with hydrogen ions, forming water and carbon dioxide, correcting metabolic acidosis and increasing blood pH.

**Indications** - Sodium bicarbonate is indicated in cardiac arrest only after more definitive treatment. It is also indicated in known acidosis, aspirin overdose and tricyclic antidepressant (TCA) overdose.

**Contraindications** - Sodium bicarbonate is contraindicated in hypocalcemia, hypokalemia, alkalosis, and electrolyte loss due to vomiting and diarrhea.

### **Warnings**

Sodium bicarbonate administration may result in worsening of intracellular acidosis, hyperosmolality, hypernatremia, metabolic alkalosis, and acute hypokalemia.

**Drug Interactions** - Sodium bicarbonate may precipitate with calcium. It may also deactivate vasopressors and may increase the half-life of some medications.

**Adverse Reactions** - Adverse reactions may include metabolic alkalosis, hypoxia, electrolyte imbalance, and seizures.

### **Dosage**

**Adult Altered Mental status:** Contact medical control for consideration of sodium bicarbonate for tricyclic antidepressant overdose.

**Adult Hemodynamically Compromising Bradycardia:** Contact medical control for orders to administer sodium bicarbonate, if the patient has a history of chronic renal failure and either hemodialysis or peritoneal dialysis.

**Adult Stable Tachycardia:** Contact medical control for orders to administer sodium bicarbonate, if the patient has a history of chronic renal failure and either hemodialysis or peritoneal dialysis.

**Adult Unstable Tachycardia:** Contact medical control for orders to administer sodium bicarbonate, if the patient has a history of chronic renal failure and either hemodialysis or peritoneal dialysis.

**Adult Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT):** Contact medical control for orders to administer sodium bicarbonate, if the patient has a history of chronic renal failure and either hemodialysis or peritoneal dialysis.

**Adult Asystole/Pulseless Electrical Activity (PEA):** Contact medical control for orders to administer sodium bicarbonate, if the patient has a history of chronic renal failure and either hemodialysis or peritoneal dialysis.

**Pediatric Altered Mental Status:** Contact medical control for consideration of sodium bicarbonate for tricyclic antidepressant overdose.

The recommended adult and pediatric dose for metabolic acidosis is 1 mEq/kg IV, followed by a half-dose every 10 minutes as needed. Contact medical direction for orders and dosages.

## **SODIUM NITRITE**

**Name** - Nithiodote®

**Class** – Cyanide antidote

**Pharmacologic Action** - Nitrites create methemoglobins to bind to cyanide

**Indications** – For the management of cyanide toxicity

**Contraindications** – Documented hypersensitivity, suspected or confirmed smoke inhalation and/or carbon monoxide poisoning *All Rights Reserved V.11-14 274*

**WARNING:** There is a risk of worsening hypoxia due to methemoglobin formation. In addition, sodium nitrite can cause serious adverse reactions and death from hypotension and methemoglobin formation. Monitor to ensure adequate perfusion and oxygenation during treatment with sodium nitrite

### **Warnings**

Be aware of: Hypotension- if the patient presents in a hypotensive crisis, consider skipping this step and proceeding to sodium thiosulfate. Pregnancy- Sodium nitrite crosses the placenta and can induce methemoglobinemia in the fetus. Monitor for excessive methemoglobinemia characterized by a progressive and persistent cyanosis unresponsive to oxygen therapy and a chocolate-brown color to the blood. Sodium nitrite may also precipitate an acute hemolytic reaction in patients with glucose-6-phosphodehydrogenase (G6PD) deficiency. This may cause excessive methemoglobinemia when given to carbon monoxide exposures.

### **Drug Interactions**

May potentiate methemoglobin formation when used with amyl nitrite

### **Adverse Reactions**

Adverse reactions may include: syncope, hypotension and the potential for excessive methemoglobinemia with decreased O2 saturations.

### **Dosage**

**Cyanide Exposure: *MEDICATIONS (Cyanide Antidote Kit)*:** As soon as IV access is accomplished administer Sodium Nitrite (1 amp IV over no less than 5 minutes). Sodium Nitrite may be diluted in 50-100 ml NSS and titrated to avoid hypotension.

**Sulfide Exposure: *MEDICATIONS (Cyanide Antidote Kit)*:** As soon as IV access is accomplished administer Sodium Nitrite (1 amp IV over no less than 5 minutes). Sodium Nitrite may be diluted in 50-100 ml NSS and titrated to avoid hypotension.

***Sodium Nitrite is an optional medication that may not be available based on the kit chosen by the agency.***

## **SODIUM THIOSULFATE**

**Name** - Nithiodote®

**Class** – Cyanide antidote

**Pharmacologic Action** - Thiosulfate is sulfur donor utilized by rhodenase to convert cyanide to less toxic thiocyanate

**Indications** – For the management of cyanide toxicity

**Contraindications** – Documented hypersensitivity

### **Warnings**

May cause nausea and vomiting – be sure to maintain a patent airway.

### **Drug Interactions**

None reported

### **Adverse Reactions**

Hypotension is the chief adverse reaction.

### **Dosage**

**Cyanide Exposure:** Administer Sodium Thiosulfate (1 amp IV over 10-20 minutes). Sodium thiosulfate may be diluted in 50-100 ml NSS and titrated to avoid hypotension. If patient condition stabilizes but minor symptoms persist, consider administration of Sodium Thiosulfate (1 amp over 10 – 20 minutes). Sodium Thiosulfate may be diluted in 50 – 100 ml NSS and titrated to avoid hypotension.

- Sodium Thiosulfate is not compatible with hydroxocobalamin and the two should not be given in the same IV line
- If a second IV line cannot be established, Sodium Thiosulfate may be administered only after flushing the hydroxocobalamin line with 20 ml of NSS.

***Sodium Thiosulfate is an optional medication that may not be available based on the kit chosen by the agency.***

## **SUCCINYLCHOLINE (ANECTINE®)**

### **Description**

Succinylcholine is a depolarizing neuromuscular blocker.

### **Pharmacology**

Succinylcholine acts on the motor end plate receptors, producing depolarization, or fasciculation's, and inhibiting subsequent neuromuscular transmission for the duration of the medication.

### **Indications**

Succinylcholine is indicated to facilitate endotracheal intubation.

### **Onset/Duration**

Succinylcholine has an onset of less than one minute and a very brief duration of action (less than five minutes), making it the drug of choice for drug-facilitated intubation.

### **Contraindications**

Succinylcholine is contraindicated in penetrating eye injury as it increases intraocular pressure. Succinylcholine is contraindicated in malignant hyperthermia as it may result in irreversible trismus. It is also contraindicated if the ability to control the airway and/or support ventilations is lacking.

### **Warnings**

Sedatives should be used in conjunction with succinylcholine administration. Premedication with atropine should be considered in pediatric patients. Premedication with lidocaine may blunt increased intracranial pressure associated with intubation.

### **Drug Interactions**

Oxytocin, beta blockers, oral contraceptives, some antibiotics, glucocorticoids, MAO inhibitors, and organophosphates may potentiate succinylcholine. Diazepam may decrease the duration of action.

### **Adverse Reactions**

Adverse reactions may include anaphylaxis, prolonged apnea, hypotension, hypertension, bradycardias, dysrhythmias, and fasciculation's.

### **Dosage: Medical Control Required**

**Pediatric and Adult Airway Management: DFI Process:** Administer 2.0 mg/kg (maximum dose 200 mg) of Succinylcholine rapid IV push.

## **VECURONIUM BROMIDE (NORCURON®)**

**Description** - Nondepolarizing neuromuscular blocking agent.

**Pharmacology** - Vecuronium bromide is a short-acting (in comparison to other drugs in this classification), non-depolarizing skeletal muscle relaxant that binds with the cholinergic receptor sites. That prevents acetylcholine from binding to receptors on motor end plate, thus blocking neuromuscular transmission and inhibiting transmission of nerve impulses, antagonizing the action of acetylcholine.

**Indications** - To facilitate endotracheal intubation and to provide skeletal muscle relaxation during mechanical ventilation.

**On set/Duration** - After IV infusion flaccid paralysis occurs within a few minutes (3-5) with maximum effect lasting form 30-60 minutes. The muscle paralysis caused by Vecuronium is sequential in the following order: first muscles affected include eyes, face and neck; followed by limbs, abdomen, and chest with the diaphragm affected last Recovery usually occurs in reverse order.

**Contraindications** - Hypersensitivity reactions are possible. Serious but unlikely side effects include; aspiration, bradycardia, sinus arrest, hypertension, hypotension, increased intracranial pressure and malignant hyperthermia.

Various preexisting medical conditions may increase sensitivity to the drug such as; nerve-muscle conditions (e.g., myasthenia gravis, Eaton-Lambert syndrome), kidney or liver disorders, electrolyte imbalances (e.g., hypokalemia, hypermagnesemia, hypercalcemia), adrenal gland problems (e.g., Addison's disease). Cardiovascular disease, old age and edematous states result in increased volume of distribution and thus a delay in onset time- the dose should NOT be increased.

### **Warnings**

Vecuronium has no known effect on consciousness, pain threshold or cerebration. Administration must be accompanied by adequate anesthesia or sedation. Causes respiratory paralysis; supportive airway control must be continuous and under direct monitoring at all times.

### **Drug Interactions**

Some antibiotics (e.g., aminoglycosides, tetracyclines, bacitracin, polymyxins, clindamycin), skeletal muscle relaxants (e.g., succinylcholine, pancuronium), calcium-channel blocking agents (e.g., verapamil), magnesium salts, and quinidine, may affect the neuromuscular blocking activity of vecuronium bromide.

### **Adverse Reactions**

Usually rare and related mostly to allergies caused by the drug.

### **Dosage**

**Pediatric and Adult Post Resuscitation Care with induced Hypothermia:** For patients with visible shivering: Administer 0.1mg/kg of vecuronium IV with a maximum dose of 10 mg if airway monitoring indicates adequate oxygenation and ventilation.

**Pediatric and Adult Airway Management: Post Intubation Management:** Rate the patient's neurological status (Glasgow Coma Scale). For continued paralysis of the intubated patient, consider administration of 0.1 mg/kg vecuronium. Vecuronium (in combination with up to 5 mg of midazolam (Versed®)) may be repeated once if the patient exhibits any signs of cessation of paralysis.

**Pediatric and Adult Airway Management: Failed Intubation:** With successful OEMS approved rescue airway device placement and with adequate ventilation and oxygenation, consider administration of 0.1

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mg/kg vecuronium. Vecuronium (in combination with up to 5 mg of midazolam (Versed<sup>®</sup>)) may be repeated once if the patient exhibits any signs of cessation of paralysis.

Adult and pediatric: 0.1mg/kg slow administration (30-60 seconds) IV