Tab 400
EMS Drug Formulary

Lucas County Emergency Medical Services
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Toledo, Ohio 43604

EMS Drug Formulary

EMS personnel must be familiar with a number of drugs and other agents in their routine work. What follows is a description of drugs or agents used by LCEMS personnel. While indication, contraindication, drug doses, and other relevant information are included in this formulary for information purposes, EMS personnel should refer to specific treatment protocols regarding use of any of these drugs or agents.

Drugs are categorized according to their level of risk to the fetus. The categories are interpreted as follows:

- **Category A:** controlled studies fail to demonstrate a risk to the fetus in the first trimester, and there is no evidence of risk in later trimesters; the possibility of fetal harm appears to be remote.

- **Category B:** either animal reproductive studies have not demonstrated a fetal risk but there are no controlled studies in women or animal reproductive studies have shown an adverse effect that was not confirmed in controlled studies on women in the first trimester and there is no evidence of risk in later trimesters.

- **Category C:** either studies in animals have revealed adverse effects on the fetus and there are no controlled studies in women or studies in women and animals are not available. Drugs in this category should be given only if the potential benefit justifies the risk to the fetus.

- **Category D:** there is positive evidence of human fetal risk, but the benefits for pregnant women may be acceptable despite the risk, as in life-threatening diseases for which safer drugs cannot be used or are ineffective.

- **Category X:** studies in animals and humans have demonstrated fetal abnormalities, there is evidence of fetal risk based on human experience, or both; the risk of using the drug in pregnant women clearly outweighs any possible benefit. The drug is contraindicated in women who are or may become pregnant.

EMS Drug Formulary

EMS Drug Formulary, cont.

Drugs included in this formulary:

- Adenocard
- Albuterol
- Amiodarone
- Aspirin
- Atropine
- Atrovent
- Benadryl
- Calcium Chloride
- Captopril
- Cardizem
- Cipro
- Dextrose 50%
- Dopamine
- Doxycycline
- Epinephrine
- Etomidate
- Fentanyl
- Glucagon
- Glucose
- Hydroxocobalamin (Cyanokit)
- Ketamine HCL
- Lidocaine HCL Jelly 2%
- Magnesium Sulfate
- Morphine Sulfate
- Narcan
- Nitroglycerine
- Norcuron
- Oxygen
- Pralidoxime Chloride
- Prednisone
- Procainamide
- Sodium Bicarbonate
- Solu-Medrol
- Tetracaine
- Thiamine
- Tranexamic Acid (TXA)
- Valium
- Versed
- Zofran

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Adenocard (Adenosine)

Class

- Endogenous nucleoside

Mechanism of Action

- Slows conduction time through the A-V node
- Interruption of reentry pathways through the A-V node
- Restoration of NSR in patients with PSVT

Indications

- Conversion to sinus rhythm of paroxysmal supraventricular tachycardia (PSVT), including that associated with accessory bypass tracts (Wolff-Parkinson-White Syndrome)
- Conversion to sinus rhythm of Wide Complex Tachycardia of unknown etiology

Contraindications

- Second- or third-degree A-V block
- Wolfe-Parkinson-White Syndrome (WPW) in the setting of atrial fibrillation.
- Sinus node disease, such as sick sinus syndrome or symptomatic bradycardia.
- Known hypersensitivity to adenosine

Adverse Reactions

- Facial flushing
- Lightheadedness
- Paraesthesia
- Headache
- Diaphoresis
- Palpitations
- Chest pain
- Hypotension
- Shortness of breath
- Nausea
- Metallic taste
- Transient periods of bradycardia
- Transient periods of ventricular ectopy
- Hyperventilation
- Burning sensation

Adenocard (Adenosine)

Drug Interactions

- Effects of adenosine are antagonized by methylxanthines such as caffeine and Theophylline; larger does may be required
- Adenosine effects are potentiated by dipyridamole; smaller doses may be effective

How Supplied

- 6mg/2mL vial (3mg/mL)

Dosage and Administration

- **Adult**
  - **Initial Dose:** 6mg rapid IV bolus over a 1-3 second period. A 20mL saline flush should follow.
  - **Repeat Administration:** If the first dose does not result in elimination of the SVT within 1-2 minutes, 12mg should be given as a rapid IV bolus. This 12mg dose may be repeated a second time if required.

- **Pediatrics**
  - **Initial Dose:** 0.1mg/Kg (not to exceed 6mg) as a rapid IV bolus over a 1-2 second period. A 5mL saline flush should follow.
  - **Repeat Administration:** If the first dose does not result in elimination of the SVT within 1-2 minutes, 0.2mg/Kg (not to exceed 12mg) should be given as a rapid IV bolus.

Doses greater than 12mg are not recommended for adult and pediatric patients.

Duration of Action

- Onset 30 seconds
- Duration: 10 seconds

Special Considerations

- The onset of the effect is generally within less than one minute. Reported adverse experiences are predictable, short-lived and easily tolerated.

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Adenocard
06/2016

Adenocard
(Adenosine)

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section N: Supraventricular Tachycardia
  - Section Q: Ventricular Tachycardia / Wide Complex with Pulse

- **Tab 1100 (Pediatric Protocols)**
  - Section T: Pediatric Tachycardia

Albuterol Sulfate (Ventolin, Proventil)

Class

- Sympathomimetic, bronchodilator

Mechanism of Action

- Selective ß2 agonist which stimulates adrenergic receptors of the sympathomimetic nervous system, resulting in smooth muscle relaxation in the bronchial tree and peripheral vasculature
- Little action of ß1 receptors in cardiac muscle

Indications

- Patients with signs or symptoms of respiratory distress (see Respiratory Distress Protocol)
- Treatment of bronchospasm in patients with reversible obstructive airway disease (COPD / Asthma)

Contraindications

- Hypersensitivity to any of the contents of the inhalation solution
- Cardiac insufficiency

Adverse Reactions

- Restlessness, tremors, dizziness, palpitations, tachycardia, nervousness, peripheral vasodilation, nausea, vomiting, hyperglycemia, increased blood pressure and paradoxical bronchospasm
- Synergistic with other sympathomimetics

Drug Interactions

- Tricyclic antidepressants and MAOIs may potentiate effects on vasculature – use with caution
- Beta-blockers are antagonistic
- May potentiate Hypokalemia caused by diuretics

Albuterol Sulfate (Ventolin, Proventil)

How Supplied

- 2.5mg/3mL vial inhalation solution

Dosage and Administration

- **Adult**
  - Administer 2.5mg inhalation solution via nebulizer
  - Second and subsequent doses may be given as necessary for continued assessment of bronchospasm

    NOTE: For continued auscultated wheezes after initial nebulized therapy, continue aerosol treatment with Albuterol (1 unit dose) mixed with Atrovent (1 unit dose). ***This combination therapy is only to be administered once*.**

- **Pediatrics**
  - < 1 year: 1.25mg (1.5mL) inhalation solution via nebulizer
  - > 1 year: 2.5mg (3mL) inhalation solution via nebulizer

Duration of Action

- Onset: 5-15 minutes
- Peak effect: 60-90 minutes
- Duration: 3-6 hours

Special Considerations

- Pregnancy safety: has been used in pregnant women for many years without apparent ill consequence
- Antagonized by beta-blockers
- May precipitate angina pectoris and dysrhythmias
- Should only be administered by inhalation methodology in pre-hospital management of respiratory distress

Albuterol Sulfate (Ventolin, Proventil)

Protocol References:

- **Tab 900 (Medical Emergency Protocols)**
  - Section U: Respiratory Distress
- **Tab 1100 (Pediatric Protocols)**
  - Section R: Pediatric Respiratory Distress

Amiodarone (Cordarone)

Class

- Antidysrhythmic

Mechanism of Action

- Prolongation of action potential
- Non-competitive alpha and beta sympathetic blocking effects
- Calcium channel block effects

Indications

- Patients with **absent vital signs** and either ventricular fibrillation or ventricular tachycardia on the cardiac monitor
- Suppression of ventricular fibrillation refractory to defibrillation
- Suppression of pulseless ventricular tachycardia refractory to defibrillation

Contraindications

- Cardiac arrest possibly due to hypothermia
- Patients with renal failure
- Second- or third-degree heart block
- Medication-induced ventricular dysrhythmias
- Hypotension (cardiogenic shock)\
- Bradycardia
- Torsades de pointes
- Profound sinus bradycardia
- Known hypersensitivity to oral or IV forms

Adverse Reactions

- Hypotension, bradycardia, PEA, CHF
- Nausea, fever, abnormal liver function test, thrombocytopenia
- Pulmonary fibrosis, ARDS

Amiodarone (Cordarone)

Drug Interactions

- Incompatible with sodium bicarbonate – causes precipitate
- Compatible with bretylium, dopamine, dobutamine, isoproterenol, Lidocaine, nitroglycerine, norepinephrine, phenylephrine, potassium solutions, procainamide
- Fentanyl may cause hypotension, bradycardia, and decreased cardiac output
- Caution with beta-blockers – may cause hypotension and bradycardia
- Caution with calcium channel blockers – additive effects of A-V conduction/myocardial contractility, increased risk of hypotension

How Supplied

- 150mg/3mL ampule
- 150mg/3mL pre-filled syringe

Dosage and Administration

- **Adult**
  - 300mg slow IV/IO push – initial dose
  - 150mg slow IV/IO push – second dose if refractory or VF/VT returns
  - Maximum IV/IO dose: 450mg
- **Pediatric**
  - Pulseless arrest: 5mg/Kg slow IV/IO push
  - Pediatric tachycardia (probable VT): 5mg/Kg over 20 minutes (MC order)

Duration of Action

- Onset: within 5-15 minutes
- Peak effect: variable
- Duration: variable

Amiodarone (Cordarone)

Special Considerations

- Pregnancy safety: category C
- Maintain at room temperature and protect from light in storage. Light protection not required during administration
- Hypotension usually responsive to slowing infusion rate
- Administer cautiously in patients with CHF or poor systolic function
- May be especially effective in high-risk patients with recent acute MI

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section D: Cardiac Arrest
  - Section P: Ventricular Fibrillation / Pulseless Ventricular Tachycardia

- **Tab 1100 (Pediatric Protocols)**
  - Section Q: Pediatric Pulseless Arrest
  - Section T: Pediatric Tachycardia

Aspirin
(Acetylsalicylic Acid)

Class

- Platelet inhibitor, anti-inflammatory agent

Mechanism of Action

- Prostaglandin inhibition, prevents platelet

Indications

- Chest pain suggestive of acute MI
- Patient with previous cardiac history presenting with chest pain consistent with cardiac ischemia.

Contraindications

- Hypersensitivity to ASA or nonsteroidal anti-inflammatory drugs (NSAIDs)
- Gastrointestinal bleeding

Adverse Reactions

- Heart burn
- GI bleeding
- Nausea, vomiting
- Wheezing in allergic patients
- Prolonged bleeding

Drug Interactions

- None

How Supplied

- 81mg chewable tablet

Dosage and Administration

- **Adult**
  - 324mg PO

Aspirin
(Acetylsalicylic Acid)

Duration of Action

- Onset: 30-45 minutes
- Peak effect: variable
- Duration: life of platelet (7-10 days)

Special Considerations

- Pregnancy safety: category D
- Not recommended in pediatric population

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section F: Chest Pain / Acute Coronary Syndromes

Atropine
(Atropine Sulfate)

Class

- Anticholinergic agent, parasympatholytic

Mechanism of Action

- Parasympatholytic: inhibits action of acetylcholine at postganglionic parasympathetic neuroeffector sites
- Increases heart rate in life-threatening bradydysrhythmias
- Competitively blocks the state of acetylcholine excess associated with organophosphate and nerve gas poisoning

Indications

- Hemodynamically significant bradycardia
- Organophosphate poisoning
- Nerve gas exposure

Contraindications

- Tachycardia
- Hypersensitivity
- Unstable cardiovascular status in acute hemorrhage
- Narrow-angle glaucoma

Adverse Reactions

- Headache, dizziness, palpitations, nausea and vomiting
- Tachycardia, dysrhythmias, Anticholinergic effects (blurred vision, dry mouth, urinary retention)
- Paradoxical bradycardia when pushed slowly or at low doses
- Flushed, hot dry skin

Drug Interactions

- Potential adverse effects when administered with digoxin, cholinergics, physostigmine
- Effects enhanced by antihistamines, procainamide, quinidine, antipsychotics, benzodiazepines and antidepressants.

Atropine
(Atropine Sulfate)

How Supplied

- 1mg/10mL prefilled syringe
- 2.1mg DuoDote Auto-Injector (mixed with 600mg Pralidoxime Chloride)

Dosage and Administration

Bradydysrhythmias

- **Adult**
  - 0.5mg IV bolus q 3-5 minutes PRN to maximum total dose of 3mg
- **Pediatric**
  - 0.02mg/Kg IV/IO (dose range of 0.1mg – 1 mg) may be repeated once

Toxic Ingestion / Organophosphate / Nerve Agent Exposure

- **Adult**
  - 2mg IV/IM q 5 minutes PRN
- **Pediatric**
  - 0.02mg/Kg IV/IO (dose range of 0.1mg – 1 mg)
  - Nerve agent exposure:
    - <2 years of age - 0.5mg Atropine IM (repeated every 5 minutes PRN)
    - 2-10 years of age – 1.0mg Atropine IM (repeated every 5 minutes PRN)

Duration of Action

- Onset: immediate
- Peak effect: rapid 1-2 minutes
- Duration: 2-6 hours

Atropine
(Atropine Sulfate)

Special Considerations

- Pregnancy safety: category C
- Moderate doses dilate pupils
- Much higher doses (2-4mg PRN) may be required to reverse effects of organophosphates and nerve gas agents

Protocol References:

- **Tab 100 (Operations)**
  - Section V: Hazardous Materials / WMD
- **Tab 500 (Medical Procedures / Equipment)**
  - Section P: Intramuscular Medication Administration
- **Tab 800 (Cardiac Protocols)**
  - Section C: Bradycardia
- **Tab 900 (Medical Emergency Protocols)**
  - Section s: Overdose / Toxic Ingestion
- **Tab 1100 (Pediatric Protocols)**
  - Section E: Pediatric Bradycardia
  - Section N: Pediatric Overdose / Toxic Ingestion

Atrovent
(Ipratropium Bromide)

Class

- Anticholinergic (parasympatholytic), bronchodilator

Mechanism of Action

- Anticholinergic (parasympatholytic) agent which appears to inhibit vagally-mediated reflexes by antagonizing the action of acetylcholine, the transmitter agent released at the neuromuscular junctions in the lung.
- Inhibits ACTH receptor sites on bronchial smooth muscle

Indications

- Patients with signs or symptoms of respiratory distress (see Respiratory Distress Protocol)
- Atrovent inhalation aerosol is indicated as a bronchodilator for treatment of bronchospasm associated with chronic obstructive pulmonary disease, including chronic bronchitis and emphysema

Contraindications

- Hypersensitivity to any of the contents of the inhalation solution
- Hypersensitivity to atropine or its derivatives

Adverse Reactions

- Headache, influenza-like symptoms, dizziness, dry mouth, nausea, coughing, blurred vision, palpitations, nervousness

Drug Interactions

- Has been used concomitantly with other drugs, including sympathomimetic bronchodilators, methylxanthines, oral and inhaled steroids, that may be used in the treatment of COPD
- There is some potential for additive interaction with concomitantly used anticholinergic medications. Caution is therefore advised in the co-administration of Atrovent with other anticholinergic-containing drugs

Atrovent
(Ipratropium Bromide)

How Supplied

- 0.5mg/2.5mL (0.02%) unit dose vial inhalation solution

Dosage and Administration

- **Adult**
  - Patients requiring treatment, and on home Atrovent (Ipratropium Bromide) may have nebulized Atrovent (0.5mg) initiated in lieu of Albuterol for their first treatment.
  - Second and subsequent doses may be given as necessary for continued assessment of bronchospasm

    NOTE: For continued auscultated wheezes after initial nebulized therapy, continue aerosol treatment with Albuterol (1 unit dose) mixed with Atrovent (1 unit dose). ***This combination therapy is only to be administered once*.**

- **Pediatrics**
  - Not recommended for pediatric use

Duration of Action

- Onset: 1-3 minutes
- Peak effect: 1.5-2 hours
- Duration: 4 hours

Special Considerations

- Pregnancy safety: category B

Protocol References:

- **Tab 900 (Medical Emergency Protocols)**
  - Section U: Respiratory Distress

Benadryl (Diphenhydramine)

Class

- Antihistamine, anticholinergic

Mechanism of Action

- Blocks cellular histamine receptors
- Decreases vasodilation
- Decreases motion sickness
- Reverses extrapyramidal reactions

Indications

- Symptomatic relief of allergies, allergic reactions, anaphylaxis, acute dystonic reactions due to phenothiazines

Contraindications

- Glaucoma, hypertension, narrow angle glaucoma, infants
- Patients taking monoamine oxidase inhibitors

Adverse Reactions

- Sedation, hypotension, seizures, visual disturbances, vomiting, urinary retention, palpitations, dysrhythmias, dry mouth and throat
- Paradoxical CNS excitation in children

Drug Interactions

- Potentiates effects of alcohol and other anticholinergics
- MAOIs prolong anticholinergic effects of diphenhydramine

How Supplied

- 50mg/1mL vial

Benadryl (Diphenhydramine)

Dosage and Administration

- **Adult**
  - 25-50mg IM/IV
- **Pediatric**
  - 1mg/Kg IM/IV

Duration of Action

- Onset: 15-30 minutes
- Peak effect: 1 hour
- Duration: 3-12 hours

Special Considerations

- If used in anaphylaxis, often used in conjunction with epinephrine and steroids

Protocol References:

- **Tab 900 (Medical Emergency Protocols)**
  - Section D: Allergic Reaction
- **Tab 1100 (Pediatric Protocols)**
  - Section C: Pediatric Allergic Reaction

Calcium Chloride

Class

- Electrolyte and water

Mechanism of Action

- Calcium is the fifth most abundant element in the body and the major fraction is in the bony structure. Calcium plays important physiological roles, many of which are poorly understood. It is essential for the functional integrity of the nervous and muscular systems. It is necessary for normal cardiac function and is one of the factors that operates in the mechanisms involved in the coagulation of blood

Indications

- Calcium channel blocker toxicity
- Treatment of hypocalcaemia in conditions requiring prompt increase in plasma calcium
- During cardiac resuscitation to combat hyperkalemia as the precipitant to cardiac arrest

Contraindications

- Cardiac resuscitation in presence of ventricular fibrillation or in patients with existing digitalis toxicity

Adverse Reactions

- Rapid injection may cause the patient to complain or tingling sensations, a calcium taste, a sense of oppression or “heat wave”
- Injections of calcium chloride are accompanied by peripheral vasodilation as well as a local “burning” sensation and there may be a moderate fall in blood pressure

Drug Interactions

- May potentiate digitalis toxicity

Calcium Chloride

How Supplied

- 1Gm/10mL prefilled syringe

Dosage and Administration

- **Adult**
  - **Cardiac Arrest:** Evidence of ESRD (end-stage renal disease) with suspected hyperkalemia – 1Gm slow IO/IV push.
  - **Supraventricular Tachycardia:** If adverse reaction to Cardizem infusion (hypotension, bradycardia, heart block) 1Gm over 5 minutes.
  - **Atrial Fibrillation / Flutter:** If adverse reaction to Cardizem infusion (hypotension, bradycardia, heart block) 1Gm over 5 minutes.
  - **Overdose / Toxic Ingestion (calcium channel blocker overdose):** 20mg/Kg slow IO/IV.

- **Pediatric**
  - **Overdose / Toxic Ingestion:** 20mg/Kg slow IO/IV

Special Considerations

- Pregnancy safety: category C
- Use with caution in digitalized patients
- Inject slowly into large vein to help prevent irritation and cardiac syncope

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section B: Atrial Fibrillation / Flutter
  - Section D: Cardiac Arrest
  - Section N: Supraventricular Tachycardia

- **Tab 900 (Medical Emergency Protocols)**
  - Section S: Overdose / Toxic Ingestion

- **Tab 1100 (Pediatric Protocols)**
  - Section N: Pediatric Overdose / Toxic Ingestion

Captopril

Class

- Specific competitive inhibitor of angiotensin I-converting enzyme (ACE), the enzyme responsible for the conversion of angiotensin I to angiotensin II

Mechanism of Action

- Beneficial effects in hypertension and heart failure result primarily from suppression of the rennin-angiotensin-aldosterone system
- Afterload reduction
- Arterial vasodilation

Indications

- Hypertension
- Hypertension associated with acute pulmonary edema

Contraindications

- Patients who are hypersensitive to Captopril or any other ACE Inhibitors

Adverse Reactions

- Rash, fever, taste impairment, angioedema, cough, hypotension

Drug Interactions

- Hypotension-patients on other Diuretic therapy

How Supplied

- 25mg tablets

Captopril

Dosage and Administration

- **Adult**
  - 25mg tablet SL for hypertension
- **Pediatric**
  - Not recommended for use in pediatrics

Duration of Action

- Onset: within 15 minutes
- Peak effect: variable
- Duration: variable

Special Considerations

- When used in pregnancy during the second and third trimesters, ACE inhibitors can cause injury and even death to the developing fetus
- Wetting the tablet prior to SL administration will help absorption

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section K: Pulmonary Edema
- **Tab 900 (Medical Emergency Protocols)**
  - Section O: Hypertensive Emergency

Cardizem (Diltiazem)

Class

- Calcium channel blocker

Mechanism of Action

- Block the entry of calcium into muscle cells that make up the heart and that surround the arteries.
- Decreases the force of contraction of the heart and its rate of contraction. It also relaxes the muscles surrounding the arteries, allowing the arteries to widen (dilate).
- By dilating arteries, diltiazem reduces the pressure in the arteries into which the heart must pump blood, and, as a result, the heart needs to work less and requires less oxygen. By reducing the heart's need for oxygen, diltiazem relieves or prevents angina. Dilation of the arteries also reduces blood pressure.

Indications

- Conversion of narrow-complex PSVT refractory to Adenocard administration
- Rate-control for symptomatic atrial fibrillation / flutter

Contraindications

- CHF
- SA node or AV conduction disturbances
- Wolff-Parkinson-White Syndrome (with atrial Fibrillation)
- Diltiazem is relatively contraindicated in the presence of sick sinus syndrome, A-V node conduction disturbances, bradycardia, impaired left ventricular function, peripheral artery occlusive disease, COPD and Prinzmetal's angina

Adverse Reactions

- Anorexia, nausea, thirst, nervousness, headache, angina, arrhythmia, A-V block, hypotension, palpitations, syncope

Cardizem (Diltiazem)

Drug Interactions

- Due to the potential for additive effects, caution and careful titration are warranted in patients receiving diltiazem concomitantly with other agents known to affect cardiac contractility and/or conduction. Pharmacologic studies indicate that there may be additive effects in prolonging AV conduction when using beta-blockers or digitalis concomitantly with diltiazem

How Supplied

- 25mg/5mL vial (5mg/mL)

Dosage and Administration

- **Adult**
  - **Atrial Fibrillation / Flutter:** 0.25mg/Kg (maximum dose 20mg) IV over 2 minutes. If needed for further rate control, in 15 minutes 0.35mg/Kg (maximum dose 25mg) IV over 2 minutes
  - **Supraventricular Tachycardia:** if refractory to Adenocard administration, 0.25mg/Kg (maximum dose 20mg) IV over 2 minutes. If needed for further rate control, in 15 minutes 0.35mg/Kg (maximum dose 25mg) IV over 2 minutes
- **Pediatric**
  - Not recommended for use in pediatrics

Duration of Action

- Onset: within 3-5 minutes
- Peak effect: variable
- Duration: 4-10 hours

Special Considerations

- Pregnancy safety: category C
- May cause CHF in patients on beta blocker therapy
- Development of bradycardia, hypotension or heart block during administration

Cardizem
(Diltiazem)

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section B: Atrial Fibrillation / Flutter
  - Section N: Supraventricular Tachycardia

Cipro
(Ciprofloxacin)

Class

- Synthetic broad spectrum antimicrobial agent
- Fluoroquinolone

Mechanism of Action

- Ciprofloxacin has in vitro activity against a wide range of gram-negative and gram-positive organisms. Ciprofloxacin inhibits bacterial DNA gyrase, an enzyme responsible for counteracting excessive supercoiling of DNA during replication or transcription. The mechanism of action of quinolones, including ciprofloxacin, is different from that of other antimicrobial agents such as beta-lactams, macrolides, tetracyclines, or aminoglycosides; therefore, organisms resistant to these drugs may be susceptible to ciprofloxacin. There is no known cross-resistance between ciprofloxacin and other classes of antimicrobials.

Indications

- Inhalation anthrax (post-exposure): to reduce the incidence or progression of disease following exposure to aerosolized *Bacillus anthracis*

Contraindications

- Should not be used by persons with a history of hypersensitivity to Cipro, or other quinolones.

Adverse Reactions

- Nausea, diarrhea, vomiting, abdominal pain/discomfort, headache, restlessness, rash

Drug Interactions

- Concurrent administration with Theophylline may lead to elevated serum concentrations of Theophylline and prolongation of its elimination half-life
- Has shown to interfere with the metabolism of caffeine
- Enhancement of effects of oral anticoagulant Warfarin or its derivatives

Cipro
(Ciprofloxacin)

How Supplied

- 500mg tablets

Dosage and Administration

- **Adult**
  - The determination of dosage for any particular patient must take into consideration the severity and nature of the infection, the susceptibility of the causative organism, the integrity of the patient's host-defense mechanisms, and the status of renal function and hepatic function
- **Pediatric**
  - The determination of dosage for any particular patient must take into consideration the severity and nature of the infection, the susceptibility of the causative organism, the integrity of the patient's host-defense mechanisms, and the status of renal function and hepatic function

Special Considerations

- Pregnancy safety: category C

Protocol References:

- **Tab 100 (Operations)**
  - Section V: Hazardous Materials / WMD

Cyanokit®
(Hydroxocobalamin)

Class

– Antidote

Mechanism of Action

Cyanide is an extremely toxic poison. In the absence of rapid and adequate treatment, exposure to a high dose of cyanide can result in death within minutes due to the inhibition of cytochrome oxidase resulting in arrest of cellular respiration. Specifically, cyanide binds rapidly with cytochrome a3, a component of the cytochrome c oxidase complex in mitochondria. Inhibition of cytochrome a3 prevents the cell from using oxygen and forces anaerobic metabolism, resulting in lactate production, cellular hypoxia and metabolic acidosis. In massive acute cyanide poisoning, the mechanism of toxicity may involve other enzyme systems as well. Signs and symptoms of acute systemic cyanide poisoning may develop rapidly within minutes, depending on the route and extent of cyanide exposure.

The action of Cyanokit in the treatment of cyanide poisoning is based on its ability to bind cyanide ions. Each hydroxocobalamin molecule can bind one cyanide ion by substituting it for the hydroxo ligand linked to the trivalent cobalt ion, to form cyanocobalamin, which is then excreted in the urine.

Indications

– Cyanokit is indicated for the treatment of known or suspected cyanide poisoning.

Contraindications

– None

Adverse Reactions

– Most common adverse reactions (>5%) include transient chromaturia, erythema, rash, increased blood pressure, nausea, headache, and injection site reactions.

Drug Interactions

– No formal drug interaction studies have been conducted with Cyanokit.

Cyanokit®
(Hydroxocobalamin)

How Supplied

- Cyanokit (Hydroxocobalamin for injection) 5Gm for intravenous infusion consists of 1 vial, containing 5Gm lyophilized hydroxocobalamin dark red crystalline powder for injection. After reconstitution, the vial contains hydroxocobalamin for injection, 25mg/mL. Administration of the entire 5Gm vial constitutes a complete starting dose.

Dosage and Administration

- **Adult**
  - The starting dose of Cyanokit is 5Gm, administered by intravenous infusion over 15 minutes. One 5Gm vial is a complete starting dose.
  - The recommended diluent is 0.9% Sodium Chloride injection.
  - Diluent is not included with Cyanokit
- **Pediatric**
  - Calculate dose at 70mg/Kg
  - Leaving total dose to be administered in vial, use Burette IV tubing to fill chamber to desired dose
  - Infuse over 15 minutes.

Warnings and Precautions

- Use caution in the management of patients with known anaphylactic reactions to hydroxocobalamin or cyanocobalamin. Consideration should be given to use alternative therapies, if available.
- Allergic reactions may include: anaphylaxis, chest tightness, edema, urticaria, pruritus, dyspnea, and rash.
- Blood pressure increase: Substantial increases in blood pressure may occur following Cyanokit therapy.

Special Considerations

- Pregnancy: Based on animal studies, may cause fetal harm; however, treatment of maternal/fetal cyanide poisoning may be lifesaving.
- No safety and efficacy studies have been performed in pediatric patients.

Cyanokit®
(Hydroxocobalamin)

Protocol References:

- **Tab 900 (Medical Emergencies)**
  - Section S: Overdose / Toxic Ingestion
  - Section AA: Cyanide Exposure / Cyanokit

- **Tab 1100 (Pediatric Emergencies)**
  - Section N: Pediatric Overdose / Toxic Ingestion

Dextrose 50% (D50W)

Class

- Hypertonic carbohydrate solution

Mechanism of Action

- Rapidly increases serum glucose levels

Indications

- Signs and symptoms consistent with hypoglycemia
- Documented hypoglycemia

Contraindications

- Intracranial hemorrhage
- Increased intracranial pressure

Adverse Reactions

- Extravasation leads to tissue necrosis
- Warmth, pain, burning, thrombophlebitis, rhabdomyositis

Drug Interactions

- Sodium bicarbonate
- Coumadin

How Supplied

- 25Gm/50mL prefilled syringe (Dextrose 50%)

Dosage and Administration

- **Adult**
  - 25Gm IV (repeat dosing PRN)
- **Pediatric**
  - **0-30 days:** 0.2g/Kg D10W: (D50 – 4mL) + 40mL NS
  - **31 days-24mos:** 0.5g/Kg D25W: (D50 – 25mL) + 25mL NS
  - **>2 years:** 0.5g/Kg D50W

Dextrose 50% (D50W)

Duration of Action

- Onset: < 1 minute
- Peak effect: variable
- Duration: variable

Special Considerations

- Check blood sugar before administering if available – if not available, do not delay administration if known diabetic with decreased level of consciousness or if clinical suspicion HIGH for hypoglycemia
- Do not administer to patients with known CVA unless hypoglycemia documented

Protocol References:

- **Tab 900 (Medical Emergency Protocols)**
  - Section E: Altered Mental Status
  - Section S: Overdose / Toxic Ingestion
  - Section V: Seizures
  - Section X: Syncope
  - Section W: Stroke / CVA
  - Section BB: Hypo- / Hyperglycemia

- **Tab 1100 (Pediatric Protocols)**
  - Section D: Pediatric Altered Mental Status
  - Section W: Pediatric Hypo- / Hyperglycemia

Dopamine (Intropin)

Class

- Phenethylamine which functions as a neurotransmitter

Mechanism of Action

- Dopamine stimulates dopaminergic receptors at lower doses producing renal and mesenteric vasodilation while at higher doses stimulate both dopaminergic and β-adrenergic receptors producing cardiac stimulation and renal vasodilation. It increases heart rate and force of contraction. At low infusion rates vasodilatation occurs in the renal, mesenteric, coronary and cerebral beds. At higher rates vasoconstriction in skeletal muscles and a rise in BP.

Indications

- Acute heart failure
- Hemodynamically unstable hypotension
- Bradycardia with low cardiac output

Contraindications

- Pheochromocytoma
- Uncorrected tachyarrhythmias
- Ventricular fibrillation
- Hypersensitivity

Adverse Reactions

- Nausea, vomiting, tachycardia, ectopic beats, palpitations, anginal pain, hypotension, vasoconstriction, bradycardia, hypertension, dyspnea, headache, widened QRS complexes, azotaemia

Drug Interactions

- MAO inhibitors prolong and increase dopamine effects.
- Ergots potentiate vasoconstriction action of dopamine.
- Alpha-blockers unmask dopamine's beta action.

Dopamine (Intropin)

How Supplied

- 400mg/10mL vial (40mg/mL)

Dosage and Administration

- **Adult**
  - 5-20mcg/Kg/min: Mix 400mg of Dopamine in 250mL of D5W (1600mcg/mL). With mini-drip setting on administration set (60gtt), start Dopamine drip at 5mcg/Kg/min and titrate up to a maximum of 20mcg/Kg/min or until a perfusing heart rate and blood pressure are achieved.

- **Pediatric**
  - 5-20mcg/Kg/min: Mix 400mg of Dopamine in 250mL of D5W (1600mcg/mL). With mini-drip setting on administration set (60gtt), start Dopamine drip at 5mcg/Kg/min and titrate up to a maximum of 20mcg/Kg/min or until a perfusing heart rate and blood pressure are achieved.

Duration of Action

- Onset: within 2-4 minutes
- Duration: 10-15 minutes

Special Considerations

- Pregnancy safety: category C
- Infuse in large vein to prevent extravasation
- Must calculate appropriate weight-based dose
- Titration of medication to desired effect

Dopamine (Intropin)

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section C: Bradycardia
  - Section E: Cardiogenic Shock
  - Section I: I.C.E. (Induced Cooling by EMS)
  - Section J: Post Resuscitation Care
  - Section K: Pulmonary Edema

- **Tab 900 (Medical Emergency Protocols)**
  - Section Q: Hypotension / Shock (Non-Trauma)

- **Tab 1100 (Pediatric Protocols)**
  - Section J: Pediatric Hypotension / Shock (Non-Trauma)

Doxycycline
(Doxycycline Hyclate)

Class

- A broad-spectrum antibiotic

Mechanism of Action

- Doxycycline is an antimicrobial drug
-

Indications

- Brucellosis
- Fever (of suspected biological agent)
- Pneumonic Plague
- Typhoidal Tularemia
- Anthrax exposure

Contraindications

- This drug is contraindicated in persons who have shown hypersensitivity to any of the tetracyclines.

Adverse Reactions

- Anorexia, nausea, vomiting, diarrhea, glossitis, dysphagia, enterocolitis, rash

Drug Interactions

- Avoid giving with penicillin
- Anticoagulant therapy
- May render oral contraceptives less effective

How Supplied

- 100mg tablets

Doxycycline
(Doxycycline Hyclate)

Dosage and Administration

- **Adult**
  - The determination of dosage for any particular patient must take into consideration the severity and nature of the infection, the susceptibility of the causative organism, the integrity of the patient's host-defense mechanisms, and the status of renal function and hepatic function

- **Pediatric**
  - The determination of dosage for any particular patient must take into consideration the severity and nature of the infection, the susceptibility of the causative organism, the integrity of the patient's host-defense mechanisms, and the status of renal function and hepatic function

Special Considerations

- Pregnancy safety: category D
- Patients taking Doxycycline should avoid excessive sunlight
- Patients should drink fluids liberally

Protocol References:

- **Tab 100 (Operations)**
  - Section V: Hazardous Materials / WMD

Epinephrine (Adrenalin)

Class

- Sympathomimetic

Mechanism of Action

- Direct acting alpha and beta agonist
  - **Alpha:** bronchial, cutaneous, renal and visceral arteriolar vasoconstriction
  - **Beta 1:** positive inotropic and chronotropic actions, increases automaticity
  - **Beta 2:** bronchial smooth muscle relaxation and dilation of skeletal vasculature
- Blocks histamine release

Indications

- Patient with absent vital signs and either ventricular fibrillation or ventricular tachycardia on the monitor
- Cardiac arrest patient presenting in Asystole on cardiac monitor but does not meet standard criteria for determination of death
- Patient with cardiac electrical activity on the cardiac monitor but absent vital signs or evidence of spontaneous circulation (PEA)
- Cardiac arrest, Asystole, PEA, VF unresponsive to initial defibrillation
- Anaphylaxis, acute allergic reactions
- Asthma
- Hemodynamically unstable bradycardia

Contraindications

- Cardiac arrest due to hypothermia
- Hypertension, pulmonary edema/CHF, coronary insufficiency, hypovolemic shock
- Narrow angle (congestive) glaucoma – relative contraindication

Epinephrine (Adrenalin)

Adverse Reactions

- Hypertension, dysrhythmias, pulmonary edema/congestive heart failure, anxiety, psychomotor agitation, nausea, angina, headache, restlessness
- Overdose or inadvertent IV injection of epinephrine may cause CNS hemorrhage resulting from the sharp rise in BP

Drug Interactions

- Potentiates other sympathomimetics
- Deactivated by alkaline solutions
- MAOIs and bretylium may potentiate effects of epinephrine

How Supplied

- 1mg/10mL prefilled syringe (0.1mg/mL)
- 30mg/30mL multi-dose vial (1mg/mL)

Dosage and Administration

Cardiac Arrest

- **Adult**
  - 1mg Epinephrine (0.1mg/mL) IV/IO q 3-5 minutes PRN.
- **Pediatric**
  - 0.01mg/Kg Epinephrine (0.1mg/mL) IV/IO q 3-5 minutes PRN

Allergy / Anaphylaxis

- **Adult**
  - **Allergy:** 0.5mg Epinephrine (1mg/mL) IM
  - **Anaphylaxis:** 0.3mg Epinephrine (0.1mg/mL) IV
- **Pediatric**
  - **Allergy:** 0.01mg/Kg Epinephrine (1mg/mL) IM: (max 0.5mg)
  - **Anaphylaxis:** 0.01mg/Kg Epinephrine (0.1mg/mL) IV: (max 0.5mg)

Epinephrine (Adrenalin)

Respiratory Distress

- **Adult**
  - **Wheezes:** 0.5mg Epinephrine (1mg/mL) IM
  - **Stridor:** 0.5mg Epinephrine (1mg/mL) nebulized or 0.5mg (1mg/mL) IM
  - **Hemodynamically Unstable:** 0.3mg Epinephrine (0.1mg/mL) IV
- **Pediatric**
  - **Wheezes (<18mos):** 1mg Epinephrine (1mg/mL) nebulized with 2mL NS
  - **Wheezes (>18mos):** 0.01mg/Kg Epinephrine (1mg/mL) IM: (max dose 0.5mg)
  - **Stridor/Croup:** 1mg Epinephrine (1mg/mL) nebulized with 2mL NS

Bradycardia

- **Adult**
  - 2-10mcg/min IV drip. Mix 2mg Epinephrine (1mg/mL) in 250mL D5W (8mcg/mL). With mini-drip setting on administration set (60gtt), start Epinephrine drip at 2mcg/min and titrate up to a maximum of 10mcg/min or until a perfusing heart rate and blood pressure are achieved. A second IV line is desired, however do not delay administration of medication is not obtainable.

Epinephrine Drip Rates: **15gtts = 2mcg/min**
30gtts = 4mcg/min
45gtts = 6mcg/min
60gtts = 8mcg/min

- **Pediatric**
  - 0.01mg/Kg Epinephrine (0.1mg/mL) IV/IO

Duration of Action

- Onset: immediate
- Peak effect: minutes
- Duration: 5-10 minutes

Epinephrine (Adrenalin)

Special Considerations

- Pregnancy safety: category C
- Syncope in asthmatic children
- Increases myocardial work effort and oxygen consumption

Protocol References:

- **Tab 500 (Medical Procedures / Equipment)**
  - Section M: Endotracheal Medication Administration
  - Section P: Intramuscular Medication Administration
- **Tab 800 (Cardiac Protocols)**
  - Section A: Asystole
  - Section C: Bradycardia
  - Section L: Pulseless Electrical Activity (PEA)
  - Section P: Ventricular Fibrillation / Pulseless VT
- **Tab 900 (Medical Emergency Protocols)**
  - Section D: Allergic Reaction
  - Section U: Respiratory Distress
- **Tab 1100 (Pediatric Protocols)**
  - Section C: Pediatric Allergic Reaction
  - Section E: Pediatric Bradycardia
  - Section Q: Pediatric Pulseless Arrest
  - Section R: Pediatric Respiratory Distress

Etomidate (Amidate)

Class

- Hypnotic, sedative

Mechanism of Action

- Non-barbiturate hypnotic and sedative without analgesic activity; has minimal effects on myocardial activity, BP and respirations

Indications

- Sedation for induction of therapeutic hypothermia with documented patient movement (i.e., gasping, shivering, seizure activity, or movement)

Contraindications

- Hypersensitivity

Adverse Reactions

- Hypotension (Systolic BP <90)
- Transient clonic jerking of skeletal muscle (too rapid infusion)
- Laryngospasm
- Allergic reactions (rare)

Drug Interactions

- None well documented

How Supplied

- 40mg/20mL vial (2mg/mL)
- 20mg/10mL vial (2mg/mL)

Etomidate (Amidate)

Dosage and Administration

- **Adult**
  - 20mg slow IV/IO push

Duration of Action

- Onset: usually within 1 minute
- Duration: 3-5 minutes

Special Considerations

- Pregnancy safety: category C
- Rapid IV infusion can cause skeletal muscle fasciculation
- Re-dosing per MC contact with continued patient movement/activity during therapeutic hypothermia

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section I: I.C.E. (Induced Cooling by EMS)

Fentanyl (Sublimaze)

Class

- Narcotic analgesic

Mechanism of Action

- Fentanyl is a potent opioid analgesic that increases pain threshold, alters pain reception and inhibits ascending pain pathways by binding to stereospecific receptors within the CNS.

Indications

- Use as a narcotic analgesic for pain management
- Use as a sedative for induction of therapeutic hypothermia during cardiac arrest post-resuscitation care

Contraindications

- Known intolerance or hypersensitivity

Adverse Reactions

- Somnolence, respiratory depression, muscle rigidity, bradycardia, seizures, diaphoresis, hypotension, apnea, dizziness, blurred vision, nausea, vomiting

Drug Interactions

- Depressant effects may be enhanced by other CNS depressants (e.g. alcohol, anaesthetics, anxiolytics, hypnotics, TCAs and antipsychotics). Ammonium chloride may increase excretion of Fentanyl. Phenothiazines may increase hypotensive effect of opioid analgesics.

How Supplied

- 100mcg/2mL Carpuject (50mcg/mL)
- 100mcg/2mL Ampule (50mcg/mL)

Fentanyl (Sublimaze)

Dosage and Administration

Synchronized Cardioversion / TCP

- **Adult**
  - <50Kg administer 1mcg/Kg IV/IN (repeat dosing x1 by protocol)
  - >50Kg administer 50mcg IV/IN (repeat dosing x1 by protocol)
- **Pediatric**
  - 1mcg/Kg IV/IN (dose not to exceed 50mcg)

Isolated Peripheral Traumatic Injuries

- **Adult**
  - <50Kg administer 1mcg/Kg IV/IN q 5-10 minutes PRN not to exceed 100mcg
  - >50Kg administer 50mcg IV/IN q 5-10 minutes PRN not to exceed 100mcg
- **Pediatric**
  - 1mcg/Kg IV/IN (dose not to exceed 50mcg)

Burns

- **Adult**
  - <50Kg administer 1mcg/Kg IV/IN q 5-10 minutes PRN not to exceed 200mcg
  - >50Kg administer 100mcg IV/IN. Repeat PRN at 50mcg q 5-10 minutes not to exceed 200mcg.
- **Pediatric**
  - 1mcg/Kg IV/IN (dose not to exceed 50mcg)

Fentanyl (Sublimaze)

Sickle Cell Crisis

- **Adult**
  - <50Kg administer 1mcg/Kg IV/IN q 5-10 minutes PRN not to exceed 100mcg
  - >50Kg administer 50mcg IV/IN q 5-10 minutes PRN not to exceed 100mcg
- **Pediatric**
  - 1mcg/Kg IV/IN (dose not to exceed 50mcg)

Therapeutic Hypothermia

- **Adult**
  - 50mcg slow IV/IO
- **Pediatric**
  - Not recommended for use in pediatrics

Duration of Action

- Onset: rapid
- Peak effect: variable
- Duration: short

Special Considerations

- Pregnancy safety: category C
- Head injury; increased intracranial pressure; intracranial lesions; renal or hepatic impairment; neonates; opioid-nontolerant patients.
- Increased risk of respiratory depression in elderly, debilitated patients, patient with hypoxia or hypercapnia.
- Hypothyroidism, prostatic hyperplasia, inflammatory bowel disorders, bradycardia or bradyarrhythmias.
- Rapid IV infusion may cause skeletal muscle and chest wall rigidity, impaired ventilation or respiratory distress/arrest.

Fentanyl (Sublimaze)

Special Considerations (cont.)

- Prolonged use may cause tolerance, psychological and physical dependence.
- Abrupt withdrawal after prolonged admin may lead to withdrawal symptoms.

Protocol References:

- **Tab 500 (Medical Procedures / Equipment)**
  - Section Q: Intranasal (IN) Medication Administration
- **Tab 800 (Cardiac Protocols)**
  - Section B: Atrial Fibrillation / Flutter
  - Section C: Bradycardia
  - Section I: I.C.E. (Induced Cooling by EMS)
  - Section N: Supraventricular Tachycardia
  - Section Q: Ventricular Tachycardia / Wide Complex with Pulse
- **Tab 900 (Medical Emergency Protocols)**
  - Section T: Pain Management
- **Tab 1100 (Pediatric Protocols)**
  - Section E: Pediatric Bradycardia
  - Section F: Pediatric Burns
  - Section O: Pediatric Pain Control
  - Section T: Pediatric Tachycardia

Glucagon (Glucagen)

Class

- Hyperglycemic agent, pancreatic hormone, insulin antagonist

Mechanism of Action

- Increases blood glucose by stimulating glycogenesis (converts liver glycogen to glucose)
- Unknown mechanism of stabilizing cardiac rhythm in beta- or calcium-channel blocker overdose
- Minimal positive inotrope and chronotrope
- Decreases GI motility and secretions – smooth muscle relaxant

Indications

- Signs and symptoms consistent with hypoglycemia
- Documented hypoglycemia
- Altered level of consciousness when hypoglycemia is suspected
- May be used as inotropic or chronotropic agent in beta- or calcium-channel blocker overdose

Contraindications

- Hyperglycemia
- Hypersensitivity
- Known Pheochromocytoma (adrenal tumor that secretes excess epinephrine)

Adverse Reactions

- Nausea and vomiting (occasional)
- Tachycardia, hypertension

Drug Interactions

- Incompatible in solution with most other substances
- No significant drug interactions with other emergency medications

Glucagon (Glucagen)

How Supplied

- 1mg (1IU) vial (must be reconstituted)

Dosage and Administration

- **Adult**
  - 1mg IN/IM (requires reconstitution)
  - For beta-blocker overdose administer IV
- **Pediatric**
  - 0.1mg/Kg IN /IM
  - For beta-blocker overdose administer IV

Duration of Action

- Onset: 1 minute
- Peak effect: 30 minutes
- Duration: variable (generally 9-17 minutes)

Special Considerations

- Pregnancy safety: category C
- Ineffective if glycogen stores depleted (chronic alcohol related liver disease)
- Should always be used in conjunction with 50% Dextrose whenever possible

Protocol References:

- **Tab 500 (Medical Procedures / Equipment)**
  - Section P: Intramuscular Medication Administration
  - Section Q: Intranasal (IN) Medication Administration
- **Tab 800 (Cardiac Protocols)**
  - Section D: Cardiac Arrest
  - Section L: Pulseless Electrical Activity (PEA)

Glucagon
(Glucagen)

Protocol References (cont):

- **Tab 900 (Medical Emergency Protocols)**
  - Section E: Altered Mental Status
  - Section S: Overdose / Toxic Ingestion
  - Section V: Seizures
  - Section X: Syncope
  - Section W: Stroke / CVA

- **Tab 1100 (Pediatric Protocols)**
  - Section D: Pediatric Altered Mental Status
  - Section N: Pediatric Overdose / Toxic Ingestion

Glucose
(Glutose)

Class

– Hyperglycemic agent

Mechanism of Action

– Provides quickly absorbed glucose to increase blood glucose levels

Indications

– Conscious patients with suspected signs and symptoms consistent with hypoglycemia
– Documented hypoglycemia

Contraindications

– Decreased level of consciousness, absent gag reflex, nausea, vomiting

Adverse Reactions

– Nausea, vomiting

Drug Interactions

– None

How Supplied

– Oral glucose gel (15g/tube)

Dosage and Administration

- **Adult**
  – 1 tube (repeat PRN)

- **Pediatric**
  – < 3 years of age: Not indicated
  – > 3 years of age: 1 tube (repeat PRN)

Duration of Action

– Onset: immediate
– Peak effect: variable
– Duration: variable

Glucose
(Glutose)

Special Considerations

– As noted in “indications” section

Protocol References:

- **Tab 900 (Medical Emergency Protocols**
  – Section BB: Hypo- / Hyperglycemia
- **Tab 1100 (Pediatric Protocols)**
  – Section W: Pediatric Hypo- /Hyperglycemia

Ketamine HCL

Class

- Anesthetic Induction

Mechanism of Action

- Ketamine is a controlled substance medication that is a rapid acting anesthetic producing an anesthetic state characterized by profound analgesia, normal pharyngeal-laryngeal reflexes, normal or slightly enhanced skeletal tone, cardiovascular and respiratory stimulation, and occasionally a transient and minimal respiratory depression.

Indications

- Patient in Excited Delirium when there is a threat to crew or self.

Contraindications

- Ketamine is contraindicated in those in whom a significant elevation of blood pressure would constitute a serious hazard and in those who have shown hypersensitivity to the drug.

Adverse Reactions

- **Cardiovascular:** blood pressure and pulse rate are frequently elevated following administration of Ketamine alone. However, hypotension and bradycardia have been observed. Arrhythmia has also occurred.
- **Respiration:** Although respiration is frequently stimulated, severe depression of respiration or apnea may occur following rapid intravenous administration or high doses of Ketamine. Laryngospasms and other forms of airway obstruction have occurred during Ketamine anesthesia.
- **Eye:** Diplopia and nystagmus have been noted following Ketamine administration. It also may cause a slight elevation in intraocular pressure measurement.
- **Neurological:** In some patients, enhanced skeletal muscle tone may be manifested by tonic and clonic movements sometimes resembling seizures.
- **Gastrointestinal:** Anorexia, nausea and vomiting have been observed; however, this is not usually severe and allows the great majority of patients to take liquids by mouth shortly after regaining consciousness.
- **General:** Anaphylaxis, local pain and exanthema at the injection site have infrequently been reported. Transient erythema and/or morbilliform rash have also been reported.

Drug Interactions

- Prolonged recovery time may occur if barbiturates and/or narcotics are used concurrently with Ketamine.

How Supplied

- Ketamine HCL Concentrate
- 500mg (5mL vial): 100mg/mL
- Color of solution may vary from colorless to slightly yellowish and may darken upon prolonged exposure to light. This darkening does not affect potency. Do not use if precipitate appears.
- Protect from light
- **DO NOT ADMINISTER IV**

Dosage and Administration

- **Adult**
  - 4mg/Kg IM (Maximum dose of 400mg)
  - 4mg/Kg IN (Maximum dose of 400mg)
- **Pediatric**
  - Currently no pediatric dosing recommendations

Duration of Action

- Onset: 45-60 seconds (IM)
- Duration: 12-25min (IM)

Special Considerations

- Elevation of blood pressure begins shortly after injection, reaches maximum within a few minutes and usually returns to pre-anesthetic values within 15 minutes after injection.
- Use with caution in the chronic alcoholic and the acutely alcohol intoxicated patient.
- Ketamine is a Class III controlled substance medication.

Protocol References:

- **Tab 100 (Operations Section)**
  - Section W: Controlled Substance Program Policy

- **Tab 500 (Medical Procedures / Equipment)**
  - Section P: Intramuscular Medication Administration
  - Section Q: Intranasal (IN) Medication Administration

- **Tab 900 (Medical Emergency Protocols)**
  - Section F: Behavioral / Agitated Delirium

Lidocaine HCL Jelly USP 2%

Class

– Lidocaine HCL 2% Jelly is a sterile, aqueous product that contains a local anesthetic agent and is administered topically

Mechanism of Action

– Lidocaine stabilizes the neuronal membrane by inhibiting the ionic fluxes required for the initiation and conduction of impulses, thereby effecting local anesthetic action

Indications

– Topical (local) anaesthetic for introduction of nasal airways (NPA) / intubation

Contraindications

– Known history of hypersensitivity to local anesthetics of the amide type or components of Lidocaine HCL 2% Jelly

Adverse Reactions

– Similar in nature to those observed in other amide local anesthetic agents.

How Supplied

– Lidocaine Hydrochloride Jelly 2% - 5mL tube

Dosage and Administration

– Apply a moderate amount of jelly to the external surface of the NPA / ET tube shortly before use. Care should be taken to avoid introducing the product into the lumen of the tube. Do not use the jelly to lubricate endotracheal stylettes.

Lidocaine HCL Jelly USP 2%

Duration of Action

- Onset: 3 – 5 minutes

Special Considerations

- Pregnancy safety: category B

Magnesium Sulfate

Class

- Anticonvulsant, electrolyte

Mechanism of Action

- Reduction of acetylcholine released by nerve impulses, resulting in anticonvulsant effects and central nervous system depression and blocking peripheral neuromuscular transmission
- Antagonizes calcium and blocks calcium channels in bronchial and vascular smooth muscle
- Antihypertensive actions

Indications

- Treatment and prevention of hypomagnesemia
- Seizure prevention in severe pre-eclampsia or eclampsia
- Short-term treatment torsade de pointes
- Respiratory distress (Asthma/COPD)

Contraindications

- Heart block, serious renal impairment, myocardial damage, hepatitis, Addison's disease

Adverse Reactions

- Hypotension and Asystole may occur with rapid administration
- Depressed CNS, diarrhea, flushing, somnolence,
- Cardiac conduction affected
- Respiratory paralysis

Drug Interactions

- Increased effect: Nifedipine decreased blood pressure and increased neuromuscular blockade
- Increased toxicity: Aminoglycosides increased neuromuscular blockade; CNS depressants increased CNS depression; neuromuscular antagonists, pulmonary edema

Magnesium Sulfate

How Supplied

- 5Gm/10mL vial (0.5Gm/mL)

Dosage and Administration

Cardiac Arrest (Torsades de Pointes)

- **Adult**
  - 2Gm IV/IO push
- **Pediatric**
  - No current protocol recommendations for pediatrics

Seizures (Pre-Eclampsia / Eclampsia)

- **Adult**
  - 4Gm IV drip over 10-20 minutes (4Gm mixed in 50mL bag D5W attached to 60gtt administration set and run wide open)

Respiratory Distress

- **Adult**
  - 2Gm IV drip over 10-20 minutes (2Gm mixed in 50mL bag D5W attached to 60gtt administration set and run wide open)
- **Pediatric**
  - No current protocol recommendations for pediatrics

Duration of Action

- Onset: immediate
- Duration: 3-4 hours

Special Considerations

- Pregnancy safety: category A
- Flushing and diaphoresis may occur with administration
- Caution in renal failure patients
- Closely monitor respiratory status and ECG rhythm during administration

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section D: Cardiac Arrest

- **Tab 900 (Medical Emergency Protocols)**
  - Section N: Gynecological / Obstetrical Emergency
  - Section U: Respiratory Distress

Morphine
(Morphine Sulfate)

Class

- Opioid analgesic

Mechanism of Action

- Alleviates pain through CNS actions
- Suppresses fear and anxiety centers in the brain
- Depresses brain stem respiratory centers
- Increases peripheral venous capacitance and decreases venous return
- Decreases preload and afterload, decreasing myocardial oxygen demand

Indications

- Chest pain due to acute coronary syndrome
- Pain management

Contraindications

- Undiagnosed head injury
- Undiagnosed abdominal pain
- Known hypersensitivity to morphine or other opiate analgesics
- Clinical evidence of shock or respiratory depression
- Exacerbated COPD, hypotension, suspected hypovolemia, decreased level of consciousness
- Patients who have taken MAOIs within the past 14 days

Adverse Reactions

- Respiratory depression, hypotension, decreased level of consciousness, nausea, vomiting
- Bradycardia, tachycardia, syncope, facial flushing, euphoria, bronchospasm, dry mouth
- Note: caution must be exercised when using morphine in patients with a history of asthma or underlying respiratory disease

Morphine
(Morphine Sulfate)

Drug Interactions

- Potentiates sedative effects of phenothiazines
- CNS depressants may potentiate effects of morphine
- MAOIs may cause paradoxical excitation

How Supplied

- 10mg/1mL Carpuject

Dosage and Administration

Chest Pain (ACS)

- **Adult**
  - 2-5mg slow IV (maximum 10mg by protocol). Maintain SBP >100

Isolated Peripheral Traumatic Injuries

- **Adult**
  - 2-5mg slow IV q 5-10 minutes PRN (maximum 10mg by protocol)
- **Pediatric**
  - 0.1mg/Kg IV (re-dosing per MC order)

Burns

- **Adult**
  - 5mg IV/IM q 5-10 minutes PRN (not to exceed 20mg by protocol)
- **Pediatric**
  - 0.1mg/Kg IV/IM (re-dosing per MC order)

Morphine
(Morphine Sulfate)

Sickle Cell Crisis

- **Adult**
  - 2-5mg slow IV q 5-10 minutes PRN (maximum 10mg by protocol)

- **Pediatric**
  - 0.1mg/Kg IV/IM (re-dosing per MC order)

Duration of Action

- Onset: immediate IV; delayed IM
- Peak effect: 20 minutes
- Duration: 2-7 hours

Special Considerations

- Pregnancy Safety: on basis of historical studies, no known risk of fetal abnormality
- Morphine rapidly crosses the placenta
- Use with caution in geriatric population and those with COPD and asthma
- Vagotonic effect in patient with acute inferior MI (bradycardia, heart block)
- Naloxone should be readily available as antidote

Protocol References:

- **Tab 500 (Medical Procedures / Equipment)**
  - Section P: Intramuscular Medication Administration

- **Tab 800 (Cardiac Protocols)**
  - Section F: Chest Pain / Acute Coronary Syndromes

- **Tab 900 (Medical Emergency Protocols)**
  - Section H: Burns
  - Section T: Pain Management

Morphine
(Morphine Sulfate)

Protocol References (cont.):

- **Tab 1100 (Pediatric Protocols)**
  - Section F: Pediatric Burns
  - Section O: Pediatric Pain Control

Narcan
(Naloxone)

Class

- Narcotic antagonist

Mechanism of Action

- Competitive inhibition at narcotic receptor sites
- Reverse respiratory depression secondary to depressant drugs
- Completely inhibits the effect of narcotic agents
- No pharmacologic activity at all in the absence of narcotic agents

Indications

- Opiate overdose or decreased level of consciousness due to opiate use
- Complete or partial reversal of CNS and respiratory depression induced by opioids
- Reverses the effect of the following:
  - Morphine, Heroin, Hydromorphone (Dilaudid), Methadone, Meperidine (Demerol), Fentanyl (Sublimase), Oxycodone (Percodan), Codeine, Propoxyphene (Darvon), Butorphanol (Stadol), Pentazocine (Talwin), Nalbuphine (Nubain)
- Coma of unknown origin

Contraindications

- Known hypersensitivity

Adverse Reactions

- Withdrawal symptoms in the addicted patient
- Tachycardia, hypertension, dysrhythmias, nausea, vomiting, diaphoresis

Drug Interactions

- Incompatible with bisulfite and alkaline solutions

How Supplied

- 4mg/10mL multi-dose vial (0.4mg/mL)
- 2mg/2mL Luer-Jet prefilled syringe

Narcan
(Naloxone)

Dosage and Administration

- **Adult**
  - 4mg IV / IO / IM / IN / ET
  - ETT administration: 2-2.5 times the recommended IV dosage

- **Pediatric**
  - 0.1mg/Kg IV / IO / IM / IN / ET

Duration of Action

- Onset: within 2 minutes
- Peak effect: variable
- Duration: 30-80 minutes

Special Considerations

- Pregnancy Safety: safety has not been established
- Seizures without causal relationship have been reported
- May not reverse hypotension
- Use with caution when administering to narcotic addicts (violent behavior, etc.)
- Duration of action may be shorter than the effects of long acting narcotic agents. Frequent monitoring of the patient is required and repeat doses of Naloxone may be necessary

Protocol References:

- **Tab 500 (Medical Procedures / Equipment)**
  - Section M: Endotracheal Medication Administration
  - Section P: Intramuscular Medication Administration
  - Section Q: Intranasal (IN) Medication Administration

- **Tab 800 (Cardiac Protocols)**
  - Section D: Cardiac Arrest
  - Section L: Pulseless Electrical Activity (PEA)

Narcan
(Naloxone)

Protocol References (cont.):

- **Tab 900 (Medical Emergency Protocols)**
  - Section S: Overdose / Toxic Ingestion

- **Tab 1100 (Pediatric Protocols)**
  - Section N: Pediatric Overdose / Toxic Ingestion
  - Section Q: Pediatric Pulseless Arrest

Nitroglycerin

Class

- Vasodilator

Mechanism of Action

- Smooth muscle relaxant acting on vascular, bronchial, uterine and intestinal smooth muscle
- Dilation of arterioles and veins in the periphery, reduces preload and afterload, decreases the workload of the heart and thereby decreases myocardial oxygen demand

Indications

- Adult patients with complaint of chest pain that is suspected to be of ischemic origin
- Patients with ECG evidence of myocardial ischemia
- Hypertension, congestive heart failure

Contraindications

- Known or suspected sensitivity to nitroglycerin
- Systolic blood pressure <100mmHg
- Sildefanil (Viagra) use within 24 hours
- Intracranial bleeding or head injury

Adverse Reactions

- Headache, hypotension, syncope, reflex tachycardia, flushing
- Nausea, vomiting, diaphoresis, muscle twitching

Drug Interactions

- Additive effect with other vasodilators
- Potent, refractory hypotension occurs when Sildefanil (Viagra) used within 24 hours
- Incompatible with other drugs when given IV

Nitroglycerin

How Supplied

- 1/150gr sublingual tablets (0.4mg)
- 400mcg Nitrolingual spray (200 metered dose sprays)

Dosage and Administration

Chest Pain / Acute Coronary Syndrome

- **Adult**
  - 0.4mg SL (tablet or spray) q 5 minutes PRN. Maintain SBP >100

Pulmonary Edema

- **Adult**
  - 0.4mg SL (tablet or spray) q 3-5 minutes PRN. Maintain SBP >110

Duration of Action

- Onset: 1-3 minutes
- Peak effect: 5-10 minutes
- Duration: 20-30 minutes

Special Considerations

- Pregnancy Safety: category C
- Hypotension more common in geriatric population
- Decomposes if exposed to light or heat
- Must be kept in airtight containers
- Active ingredient may have stinging effect when administered SL
- Caution with use in right-sided and inferior MIs

Nitroglycerin

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section F: Chest Pain / Acute Coronary Syndromes
  - Section K: Pulmonary Edema

Norcuron
(Vecuronium Bromide)

Class

- Neuromuscular blocker

Mechanism of Action

- Neuromuscular blocker and a non-depolarizing agent that prevents acetylcholine from binding to receptors on the muscle end plate, thus blocking depolarization.

Indications

- Neuromuscular blockade used for induction of therapeutic hypothermia with documented patient movement (i.e., ., gasping, shivering, seizure activity, or movement)

Contraindications

- Patients with hypersensitivity to bromides

Adverse Reactions

- Transient increase in heart rate
- Prolonged dose related apnea
- Redness, itching, skeletal muscle weakness

Drug Interactions

- Other skeletal muscle relaxants: potentiated neuromuscular blockade

How Supplied

- 10mg (1mg/mL when reconstituted with 10mL sterile water)

Norcuron
(Vecuronium Bromide)

Dosage and Administration

- **Adult**
  - 0.1mg/Kg slow IV/IO (maximum 10mg)

Duration of Action

- Onset: usually within 1 minute
- Peak effect: 3-5 minutes
- Duration: 25-30 minutes

Special Considerations

- Pregnancy safety: category C
- Do not mix with alkaline solutions

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section I: I.C.E. (Induced Cooling by EMS)

Oxygen

Class

- Naturally occurring atmospheric gas

Mechanism of Action

- Reverses hypoxemia

Indications

- Confirmed or expected hypoxemia
- Ischemic chest pain
- Respiratory insufficiency
- Prophylactically during transport
- Confirmed or suspected carbon monoxide poisoning
- All other cases of decreased tissue oxygenation
- Decreased level of consciousness

Contraindications

- Certain patients with COPD, emphysema who will not tolerate concentrations over 35%
- Hyperventilation

Adverse Reactions

- Decreased level of consciousness and respiratory depression in patients with chronic C02 retention
- Retrolental fibroplasias if given in high concentrations to premature infants

Drug Interactions

- None

How Supplied

- Oxygen cylinders of 100% compressed oxygen gas

Oxygen

Dosage and Administration

- **Adult**
  - Cardiac arrest and carbon monoxide poisoning: 100%
  - Hypoxemia: 10-15 L via non-rebreather mask
  - Oxygen support: 1-6 L via nasal cannula

- **Pediatric**
  - Cardiac arrest and carbon monoxide poisoning: 100%
  - Hypoxemia: 10-15 L via non-rebreather mask
  - Oxygen support: 1-6 L via nasal cannula

Duration of Action

- Onset: immediate
- Peak effect: not applicable
- Duration: less than 2 minutes

Special Considerations

- Be familiar with liter flow and each type of delivery device used
- Supports combustion

Pralidoxime Chloride (2-PAM CL)

Class

- Cholinesterase reactivator

Mechanism of Action

- The principal action of pralidoxime is to reactivate cholinesterase (mainly outside of the central nervous system) which has been inactivated by phosphorylation due to an organophosphate pesticide or related compound. The destruction of accumulated acetylcholine can then proceed and neuromuscular junctions will again function normally. Pralidoxime also slows the process of "aging" of phosphorylated cholinesterase to a non-reactivatable form, and detoxifies certain organophosphates by direct chemical reaction. The drug has its most critical effect in relieving paralysis of the muscles of respiration. Because pralidoxime is less effective in relieving depression of the respiratory center, atropine is always required concomitantly to block the effect of accumulated acetylcholine at this site. Pralidoxime relieves muscarinic signs and symptoms, salivation, bronchospasm, etc., but this action is relatively unimportant since atropine is adequate for this purpose.

Indications

- Pralidoxime Chloride is specifically indicated for intramuscular use as an adjunct to atropine in the treatment of poisoning by nerve agents having anticholinesterase activity.

Contraindications

- Pralidoxime Chloride auto-injector is contraindicated in patients who are hypersensitive to any component of the product.

Adverse Reactions

- Mild to moderate pain at the site of injection
- Blurred vision, dizziness, headache, drowsiness, nausea, tachycardia, increased systolic and diastolic blood pressure, hyperventilation, muscular weakness

Pralidoxime Chloride (2-PAM CL)

Drug Interactions

- When used with Atropine, the signs of atropinization may occur earlier

How Supplied

- 600mg/2mL Auto-Injector

Dosage and Administration

- **Adult**
  - Dyspnea, vomiting or diarrhea: DuoDote Auto-Injector 2-PAM CL / Atropine IM
  - Seizures, apnea, severe respiratory distress, unconsciousness, muscle twitching: (3 DuoDote Auto-Injectors) 2-PAM CL used in conjunction with Atropine and Valium IM
- **Pediatric**
  - 15mg/Kg

Duration of Action

- Onset: approximately 10 minutes
- Duration: dose dependent

Special Considerations

- Pregnancy safety: category C
- Caution in patients taking Aminophylline, Caffeine, Theophylline

Protocol References:

- **Tab 100 (Operations)**
  - Section V: Hazardous Materials / WMD

Prednisone

Class

- Corticosteroid

Mechanism of Action

- Glucocorticoids are naturally occurring hormones that prevent or suppress inflammation and immune responses when administered at pharmacological doses.

Indications

- Bronchial asthma
- Emphysema (COPD)
- Pulmonary fibrosis

Contraindications

- Peptic ulcer, osteoporosis
- Psychoses or severe psychoneuroses

Adverse Reactions

- Headache, eye pain, bradycardia, chest pain, seizures, peripheral swelling, dyspnea, exacerbation of depression or suicidal ideation

Drug Interactions

- Barbiturates may reduce effects of corticosteroids
- Chronic use of antacids with prednisone may decrease absorption

How Supplied

- 20mg tablets

Prednisone

Dosage and Administration

- **Adult**
  - 40mg PO
- **Pediatric**
  - 20mg PO (if ability to swallow and maintain own airway)

Duration of Action

- Onset: 30-60 minutes
- Peak effect: variable
- Duration: Hours/days

Special Considerations

- Pregnancy Safety: category C
- Caution in liver disease
- Caution in patients with clotting disorders

Protocol References:

- **Tab 900 (Medical Emergency Protocols)**
  - Section U: Respiratory Distress
- **Tab 1100 (Pediatric Protocols)**
  - Section R: Pediatric Respiratory Distress

Procainamide (Pronestyl)

Class

- Class IA cardiac antiarrhythmic

Mechanism of Action

- Inhibition of fast sodium channels depressing Phase 0 of the action potential
- Ventricular excitability is depressed and the stimulation threshold of the ventricle is increased during diastole

Indications

- Treatment of documented, sustained ventricular tachycardia
- Used to treat tachyarrhythmias from Wolff-Parkinson-White Syndrome by prolonging the refractory period of the accessory pathway

Contraindications

- May be contraindicated in patients with myasthenia gravis
- Hypersensitivity
- Torsades de Pointes
- Heart block

Adverse Reactions

- Generally dosage (blood level) related
- Anorexia, vomiting, diarrhea
- Weakness, hypotension, negative inotropism
- Widened QRS complex and QT intervals
- Profound hypotension if administered to rapidly

Drug Interactions

- Additive effects on the heart when used in conjunction with other antiarrhythmics

Procainamide (Pronestyl)

How Supplied

- 1Gm/2mL vial (500mg/mL)

Dosage and Administration

- **Adult**
  - 20mg/min until the arrhythmia is suppressed, hypotension ensues, the QRS complex is prolonged by 50% from its original duration, or a total of 17mg/Kg of the drug has been given. Mix 1Gm Procainamide in a 50mL bag of D5W (20mg/mL). With (60gtt) administration set, run at 60gtts/min to achieve 20mg/min.

V-Tach terminated with the use of Procainamide will require a maintenance infusion. Mix 1Gm Procainamide in a 250mL bag of D5W (4mg/mL). With (60gtt) administration set, run at 1-4mg/min:

1mg/min = 15gtts/min
2mg/min = 30gtts/min
3mg/min = 45gtts/min
4mg/min = 60gtts/min

Duration of Action

- Onset: within minutes
- Duration: variable 3-4 hours

Special Considerations

- Pregnancy safety: category C
- Constant monitoring of patient and cardiac monitor
- Stop infusion if noted hypotension
- Stop infusion for prolonged QRS or QT intervals

Procainamide (Pronestyl)

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section Q: Ventricular Tachycardia / Wide Complex with Pulse

Sodium Bicarbonate

Class

- Electrolyte

Mechanism of Action

- Intravenous sodium bicarbonate therapy increases plasma bicarbonate, buffers excess hydrogen ion concentration, raises blood pH and reverses the clinical manifestations of acidosis.

Indications

- Treatment of metabolic acidosis which may occur in severe renal disease, uncontrolled diabetes, circulatory insufficiency due to shock or severe dehydration, extracorporeal circulation of blood
- Cardiac arrest and severe primary lactic acidosis. Sodium bicarbonate is further indicated in the treatment of certain drug intoxications
- Acidosis associated with Tricyclic overdose

Contraindications

- Contraindicated in patients who are losing chloride by vomiting or from continuous gastrointestinal suction, and in patients receiving diuretics known to produce a hypochloremic alkalosis.
- Hypocalcemia
- Hypokalemia

Adverse Reactions

- Metabolic alkalosis, hypoxia, seizures, electrolyte imbalance
- Tissue sloughing at injection site

Drug Interactions

- May precipitate with many medications. Always flush IV line before and after medication administration

Sodium Bicarbonate

How Supplied

- 50mEq/50mL prefilled syringe (1mEq/mL)

Dosage and Administration

Cardiac Arrest

- **Adult**
  - ESRD patients with suspected hyperkalemia as potential cause of arrest: 50mEq IO/IV push
  - Tricyclic overdose as potential cause of arrest: 1mEq/Kg
- **Pediatric**
  - 1mEq/Kg

Overdose / Toxic Ingestion

- **Adult**
  - Tricyclic overdose: 1mEq/Kg IO/IV
- **Pediatric**
  - Tricyclic overdose: 1mEq/Kg IO/IV

Duration of Action

- Onset: 2-10 minutes
- Duration: 30-60 minutes

Special Considerations

- Pregnancy safety: category C
- May precipitate with many medications (i.e., calcium chloride)
- Vasopressors may be deactivated

Sodium Bicarbonate

Protocol References:

- **Tab 800 (Cardiac Protocols)**
  - Section D: Cardiac Arrest
  - Section L: Pulseless Electrical Activity (PEA)

- **Tab 900 (Medical Emergency Protocols)**
  - Section S: Overdose / Toxic Ingestion

- **Tab 1100 (Pediatric Protocols)**
  - Section N: Pediatric Overdose / Toxic Ingestion
  - Section Q: Pediatric Pulseless Arrest

Solu-Medrol (Methylprednisolone)

Class

- Glucocorticoid

Mechanism of Action

- Glucocorticoids cause profound and varied metabolic effects. In addition, they modify the body's immune responses to diverse stimuli.
- Methylprednisolone is a potent anti-inflammatory steroid with greater anti-inflammatory potency than prednisolone and even less tendency than prednisolone to induce sodium and water retention.

Indications

- When oral therapy is not feasible, and the strength, dosage form and route of administration of the drug reasonably lend the preparation to the treatment of the condition
- Bronchial asthma
- Emphysema (COPD)
- Allergic reaction / Anaphylaxis
- Pulmonary fibrosis

Contraindications

- Solu-Medrol Sterile Powder is contraindicated in systemic fungal infections
- Known hypersensitivity to the product and its constituents
- Psychoses or severe psychoneuroses

Adverse Reactions

- Headache, eye pain, bradycardia, chest pain, seizures, peripheral swelling, dyspnea, exacerbation of depression or suicidal ideation

Drug Interactions

- Convulsions have been reported with concurrent use of methylprednisolone and cyclosporin
- Methylprednisolone may increase the clearance of chronic high dose aspirin.
- Aspirin should be used cautiously in conjunction with corticosteroids in patients suffering from hypoprothrombinemia
- The effect of methylprednisolone on oral anticoagulants is variable.

Solu-Medrol (Methylprednisolone)

How Supplied

- 125mg/2mL Act-O-Vial

Dosage and Administration

- **Adult**
  - 125mg IV
- **Pediatric**
  - 1mg/Kg IV

Duration of Action

- Onset: 30 minutes – 2 hours
- Peak effect: variable

Special Considerations

- Pregnancy Safety: category C
- Caution in liver disease
- Caution in patients with clotting disorders
- Exacerbation of depression or suicidal ideation

Protocol References:

- **Tab 900 (Medical Emergency Protocols)**
  - Section D: Allergic Reaction
  - Section U: Respiratory Distress
- **Tab 1100 (Pediatric Protocols)**
  - Section C: Pediatric Allergic Reaction
  - Section R: Pediatric Respiratory Distress

Tetracaine
(Benzoic Acid)

Class

- Anesthetic, local (ophthalmic)

Mechanism of Action

- After topical application to the eye, local anesthetics penetrate to sensory nerve endings in the corneal tissue.
- These medications block both the initiation and conduction of nerve impulses by decreasing the neuronal membrane's permeability to sodium ions. This reversibly stabilizes the membrane and inhibits depolarization, resulting in the failure of a propagated action potential and subsequent conduction blockade

Indications

- Anesthesia, local—tetracaine is indicated to produce local anesthesia of short duration for ophthalmic procedures including removal of foreign bodies

Contraindications

- Hypersensitivity
- Penetration of eye globe or rupture

Adverse Reactions

- Infection, stinging, burning, eye redness

Drug Interactions

- Cholinesterase inhibitors (metabolism of tetracaine may be inhibited, leading to prolonged ocular anesthetic effect and increased risk of toxicity, if administered to a patient receiving therapy with a cholinesterase inhibitor)

How Supplied

- Ophthalmic Solution 0.5% (2mL or 15mL)

Tetracaine
(Benzoic Acid)

Dosage and Administration

- **Adult**
  - 1 to 2 drops to affected eye

- **Pediatric**
  - 1 to 2 drops to affected eye

Duration of Action

- Onset: Approximately 15 seconds
- Duration: 10 to 20 minutes; average 15 minutes

Special Considerations

- Pregnancy safety: category C
- Mild burning, stinging, redness, or other irritation of eye

Protocol References:

- **None**

Thiamine

Class

- Vitamin (B1)

Mechanism of Action

- Thiamine combines with ATP to form thiamine pyrophosphate coenzyme, a necessary component for carbohydrate metabolism. Most vitamins required by the body are obtained through diet, but certain states, such as alcoholism and malnutrition, may affect the intake, absorption, and use of thiamine. The brain is extremely sensitive to thiamine deficiency

Indications

- Coma of unknown origin (before the administration of Dextrose 50%, or Naloxone**)**
- Delirium tremens
- Wernicke's encephalopathy
- Anemia from thiamine deficiency

Contraindications

- There are not significant drug interactions with other emergency medications

Adverse Reactions

- Hypotension (from rapid injection or large dose), anxiety, diaphoresis, nausea, vomiting, allergic reaction (usually from IV injection; very rare)

Drug Interactions

- Hypersensitivity
- There are no significant drug interactions with other emergency medications

Thiamine

How Supplied

- 200mg/2mL vial (100mg/mL)

Dosage and Administration

- **Adult**
  - 100mg IV/IM

Duration of Action

- Onset: rapid
- Duration: depends on degree of deficiency

Special Considerations

- Pregnancy safety: category A
- Large IV doses may cause respiratory difficulties
- Anaphylactic reactions have been reported
- It should be given before D50 in a comatose patient suspected of alcoholism, malnutrition or Wernicke's Encephalopathy

Protocol References:

- **Tab 500 (Medical Procedures / Equipment)**
  - Section P: Intramuscular Medication Administration
- **Tab 900 (Medical Emergency Protocols)**
  - Section E: Altered Mental Status
  - Section S: Overdose / Toxic Ingestion
  - Section V: Seizures
  - Section X: Syncope
  - Section W: Stroke / CVA

Tranexamic Acid (TXA, Cyclokapron)

Class

- Anti-Fibrinolytic

Mechanism of Action

- Tranexamic Acid (TXA) is a synthetic derivative of the amino acid lysine that inhibits fibrinolysis by blocking the lysine binding sites on plasminogen.

Indications

- Evidence of marked blood loss.
- Sustained tachycardia (>110/min, despite a 500mL bolus of IVFs).
- Sustained hypotension (<90 systolic, despite a 500mL bolus).
- Major trauma with suspicion for pelvic and/or abdominal injury.
- Major arterial bleeding requiring tourniquet.

Contraindications

- Non-hemorrhagic shock
- Non-traumatic shock
- Isolated head injury
- Allergy

Adverse Reactions

- TXA has not been shown to cause significant increase in deep vein thrombosis (DVT), pulmonary embolus, myocardial infarction, or stroke in published trials to date.

Pharmacokinetics

- Onset of action within 4 hours after IV administration, exact time of onset unclear and variable. Delayed effects up to 48 hours consistent with anti-inflammatory actions.

Precautions

- Begin infusion as soon as possible after injury, but no later than 3 hours after injury.
- Do not give through the same IV as Hextend or blood products.
- Do not give IV push – will cause hypotension. Must be given over 10 minutes

Tranexamic Acid (TXA, Cyclokapron)

How Supplied

- **1Gm in 10mL vial**

Dosage and Administration

- **Adult**
  - 1 Gram in 50mL D5W IV as soon as possible, given over 10 minutes.
- **Pediatric**
  - Currently no pediatric dosing recommendations

Protocol References:

- **Tab 1000 (Trauma)**
  - Section D: Multi-System Trauma
  - Section E: Tranexamic Acid (TXA)

Valium
(Diazepam)

Class

- Benzodiazepine, sedative-hypnotic, anticonvulsant

Mechanism of Action

- Potentiates effects of inhibitory neurotransmitters
- Raises seizure threshold
- Induces amnesia and sedation

Indications

- Nerve agent exposure

Contraindications

- Focal seizure with no alteration in consciousness
- Hypersensitivity, coma, shock, myasthenia gravis (disease of voluntary muscles)

Adverse Reactions

- Respiratory depression, hypotension, drowsiness, ataxia
- Reflex tachycardia, nausea, confusion, thrombosis and phlebitis

Drug Interactions

- Incompatible with most drugs and fluids
- Caution when used in intoxicated patients – can have additive effect producing further CNS depression

How Supplied

- 10mg/2mL Auto-Injector

Valium
(Diazepam)

Dosage and Administration

Nerve Agent Exposure

- **Adult**
  - 10mg auto-injector used in conjunction with DuoDote auto-injector for patient that presents with seizures, apnea, severe respiratory distress, unconsciousness or muscle twitching

- **Pediatric**
  - 0.2mg/Kg not to exceed 10mg (if available for pediatric dosing)

Duration of Action

- Onset: 1-5 minutes
- Peak effect: 30 minutes-2 hours
- Duration: Variable

Special Considerations

- Pregnancy Safety: category D
- Short duration of anticonvulsant effect
- Consider reducing dose 50% in the elderly patient

Protocol References:

- **Tab 100 (Operations)**
  - Section V: Hazardous Materials / WMD

- **Tab 500 (Medical Procedures / Equipment)**
  - Section P: Intramuscular Medication Administration

Versed (Midazolam)

Class

- Short-acting benzodiazepine CNS depressant

Mechanism of Action

- Anxiolytic and sedative properties similar to other benzodiazepines
- Memory impairment

Indications

- Intubated patient with increased level of consciousness in who extubation is not desirable and is either becoming distressed or at risk of destabilizing their airway
- Pain/sedative therapy for electrical cardioversion
- Pain/sedative therapy for transcutaneous pacing
- Seizures
- Anxiolytic

Contraindications

- Known hypersensitivity to Midazolam or other benzodiazepines
- Glaucoma, shock, coma, alcohol intoxication, overdose patient
- Concomitant use with other CNS depressants, barbiturates, alcohol, narcotics

Adverse Reactions

- Hiccups, cough, over-sedation, nausea, vomiting, injection-site pain, headache, blurred vision
- Hypotension, respiratory depression and arrest

Drug Interactions

- Should not be used in patients who have taken CNS depressant

How Supplied

- 2mg/2mL vial (1mg/mL)

Versed
(Midazolam)

Dosage and Administration

Cardioversion / TCP

- **Adult**
  - 2mg IV/IN/IM may be repeated x 1 PRN by protocol
- **Pediatric**
  - 0.1mg/Kg IO/IV (0.2mg/Kg IN/IM) with maximum single dose 2mg. May be repeated x 1 PRN by protocol

Airway Control

- **Adult**
  - 2mg IV/IN/IM may be repeated x 1 PRN by protocol

Seizures

- **Adult**
  - 2-4mg IV/IN/IM may be repeated x 1 PRN by protocol
- **Pediatric**
  - 0.1mg/Kg IO/IV (0.2mg/Kg IN/IM) with maximum single dose 2mg. May be repeated x 1 PRN by protocol

Duration of Action

- Onset: 1-3 minutes (dose dependent)
- Peak effect: variable
- Duration: 2-6 hours (dose dependent

Special Considerations

- Pregnancy Safety: category D
- Requires continuous monitoring of respiratory and cardiac function

Versed
(Midazolam)

Protocol References:

- **Tab 500 (Medical Procedures / Equipment)**
  - Section P: Intramuscular Medication Administration
  - Section Q: Intranasal (IN) Medication Administration

- **Tab 800 (Cardiac Protocols)**
  - Section B: Atrial Fibrillation / Flutter
  - Section C: Bradycardia
  - Section I: ICE Protocol
  - Section K: Pulmonary Edema
  - Section N: Supraventricular Tachycardia
  - Section Q: Ventricular Tachycardia / Wide Complex with Pulse

- **Tab 900 (Medical Emergency Protocols)**
  - Section B: Airway, Adult
  - Section C: Airway, Adult – Failed
  - Section N: Gynecological / Obstetrical Emergencies
  - Section T: Pain Management
  - Section V: Seizures

- **Tab 1100 (Pediatric Protocols)**
  - Section E: Pediatric Bradycardia
  - Section S: Pediatric Seizures
  - Section T: Pediatric Tachycardia

Zofran
(Ondansetron)

Class

- Serotonin 5-HT_3 receptor antagonist
- Used medically as an antiemetic to treat nausea and vomiting.

Mechanism of Action

- Its effects are thought to be on both peripheral and central nerves.
- It reduces the activity of the vagus nerve, which deactivates the vomiting center in the brain.

Indications

- To combat moderate to severe nausea

Contraindications

- Allergy or hypersensitivity to other 5-HT_3 receptor antagonists.
- Known hypersensitivity to the drug.
- Use with caution in patients with hepatic impairment

Adverse Reactions

- Headache
- Lightheadedness
- Dizziness
- Drowsiness
- Tiredness
- Constipation

Drug Interactions

- Profound hypotension and loss of consciousness reported with concomitant use of Apomorphine (Dopamine agonist) – Parkinson's disease.

How Supplied

- 4mg/2mL vial
- 4mg ODT (Oral Disintegrating Tablet)

Zofran (Ondansetron)

Route of Administration

- SL / IV / IN / IM

Dosage and Administration

- **Adult**
  - 4mg SL / IV / IN / IM
  - May be repeated x 1 in 5-10 minutes PRN.
- **Pediatrics**
  - 0.1mg/Kg for children 2-15
  - Not to exceed normal adult dose of 4mg

Duration of Action

- Onset: Immediate (IV,PO) to 30 minutes (IM)
- Peak effect: variable
- Duration: Half-life is approximately 4 hours.

Special Considerations

- Pregnancy Safety: category B
- The use of Zofran in patient following abdominal surgery or in patients with chemotherapy-induced nausea and vomiting may mask a progressive ileus and/or gastric distension.
- Rarely and predominantly with intravenous Zofran, transient ECG changes including QT interval prolongation have been reported.

Special Notes:

Instructions for Use/Handling of ZOFRAN ODT Tablets –

- Do not attempt to push Zofran ODT tablets through the foil backing.
- With dry hands, peel back the foil backing of 1 blister and gently remove tablet.
- Immediately place Zofran ODT tablet under the tongue where it will dissolve in seconds, then swallow with saliva.
- Administration with liquid is not necessary.

Bottles/Vials/Unit Dose Packs

- Protect from light

Zofran
(Ondansetron)

Protocol References:

- **Tab 500 (Medical Procedures / Equipment)**
  - Section Q: Intranasal (IN) Medication Administration
- **Tab 800 (Cardiac Protocols)**
  - Section F: Chest Pain / Acute Coronary Syndromes
- **Tab 900 (Medical Emergency Protocols)**
  - Section A: Abdominal Pain
  - Section Z: Vomiting / Diarrhea
- **Tab 1100 (Pediatric Protocols)**
  - Section V: Pediatric Vomiting / Diarrhea