State of Delaware
Paramedic Standing Orders

Pharmacology Manual

DELAWARE
Office of
Emergency Medical Services
DELAWARE HEALTH AND SOCIAL SERVICES
Division of Public Health

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GENERAL INFORMATION

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

A known hypersensitivity is a contraindication to that medication.

For all medications, follow dosages specified in the current Delaware Paramedic Standing Orders document.

ANAPHYLACTIC PRECAUTIONS

Anaphylaxis:

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

Cause:

Any drug has the potential to precipitate anaphylaxis. Generally medications administered intravenously or parenterally are more likely to result in life-threatening or fatal anaphylaxis than medications 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, paresthesia, 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

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 an infusate being outside the vein in 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:** Reduce local irritation 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, implement every effort to prevent infiltration. Observe the IV site 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 administer an antidote 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.

ACETAMINOPHEN (Tylenol®)

Class – analgesic and antipyretic

Pharmacologic Action – exact mechanism of action not fully determined, may inhibit nitric oxide pathway mediated by neurotransmitters like NMDA to elevate pain threshold. Antipyretic action through inhibition of prostaglandin synthesis and release in CNS with effects in the heat-regulating center of hypothalamus. Little effect on platelet function and not known to cause gastrointestinal bleeding. Not an NSAID – has no anti-inflammatory properties

Onset: 30 - 45 minutes **Peak Effect:** 1 hour **Duration:** 4-6 hours

Indications:

- Pain of musculoskeletal injury origin

Contraindications:

- Allergy
- Liver disease or injury
- Reduced hepatic function
- Heavy alcohol abuse

Warnings:

- Use with caution in pregnancy and thrombocytopenia

Drug Interactions:

- Leeflunomide, levoketoconazole, lomitapide, mipomersen, pexidartinib, teriflunomide – may all increase risk of liver damage

Adverse Reactions:

Nausea/vomiting and abdominal pain

Protocols Containing Acetaminophen:

Pediatric and Adult Pain Management

ADENOSINE (Adenocard®)

Class – Antidysrhythmic (Class V)

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

Onset: 20-30 seconds **Peak Effect:** 20-30 seconds **Duration:** 30 seconds

Indications:

- Conversion of regular, narrow complex tachycardia – stable supraventricular tachycardia (SVT) or regular, monomorphic wide complex tachycardia (WCT).

Contraindications:

- **S**econd- or third-degree AV Block (except those on pacemakers).
- Sick sinus syndrome.
- Atrial flutter or fibrillation.
- Ventricular tachycardia / Torsades.
- Asthma.

Warnings:

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

Drug Interactions:

- Digoxin or verapamil - potential for additive or synergistic effects.
- Methylxanthines (caffeine, aminophylline and theophylline) - antagonize action of adenosine (may require higher doses).
- Dipyridamole (Persantine®, Aggrenox®) - potentiates the effect of adenosine (reduce adenosine doses).
- Carbamazepine (Tegretol®) - may increase degree of heart block following adenosine administration.

Adverse Reactions:

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

Protocols Containing Adenosine:

Adult Stable Tachycardia
Adult Unstable Tachycardia
Pediatric Tachycardia

ALBUTEROL SULFATE (Proventil®, Ventolin®)

Class – Beta-2 sympathetic agonist

Pharmacologic Action – Sympathomimetic selective for beta-2 receptors. Relaxes bronchial smooth muscle with little effect on heart rate.

Onset: 5-15 minutes **Peak Effect:** 1 – 1.5 hours **Duration:** 3-6 hours

Indications:

- Bronchospastic lung disease.

Contraindications:

- Tachycardic dysrhythmias (rate greater than 150 bpm).

Warnings

- May not adequately control asthma when used alone; consider corticosteroids.
- May cause a significant cardiovascular effect (increased pulse rate or blood pressure, ECG changes) as well as pronounced hypokalemia – caution with use in elderly or those with cardiac history.
- 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

- Sympathetic agonists – increase potential for side effects.
- Beta-blockers – may blunt effects of albuterol.

Adverse Reactions

Tremors, dizziness, headache, nausea, nasal congestion, tachycardia, arrhythmias, hypertension, bronchospasm, and cough.

Protocols Containing Albuterol:

Adult Acute Respiratory Distress
Pediatric Acute Respiratory Distress

AMIODARONE (Cordarone®)

Class – Antidysrhythmic (Class III)

Pharmacologic Action - Inhibits adrenergic stimulation; affects sodium, potassium, and calcium channels; markedly prolongs action potential and repolarization; decreases AV conduction and sinus node function. Also has some alpha- and beta-adrenergic blocking properties.

Onset: 1-2 minutes **Peak Effect:** 10 minutes **Duration:**

Indications

- Regular wide complex tachycardia in stable patients.
- Irregular wide complex tachycardia in stable patients.
- Antidysrhythmic for the management of ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT).

Contraindications

- Cardiogenic shock marked sinus bradycardia, and second- or third-degree AV block (unless a pacemaker is available).

Warnings:

- Drug-related bradycardia or worsening of existing arrhythmias may also occur.
- Use in pregnancy should only occur if the potential benefit to the mother justifies the risk to the fetus.
- Caution with use in heart failure.

Drug Interactions:

- Warfarin, digoxin, quinidine, procainamide, disopyramide (Norpace®), fentanyl, lidocaine, and cyclosporine – amiodarone may increase their effects.
- Cholestyramine and phenytoin (Dilantin®) - may decrease levels of amiodarone in the body.
- Cimetidine may increase amiodarone levels.
- 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.

Protocols Containing Amiodarone:

Acute Coronary Syndrome
ST Elevation Myocardial Infarction (STEMI)
Adult Stable Tachycardia
Adult Unstable Tachycardia
Adult Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT)
Pediatric Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT)

AMYL NITRATE

Class – Nitrate, Cyanide antidote

Pharmacologic Action - Oxidizes hemoglobin to form methemoglobin. Methemoglobin is incapable of oxygen transport but has a high affinity for cyanide. Cyanide preferentially binds to methemoglobin instead of cytochrome a3 in the mitochondria. This forms cyanomethemoglobin that carries the cyanide to the liver for detoxification and elimination.

Onset: 10 – 30 seconds **Peak Effect:** 30 seconds **Duration:** 3 – 5 minutes

Indications

- Acute cyanide toxicity.

Contraindications

- None in the case of suspected pure cyanide toxicity.
- Do not use in cases of known or suspected carbon monoxide poisoning.

Warnings:

- There is a risk of worsening hypoxia due to methemoglobin formation.
- Amyl Nitrate vapors are extremely flammable, do not use near open flame or intense heat.
- Use in children has not been studied.

Drug Interactions:

- Antihypertensive medications, nitrates, beta-blockers, antiemetics (phenothiazines) – potentiate hypotensive effects and may result in severe hypotension.

Adverse Reactions:

Headache, dizziness, weakness, orthostatic hypotension, tachycardia, and nausea/vomiting.

Protocols Containing Amyl Nitrate:

Cyanide Exposure (ToxMedic)
Sulfide Exposure (Toxmedic)

ASPIRIN

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

Pharmacologic Action - Inhibits synthesis of prostaglandin by cyclooxygenase inhibiting platelet aggregation. Aspirin also has antipyretic and analgesic activity.

Onset: 5-30 minutes **Peak Effect:** 15-120 minutes **Duration:** 1-4 hours

Indications

- Acute coronary syndrome.

Contraindications

- Hypersensitivity to aspirin or NSAIDs (aspirin-associated hypersensitivity reactions include aspirin-induced urticarial or aspirin-intolerant asthma).
- Bleeding disorders – ulcers, hemophilia, hemorrhagic diathesis, hemorrhoids, thrombocytopenia, and ulcerative colitis.
- Hemolytic anemia from pyruvate kinase (PK) and glucose-6-phosphate dehydrogenase (G6PD) deficiency.
- Lactating mother.

Warnings:

- Increases bleeding by inhibiting platelet function in patients with bleeding disorders.
- Patients with peptic ulcer disease should avoid aspirin, as it may result in irritation and bleeding.

Drug Interactions:

- ACE inhibitors – ASA diminishes their effects by affecting the renin-angiotensin conversion pathway.
- Warfarin, Heparin, Coumadin - prolongs prothrombin and bleeding times.
- Phenytoin – decreases concentration of phenytoin.
- Valproic acid – increases concentration of valproic acid.
- Beta blockers and diuretics - may be less effective due to decreased renal blood flow and retention of salt and fluid.
- Methotrexate – inhibits clearance which may result in toxicity.
- Oral hypoglycemics – may increase their effectiveness resulting in hypoglycemia.
- Antacids – reduce absorption of aspirin.

Adverse Reactions:

Anaphylaxis, bronchospasm/wheezing, dysrhythmias, hypotension, tachycardia, agitation, cerebral edema, intracranial hemorrhage, dehydration, hyperkalemia, heartburn, and renal failure.

Protocols Containing Aspirin:

Acute Coronary Syndromes (ACS)
ST Elevation Myocardial Infarction (STEMI)

ATROPINE SULFATE

Class – Anticholinergic

Pharmacologic Action – Parasympatholytic, blocks acetylcholinesterase receptors and inhibits parasympathetic stimulation. Positive chronotropic properties with little or no inotropic effects.

Onset: Immediate **Peak Effect:** 2-4 minutes **Duration:** 4 hours

Indications:

- Symptomatic bradycardia (primary or related to toxin ingestion).
- Nerve agent/organophosphate and carbamate insecticide toxicity.

Contraindications:

- None in emergency situations (ACLS/nerve agent/organophosphate scenarios).
- Relative contraindications:
    - Narrow-angle glaucoma.
    - GI obstruction / toxic megacolon.
    - Severe ulcerative colitis.
    - Bladder outlet obstruction.
    - Myasthenia gravis.
    - Hemorrhage with cardiovascular instability.
    - Thyrotoxicosis (excess production of thyroid hormones accelerating metabolic processes, more common in women).

Warnings:

- V Fib and V Tach have occurred following IV administration.
- May induce tachycardia harmful to patients suffering AMI or infarction due to increased myocardial oxygen demand.
- Doses less than 0.5 mg in an adult can induce paradoxical bradycardia and ventricular arrhythmias.
- Ineffective in hypothermic bradycardias.

Drug Interactions:

- With other anticholinergics - may increase effects of vagal blockade.
- Antihistamines, procainamide, quinidine, and psychotropic medications – may enhance atropine's effects.

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.

Protocols Containing Atropine:

Adult Hemodynamically Compromising Bradycardia
Pediatric Bradycardia
Patient Restraint
Cholinesterase Inhibitor Exposure (Tox Medic)

BUPRENORPHINE

Class – Narcotic analgesic

Pharmacologic Action – Opioid partial agonist-antagonist used to prevent withdrawal symptoms in treating opioid dependence.

Onset: 30-60 minutes **Peak Effect:** 3-4 hours **Duration:** 24-72 hours

Indications:

- Adult patients who received naloxone to reverse opioid overdose.

Contraindications:

- Patient unwilling to participate in program – does not provide name and date of birth
- Pregnancy
- Methadone use less than 45 minutes prior to buprenorphine
- Altered mental status
- Unable to give consent

Warnings:

- May precipitate withdrawal symptoms in patients who are addicted to opioids.
- Caution in patients with respiratory depression and gastrointestinal obstruction.

Drug Interactions:

- Caution in patients receiving other opioids/narcotics.

Adverse Reactions:

Nausea, vomiting, drowsiness, dizziness, headache, memory loss, sweating, dry mouth, miosis, orthostatic hypotension, urinary retention, abdominal pain, constipation, blurred vision

Protocols Containing Buprenorphine:

Adult Altered Mental Status
Buprenorphine

CALCIUM CHLORIDE

Class – Calcium salt

Pharmacologic Action - Bone mineral component; cofactor in enzymatic reactions, essential for myocardial contraction, neurotransmission, muscle contraction, and many signal transduction pathways. Provides free calcium (Ca^{2+}).

Onset: Immediate **Peak Effect:** Unknown **Duration:** Varies

Indications:

- Calcium channel blocker overdose.
- Hyperkalemia/hypocalcemia (chronic renal failure/dialysis).
- Antidote for magnesium sulfate overdose.
- Topical burns caused by hydrofluoric acid.

Contraindications:

- Hypercalcemia.
- Severe hypokalemia.

Warnings:

- **Use of Calcium Chloride limited to medical control consult only.**
- Risk for digitalis toxicity.
- Caution with peripheral IV use as significant tissue necrosis at injection site may occur.
- Rapid injection may result in bradycardia.
- May produce coronary and cerebral artery spasm.

Drug Interactions:

- Digoxin - may increase ventricular irritability and precipitate digitalis toxicity.
- Sodium Bicarbonate - calcium salts will precipitate from solution – flush line between meds.
- Verapamil - may antagonize vasodilatory action of verapamil.

Adverse Reactions:

May cause bradycardia, asystole, and hypotension.

Protocols Containing Calcium Chloride:

Adult Altered Mental Status
Adult Hemodynamically Compromising Bradycardia
Adult Stable Tachycardia
Adult Unstable tachycardia
Adult Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT)
Adult Asystole / Pulseless Electrical Activity

CALCIUM GLUCONATE

Class – Calcium salt

Pharmacologic Action – In cases of hydrofluoric acid (HF) exposure, HF will seek out calcium stores in the body. Primary sources are the bones and the cardiac conduction system. Calcium gluconate will supply elemental calcium to the HF in order to substitute for the body's natural calcium stores.

Onset: 1 – 3 minutes (IV) **Peak Effect:** Variable **Duration:** 30 – 60 minutes

Indications:

- Topical burns caused by hydrofluoric acid.
- Calcium channel blocker overdose.

Contraindications:

- Hypercalcemia.
- Sarcoidosis.
- Suspected severe hypokalemia (life-threatening cardiac arrhythmias may occur).

Warnings:

- Risk of digitalis toxicity.
- SQ or IM administration can cause severe tissue necrosis and tissue sloughing.
- Can induce serious cardiac dysrhythmias.

Drug Interactions:

- None known.

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.

Protocols Containing Calcium Gluconate:

Hydrofluoric Acid Exposure (Tox Medic)

DEXTROSE

Class – Carbohydrate

Pharmacologic Action – Rapidly increases blood glucose. Oxidizes to carbon dioxide and water. Provides 3.4 kilocalories/gram of d-glucose (this is the primary form of sugar used by the body).

Onset: < 1 minute **Peak Effect:** Variable **Duration:** Variable

Indications:

- Hypoglycemia

Contraindications:

- Hyperglycemia.
- Anuria.
- Diabetic coma.
- Intracranial or intraspinal hemorrhage.
- Increased intracranial pressure.
- Dehydration with delirium.
- Glucose-galactose malabsorption syndrome.

Warnings:

- Extravasation may result in tissue necrosis - use large vein for access.
- May induce acute thiamine deficiency (Wernicke-Korsakoff syndrome) in malnourished patients and chronic alcoholics.

Drug Interactions:

- None known

Adverse Reactions:

Warmth, pain, burning, or phlebitis secondary to injection.

Protocols Containing Dextrose:

Adult Altered Mental Status
Suspected Stroke
Adult Seizures (Active)
Pediatric Altered Mental Status
Pediatric Seizures (Active)

DIAZEPAM (Valium®)

Class – Benzodiazepine

Pharmacologic Action – Binds to sites on gamma-aminobutyric acid (GABA). Has no direct effect on GABA receptors but potentiates the effects of GABA within the brain (GABA is the main inhibitory neurotransmitter in the CNS – by potentiating the effects of GABA, Diazepam promotes sedation). In seizures, does not atop abnormal discharge focus but does stop the spread of seizure activity though the motor cortex. Skeletal muscle relaxant (ortho injuries) and induces amnesia. 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.

Onset: 1 – 5 minutes (IV) **Peak Effect:** 15 minutes (IV) **Duration:** 15 – 60 minutes

Onset: 15 – 30 minutes (IM) **Peak Effect:** 30 – 45 minutes (IM) **Duration:** 15 – 60 minutes

Indications:

- Active seizures (Under DE protocol – diazepam is only used IM for seizures caused by cholinesterase inhibitor exposure).

Contraindications:

- Severe respiratory depression.

Warnings:

- May cause respiratory depression.
- No effect on pain.

Drug Interactions:

- Other CNS depressants – may result in significant CNS depression.
- Other IV meds - may precipitate, flush line between meds.

Adverse Reactions:

Hypotension, tachycardia, respiratory depression, confusion, nausea, and impairment.

Protocols Containing Diazepam:

Cholinesterase Inhibitor Exposure (Tox Medic).

DILTIAZEM HYDROCHLORIDE (Cardizem®)

Class – Antidysrhythmic (Class IV), calcium channel blocker

Pharmacologic Action - Inhibits extracellular calcium ion influx across membranes of myocardial cells and vascular smooth muscle cells, resulting in inhibition of 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, slowing the ventricular rate associated with Atrial Fibrillation and Atrial Flutter.

Onset: 3 minutes **Peak Effect:** 7 minutes **Duration:** 1-3 hours

Indications:

- Narrow complex tachycardias – Atrial Fibrillation/Atrial Flutter.
- SVT not responding to adenosine.

Contraindications:

- Congestive Heart Failure.
- 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.
- 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.
- Should not be administered to compromised myocardium (severe CHF, AMI, or cardiomyopathy).
- Use caution when giving to hypotensive patients.
- May result in hepatic injury.
- Calcium chloride is an antidote for cases of hypotension due to overdose of Diltiazem.

Drug Interactions:

- Beta blockers – do not administered together or within a few hours.
- Anesthetics - may potentiate the effects on cardiac contractility, conductivity, and automaticity.
- Carbamazepine (Tegretol®) – may elevate levels of Tegretol (toxicity).
- Digoxin - use with caution.

Adverse Reactions:

Hypotension, asystole, AV block, bradycardia, chest pain, CHF, ventricular arrhythmias, flushing, injection site reactions, nausea, vomiting, and dizziness.

Protocols Containing Diltiazem:

Adult Stable Tachycardia

DIPHENHYDRAMINE HYDROCHLORIDE (Benadryl®)

Class - Antihistamine

Pharmacologic Action - Histamine H1-receptor antagonist of effector cells in respiratory tract, blood vessels, and GI smooth muscle. Blocks histamine response. Also has anticholinergic actions.

Onset: 10 – 15 minutes (IV) **Peak Effect:** 1 hour **Duration:** 6 – 8 hours

Indications:

- Urticarial and/or pruritus from allergic reactions.
- Dystonia/akathisia (extrapyramidal symptoms).

Contraindications:

- Premature infants and neonates.

Warnings:

- Use with caution in patients with severe vomiting, asthma, narrow-angle glaucoma, benign prostatic hypertrophy, and alcohol intoxication.

Drug Interactions:

- MAO inhibitors - may prolong and potentiate diphenhydramine.
- Furosemide

Adverse Reactions:

Drowsiness, thickening of bronchial secretions, hypotension, tachycardia, bradycardia, and dry mouth.

Protocols Containing Diphenhydramine:

Adult Allergic/Adverse Reactions/Dystonic Reaction (Severe and Moderate/Dystonic)
Pediatric Allergic Reactions (Severe and Moderate)
Patient Restraint

Droperidol

Class- Antipsychotic; Antiemetic

Pharmacologic Action- Dopamine antagonist, predominantly blocks dopamine-2 receptors in the brain, also alpha-adrenergic blockade

Onset: 3-10 minutes **Peak Effect:** ~30 minutes **Duration:** 2-4 hours

Indications:

- Acute psychosis or agitated/violent behavior refractory to non-pharmacologic interventions.
- Nausea and vomiting refractory to Zofran(Ondansetron)

Contraindications:

- Severe CNS depression
- Prolonged QT interval or history of long QT syndrome (QTc >440 msec for males or >450 msec for females)
- Neuroleptic malignant syndrome
- Parkinson's disease

Warnings:

- Risk of QT prolongation and/or torsades de pointes
- Use caution in patients with cardiac disease or bradycardia (HR<50/minute)

Drug Interactions:

- May increase the effects of other sedating medications.
- Antihypertensive medications—may increase the possibility of orthostatic hypotension.
- Anti-Parkinson agents (such as carbidopa/levodopa)—may diminish effects of Anti-Parkinson medications through dopamine blockade.
- Antiarrhythmics (such as flecainide, amiodarone, or sotalol) which may prolong the QT interval.

Adverse Reactions:

- CNS depression, orthostatic hypotension, respiratory depression.
- Extrapyramidal reactions, such as akathisia or dystonic reactions (have diphenhydramine available)
- Neuroleptic malignant syndrome, rarely.
- Risk of QT prolongation, although more recent studies have suggested risk is less than previously stated.

Protocols Containing Droperidol:

Patient restraint
General Patient Care

EPINEPHRINE

Class – Sympathetic (Alpha/beta adrenergic) agonist

Pharmacologic Action – Epinephrine has both alpha- and beta-adrenergic effects. Epi's beta-adrenergic effects are much stronger than it's alpha effects. Alpha stimulation increases peripheral vascular resistance through vasoconstriction and helps to increase the force of cardiac contractions. The stronger beta effects increase the heart rate, contractility, and automaticity. Strong beta-1- and moderate beta-2-adrenergic effects result in bronchial smooth muscle relaxation. There are also secondary relaxation effects on smooth muscle of stomach, intestine, uterus, and urinary bladder.

Onset: < 2 minutes (IV) **Peak Effect:** < 5 minutes (IV) **Duration:** 5-10 minutes (IV)

Onset: 3-10 minutes (IM) **Peak Effect:** 20 minutes (IM) **Duration:** 20-30 minutes (IM)

Indications:

- Anaphylaxis.
- Shock.
- Cardiac arrest.
- Bradycardia.
- Exacerbation of some COPD, croup/bronchiolitis and refractory acute asthma.

Contraindications:

- Cardiac dilatation and coronary insufficiency.

Warnings:

- Causes a dramatic increase in myocardial oxygen demand).

Drug Interactions:

- Sodium bicarbonate - inactivates epinephrine.
- MAO inhibitors, antidepressants, 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:

Headache, nausea, restlessness, palpitations, weakness, dysrhythmias, hypertension, and angina.

Protocols Containing Epinephrine:

Adult Acute Respiratory Distress
Adult Allergic/Adverse Reactions/Dystonic Reaction (Severe)
Adult Hemodynamically Compromising Bradycardia
Adult Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT)
Adult Asystole/Pulseless Electrical Activity (PEA)
Pediatric Acute Respiratory Distress
Pediatric Allergic Reaction (Severe)
Pediatric Bradycardia
Pediatric Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT)
Pediatric Asystole / Pulseless Electrical Activity (PEA)

ESMOLOL HYDROCHLORIDE (Brevibloc®)

Class – Beta-blocker (Antiarrhythmic Class II)

Pharmacologic Action – Competitively blocks beta 1 receptors in cardiac muscle. This reduces both contractility and heart rate.

Onset: < 5 minutes **Peak Effect:** 10-20 minutes **Duration:** 10-30 minutes

Indications:

- Persistent or recurrent Ventricular Fibrillation or Ventricular Tachycardia after the administration of a total of 5 mg of Epinephrine.

Contraindications:

- Bradycardia.
- Second- and third-degree AV blocks.
- Cardiogenic shock.
- Congestive heart failure.

Warnings:

- Worsens heart failure.
- Hypotension can occur (usually dose related) – reduce dose.

Drug Interactions:

- Calcium channel blockers and antihypertensive medications.
- Morphine – increases blood levels of Esmolol.

Adverse Reactions:

Bradycardia, dizziness, hypotension, lethargy, CHF, dyspnea, wheezing, weakness.

Protocols Containing Esmolol:

Adult Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT)

ETOMIDATE (Amidate®)

Class – Sedative and hypnotic

Pharmacologic Action - Appears to act similar to GABA by depressing the activity of the brain stem reticular activating system. No analgesic properties. Minimal respiratory and cardiovascular effects. Does not cause a histamine release (like many other sedative/hypnotics do).

Onset: 10 – 20 seconds **Peak Effect:** < 1 minute **Duration:** 3 – 5 minutes

Indications:

- Induction of general anesthesia and sedation of critically ill patients prior to cardioversion or intubation.

Contraindications:

- Known hypersensitivity.

Warnings:

- Not intended for prolonged infusion due to suppression of cortisol and aldosterone production.

Drug Interactions:

- Many prescription medications (alpha blockers, beta blockers, and antipsychotic) – increase risk for hypotension.
- Verapamil - may result in increased hypotension as well as AV delay.

Adverse Reactions:

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.

Protocols Containing Etomidate:

Adult Unstable Tachycardia
Pediatric Tachycardia
Cyanide Exposure (Tox Medic)
Cholinesterase Inhibitor Exposure (Tox Medic)
Hydrofluoric Acid Exposure (Tox Medic)

FENTANYL CITRATE (Sublimaze®)

Class – Synthetic opioid, analgesic (Schedule II)

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. 50-100 times more potent than morphine but with a shorter duration of action. Respiratory effects tend to last longer than the analgesic effects. Less emetic activity than other narcotics.

Onset: Immediate **Peak Effect:** 3 – 5 minutes (IV) **Duration:** 30 – 60 minutes

Indications:

- Management of acute pain.

Contraindications:

- Hypoventilation.
- Severe hemorrhage.

Warnings:

- Caution using in elderly, patients with hypotension, bradycardia, suspected gastrointestinal obstruction, head injury, and patients taking CNS depressants.
- May result in respiratory depression.
- Has been rarely linked to muscle rigidity, particularly involving the muscles of respiration (in extended postoperative period usually following high dose administration).
- Use with caution in presence of liver or kidney disease (affect drug elimination).

Drug Interactions:

- CNS depressants – potentiate effects (lessen dose)
- MAO inhibitors (within the last 14 days) – cause paradoxical excitation.

Adverse Reactions:

Bradycardia, restlessness, circulatory depression, respiratory depression, muscle rigidity and euphoria.

Protocols Containing Fentanyl:

Acute Coronary Syndromes (ACS)
ST Elevation Myocardial Infarction (STEMI)
Adult Hemodynamically Compromising Bradycardia
Pediatric and Adult Airway Management
Pediatric and Adult Pain Management

.

GLUCAGON

Class – Hormone, antihypoglycemic

Pharmacologic Action - Stimulates cyclic adenosine monophosphate (cAMP) synthesis to accelerate hepatic glycogenolysis and gluconeogenesis (breaks down stored glycogen to form glucose and prevents the reverse process). These processes increase the amount of glucose in the blood stream. Glucagon is only effective if there are sufficient stores of glycogen in the liver. Also relaxes smooth muscles of GI tract. Positive inotrope (cardiac) and decreases renal vascular resistance.

Onset: 5 – 20 minutes **Peak Effect:** 30 minutes **Duration:** 1 – 2 hours

Indications:

- Hypoglycemia.
- Antidote for symptomatic bradycardia caused by beta-blocker or calcium channel blocker overdoses.

Contraindications:

- Pheochromocytoma (adrenal gland tumor).
- Insulinoma (pancreatic tumor).

Warning:

- Nausea and vomiting occur commonly after administration – protect airway.
- Onset is much slower than when using D50 – usually 5-20 minutes.
- Caution in cardiovascular or renal disease.

Drug Interactions:

- None known

Adverse Reactions:

Nausea and vomiting, hypotension, dizziness, headache.

Protocols Containing Glucagon:

Adult Altered Mental Status
Suspected Stroke
Adult Seizures (Active)
Pediatric Altered Mental Status
Pediatric Seizures (Active)

GLUCOSE, ORAL

Class – Carbohydrate gel

Pharmacologic Action – Provides source of carbohydrates for cellular metabolism.

Onset: **Peak Effect:** **Duration:**

Indications:

- Altered mental status due to hypoglycemia in patient with ability to swallow.

Contraindications:

- Unresponsive patient.
- Inability to swallow or follow commands.

Warning:

- Patient must be able to maintain the patency of their own airway to prevent oral glucose gel from becoming a potential airway obstruction or aspiration risk.
- Increase in blood glucose level may be transient. Patient will need to consume a more robust source of carbohydrates in order to maintain adequate glucose levels.

Drug Interactions:

- None known

Adverse Reactions:

None

Protocols Containing Oral Glucose:

Adult Altered Mental Status

HALOPERIDOL (Haldol®)

Class – Antipsychotic, neuroleptic

Pharmacologic Action - Antagonizes dopamine-1 and dopamine-2 receptors in brain (this blocks the dopamine receptors associated with mood and behavior); depresses reticular activating system and inhibits release of hypothalamic and hypophyseal (associated with body growth) hormones,

Onset: 30 – 45 minutes **Peak Effect:** 10 – 20 minutes **Duration:** Variable

Indications:

- Acute psychosis or agitated/violent behavior refractory to non-pharmacologic interventions.

Contraindications:

- Severe CNS depression (including coma).
- Neuroleptic malignant syndrome.
- Poorly controlled seizure disorder.
- Parkinson's disease.
- Patients taking pentazocine (Talwin®).

Warnings:

- 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.
- Mental and physical impairment.
- Orthostatic hypotension.
- Dystonic reaction possible.

Drug Interactions:

- Talwin® – results in addictive depression, sedation, and anesthesia.
- Antihypertensive medications - additive effect (increasing the possibility of orthostatic hypotension).
- Lithium – use caution, may cause brain damage (encephalopathic syndrome).
- Anticoagulants

Adverse Reactions:

Physical and mental impairment, dystonic reactions (have Benadryl® ready), akathisia, dry mouth, blurred vision, and orthostatic hypotension.

Protocols Containing Haldol:

Patient Restraint

HYDROXOCOBALAMIN (Cyanokit®)

Class – Cyanide antidote

Pharmacologic Action – Precursor to Vitamin B12. In the mitochondria, converts cyanide on cytochrome oxidase to cyanocobalamin (Vitamin B12) which is then excreted safely in the urine.

Onset: 2 – 15 minutes **Peak Effect:** Variable **Duration:** Variable

Indications:

- Cyanide toxicity.

Contraindications:

- Documented hypersensitivity.

Warnings:

- Causes discoloration of the skin and urine.
- Discoloration can interfere with pulse oximetry and certain diagnostic blood tests. It is suggested to draw prehospital lab work prior to the administration of hydroxocobalamin.
- Can cause allergic reactions.

Drug Interactions:

- Diazepam, dopamine, and fentanyl – may cause particle formation if given via same IV line.
- Sodium thiosulfate, sodium nitrite and ascorbic acid – chemically incompatible.

Adverse Reactions:

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

Protocols Containing Hydroxocobalamin:

Pediatric and Adult Smoke Inhalation
Cyanide Exposure (Tox Medic)

IPRATROPIUM BROMIDE (Atrovent®)

Class – Anticholinergic

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

Onset: Variable **Peak Effect:** 1.5 – 2 hours **Duration:** 4 – 6 hours

Indications:

- Bronchoconstriction - asthma and COPD.

Contraindications:

- Documented hypersensitivity to ipratropium, atropine, or derivatives.

Warnings:

- Use with caution in patients with hepatic and renal insufficiency due to lack of research.
- Use with caution in patients with narrow-angle glaucoma, prostatic hypertrophy, and bladder obstruction.

Drug Interactions:

- None known

Adverse Reactions:

Palpitations, dizziness, anxiety, headache, eye pain, urinary retention, and nervousness.

Protocols Containing Ipratropium Bromide:

Adult Acute Respiratory Distress
Pediatric Acute Respiratory Distress

KETAMINE (Ketalar®)

Class – Anesthetic, analgesic

Pharmacologic Action – Ketamine is thought to cause a dissociation between the cortical and limbic systems. This results in what appears to be an awake patient who is unaware of their environment. Ketamine also has analgesic and sedative properties.

Onset: < 1 minute **Peak Effect:** Variable **Duration:** 10 – 15 minutes

Indications:

- Excited delirium.
- Alternate induction agent (reactive airways disease, adrenal insufficiency (sepsis), or in children).

Contraindications:

- Conditions in which elevated blood pressure is hazardous.
- Known or suspected schizophrenia.
- Infants < 3 months of age.

Warnings:

- Can cause severe hallucinations following waking (more frequently in adults than in children). Keep the environment quiet when the patient emerges from the anesthesia.
- Monitor vital signs closely.

Drug Interactions:

- Narcotics and barbiturates – prolong recovery time.

Adverse Reactions:

Hallucinations, increased skeletal muscle tone, increased bronchial secretions, nausea, and vomiting. Protective airway reflexes may be enhanced.

Protocols Containing Ketamine:

Acute Respiratory Distress
General Adult Cardiac Arrest Bundle of Care
Patient Restraint
Pediatric and Adult Airway Management
Pediatric and Adult Pain Management

KETOROLAC (Toradol®)

Class – non-steroidal, anti-inflammatory

Pharmacologic Action – An anti-inflammatory drug that also exhibits peripherally acting non-narcotic analgesic activity by inhibiting prostaglandin synthesis.

Onset: 30 minutes **Peak Effect:** 2-3 hours **Duration:** 4-6 hours

Indications:

- Moderate to severe pain

Contraindications:

- Patient taking anticoagulants or blood thinners
- Active or suspected bleeding
- Bleeding or clotting disorders
- Suspected closed head injury or intracranial bleeding
- Multisystem trauma
- Anticipated surgical candidate with open fracture or fracture deformities
- Allergy to ASA or NSAIDS
- Severe renal disease or kidney transplant
- Patient breastfeeding

Warnings:

- Risk of GI bleeding and ulcers
- Risk of renal papillary necrosis and other renal injury

Drug Interactions:

- Aliskiren, ACE inhibitors, angiotensin II blockers, methotrexate, and corticosteroids
- May increase risk of bleeding when given with anti-platelet drugs

Adverse Reactions:

Nausea, vomiting, bloating, gas, loss of appetite, sweating, dizziness, drowsiness, blurred vision, dry mouth, irritation at the injection site, and abnormal tastes may occur

Protocols Containing Ketorolac:

Pediatric and Adult Pain Management

LABETALOL (Trandate®)

Class - Beta adrenergic antagonist (Antidysrhythmic Class II)

Pharmacologic Action – Labetolol is different from other beta-blockers because it also blocks alpha 1 receptors. By blocking the alpha 1 receptors, it inhibits peripheral vasoconstriction and causes vasodilation. This lowers blood pressure in hypertensive emergencies. Beta blockade decreases the strength of the heart's contractions and decreases the heart rate. The resulting decrease in cardiac output lowers the blood pressure as well. In addition, myocardial oxygen demand decreases.

Onset: 2-5 minutes **Peak Effect:** 5-15 minutes **Duration:** 2-4 hours

Indications:

- Severe hypertension (with nausea/vomiting, headache, altered mental status, chest pain, renal failure).

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.

Warnings:

- **Use of Labetalol is limited to medical control consult only.**
- Use caution in Pheochromocytoma (adrenal tumor), cerebrovascular disease or stroke, poorly controlled diabetes, with hepatic disease.
- Use with caution at lowest effective dose in chronic lung disease.
- Observe for congestive heart failure, hypotension, CNS depression, bradycardia, shock, heart blocks, and bronchospasm – stop medication if any occur.

Drug Interactions:

- Calcium Channel Blockers and anit-hypertensive medications

Adverse Effects:

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

Protocols Containing Labetalol:

Hypertensive Crisis

LIDOCAINE (Xylocaine®)

Class – Antidysrhythmic (Class Ib)

Pharmacologic Action - Combines with fast sodium channels and inhibits recovery after repolarization (depresses depolarization and automaticity in the ventricles while having very little effect in the atria). Also provides local anesthesia to ease discomfort caused by infusion of fluids or medications through an Intraosseous (IO) site.

Onset: < 3 minutes **Peak Effect:** 5-7 minutes **Duration:** 10-20 minutes

Indications:

- Pain control prior to IO flush

Contraindications:

- Hypersensitivity to lidocaine or amide-type local anesthetic.
- Adam-Stokes syndrome (periodic syncope due to intermittent heart blockage).
- 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:

- Lidocaine toxicity - 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.
- Increased risk of toxicity: 1) **Liver dysfunction** (lidocaine is metabolized by the liver), 2) l**ow protein** (lidocaine is protein bound), and 3) **Acidosis** (increases the potential of lidocaine to dissociate from plasma proteins).

Drug Interactions:

- Beta blockers - decrease metabolism of lidocaine
- Phenytoin (Dilantin®) - cardiac depression may occur
- Procainamide - may result in additive neurologic effect.

Adverse Reactions

Lightheadedness, drowsiness, slurred speech, seizures, heart blocks, AMS, hypotension, and bradycardia.

Protocols Containing Lidocaine:

Adult General Patient Care
Pediatric General Patient Care

MAALOX

Class – Antacid

Pharmacologic Action - Combines with stomach acid to 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.
- Under DE protocol - used to provide a liquid to facilitate administration of PO prednisone.

Contraindications:

- Allergy or sensitivity

Warnings:

- Use with in patients with renal insufficiency (magnesium) or gastric outlet obstruction.

Drug Interactions:

- Benzodiazepines, chloroquine, digoxin, naproxen, mycophenolate, phenytoin, quinolones (e.g. ciproflaxin), tetracyclines and Iron - interferes with their absorption.

Adverse Reactions

None common. May cause constipation, decreased bowel motility, encephalopathy, and phosphorus depletion.

Protocols Containing Maalox:

Adult Acute Respiratory Distress
Adult Allergic/Adverse Reactions/Dystonic Reaction (Moderate)
Pediatric Acute Respiratory Distress

MAGNESIUM SULFATE

Class – Antidysrhythmic (Class V), 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. Smooth muscle relaxant (reverses vasospasm in pre-eclampsia/eclampsia) – aids in maintaining placental perfusion.

Onset: Immediate **Peak Effect:** Variable **Duration:** 1 hour

Indications:

- Torsades de pointes.
- Severe bronchoconstriction with impending respiratory failure.
- Seizure during the third trimester of pregnancy or in the postpartum patient.

Contraindications:

- Myocardial damage.
- Diabetic coma.
- Heart blocks.
- Hypermagnesemia.
- Hypocalcemia.
- Shock.
- Dialysis.
- Persistent severe hypertension.

Warnings:

- Respiratory depression may occur with rapid intravenous administration – administer slowly.
- Check reflexes.
- Caution with use in presence of renal insufficiency.
- Calcium is the antidote for side effects due to overdosing.

Drug Interactions:

- CNS depressants - may have additive CNS effects
- Digitalis – may cause cardiac conduction problems

Adverse Reactions:

Flushing, loss of tendon reflexes, impairment of mental and psychomotor function, confusion, and apnea with high doses.

Protocols Containing Magnesium Sulfate:

Adult Acute Respiratory Distress
Adult Seizures (Active)
Adult Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT)
Hypertensive Crisis
Pediatric Acute Respiratory Distress
Pediatric Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT)

METHYLPREDNISOLONE SODIUM SUCCINATE (Solu-Medrol®)

Class – Corticosteroid, anti-inflammatory

Pharmacologic Action - Potent synthetic steroid that inhibits many substances that cause inflammatory response (cytokines, interleukin, interferon). It also 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.

Onset: Variable **Peak Effect:** 4 – 8 days (IM) **Duration:** 1 – 5 weeks (IM)

Indications:

- Acute bronchospastic disease (asthma, COPD), allergies).

Contraindications:

- Untreated serious infections.
- Traumatic brain injury (high doses).
- IM route contraindicated in idiopathic thrombocytopenic purpura.
-

Warnings:

- Use with caution in pregnant patients and patients with GI bleeding.
- Use with caution in patients with diabetes mellitus (hypoglycemic responses to insulin and oral hypoglycemic agents may be blunted).
- Hold steroids for suspected pneumonia, CHF or “metabolic hyperventilation” (DKA, sepsis, etc.).
- Long-term use may cause GI bleeding, prolonged healing, and suppression of adrenocortical steroids.

Drug Interactions:

- Potassium-depleting agents - may potentiate hypokalemia.

Adverse Reactions:

Headache, hypertension, sodium and water retention, CHF, hypokalemia, alkalosis, gastritis, vertigo, malaise, and steroid-induced psychosis.

Protocols Containing Methylprednisolone:

Adult Acute Respiratory Distress
Adult Allergic/Adverse Reactions/Dystonic Reaction (Severe)
Pediatric Acute Respiratory Distress
Pediatric Allergic Reaction (Severe)

METOPROLOL TARTRATE (Lopressor®)

Class – Beta-blocker (Antidysrhythmic Class II)

Pharmacologic Action – Selective inhibitor of Beta 1 adrenergic receptors with little or no effect on beta 2 receptors (at doses less than 100 mg). Reduces heart rate, systolic blood pressure, and cardiac output.

Onset: Immediate **Peak Effect:** 20 minutes **Duration:** 5-8 hours

Indications:

- Atrial Fibrillation / Atrial Flutter

Contraindications:

- Other beta-blocker use.
- Heart blocks.
- Bradycardia.
- Systolic blood pressure < 100 mmHg.
- Bronchospastic disease.
- Congestive heart failure.

Warnings

- May have profound effects on blood pressure, heart rate, and EKG.
- Observe for signs of CHF, hypotension, CNS depression, bradycardia, shock, heart blocks, and bronchospasm – stop if any of these occur.
- Caution in patients with sick sinus syndrome and diabetes (may potentiate hypoglycemia).

Drug Interactions

- Acetylcholinesterase inhibitors, amiodarone, and cardiac glycosides – enhance bradycardia.
- Calcium channel blockers – enhance hypotensive effects.
- Antihypertensive agents

Adverse Reactions

Hypotension, bradycardia, first-degree AV block, CHF, dizziness, fatigue, vertigo, wheezing, and dyspnea.

Protocols Containing Metoprolol:

Adult Stable Tachycardia

MIDAZOLAM (Versed®)

Class – Benzodiazepine, Anticonvulsant

Pharmacologic Action - Binds to sites on gamma-aminobutyric acid (GABA). Has no direct effect on GABA receptors but potentiates the effects of GABA within the brain (GABA is the main inhibitory neurotransmitter in the CNS – by potentiating the effects of GABA, Diazepam promotes sedation). In seizures, does not stop abnormal discharge focus but does stop spread of seizure activity though the motor cortex. Skeletal muscle relaxant (ortho injuries) and induces amnesia. 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. Three to four times more potent than Diazepam.

Onset: 3 – 5 minutes (IV)	**Peak Effect:** 20 – 60 minutes (IV)	**Duration:** < 2 hours (IV)
Onset: 15 minutes (IM)	**Peak Effect:**	**Duration:** 1 – 6 hours (IM)

Indications:

- Active seizures.
- Patient sedation during advanced airway management.
- Uncontrolled shivering in hypothermia.
- Agitated or violent patients suffering behavioral emergencies.

Contraindications:

- Severe respiratory depression
- Sleep apnea.
- Narrow angle glaucoma.
- Shock.
- Unresponsive alcohol overdose.

Warnings:

- Use with caution with patients with altered mental status - respiratory depression may occur.
- No effect on pain.

Drug Interactions:

- CNS depressants (alcohol, narcotics, and barbiturates) – potentiate CNS depression.

Adverse Reactions:

Lightheadedness, laryngospasm, bronchospasm, respiratory depression, respiratory arrest, motor impairment, ataxia, impairment of mental and psychomotor function, confusion, slurred speech, and amnesia.

Protocols Containing Midazolam:

Adult Seizures (Active)
Pediatric Seizures (Active)
Patient Restraint

NALOXONE (Narcan®)

Class – Opioid antagonist

Pharmacologic Action – Because it is chemically similar to opioids, naloxone competes for opiate receptors in the brain. Displaces opioid molecules from these receptors and reverses their effects.

Onset: < 2 minutes (IV/IO) **Peak Effect:** <2 minutes (IV/IO) **Duration:** 20 – 120 minutes

Onset: 2 – 10 minutes (IM) **Peak Effect:** 2 – 10 minutes (IM) **Duration:** 20 – 120 minutes

Indications:

- Acute opioid toxicity.

Contraindications:

- Hypersensitivity

Warnings:

- Administer with caution to those patients with suspected physical addiction to opioids. Can result in the sudden onset of opiate withdrawal (agitation, tachycardia, pulmonary edema, nausea, vomiting, and seizures(neonates)).
- Works on: morphine, meperidine (Demerol®), heroin, paregoric, hydromorphone (Dilaudid®), codeine, oxycodone (Percodan®, Percocet®), fentanyl, methadone, and synthetic agents (nalbuphine (Nubain®), pentazocine (Talwin®), and butorphanol (Stadol®)).

Drug Interactions:

- Bisulfite and alkaline solutions – incompatible.

Adverse Reactions:

Tachycardia, hypertension, dysrhythmias, nausea, vomiting, and diaphoresis.

Protocols Containing Naloxone:

Adult Altered Mental Status
Pediatric Altered Mental Status

NITROGLYCERIN

Class – Nitrate, anti-anginal

Pharmacologic Action – Potent smooth muscle relaxant. Nitrate enters vascular smooth muscle and is converted to nitric oxide (NO) which leads to the 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 reduces myocardial oxygen demand. Also improves coronary collateral circulation. Lowers blood pressure, increases heart rate, and occasional may result in a paradoxical bradycardia.

Onset: 1-3 minutes (SL)	**Peak Effect:** 5-10 minutes (SL)	**Duration:** 20-30 minutes (SL)
Onset: 30 minutes (TD)	**Peak Effect:** Varies (TD)	**Duration:** 3-6 hours (TD)

Indications

- Acute coronary syndromes (management of chest pain).
- Acute pulmonary edema (reduce preload).

Contraindications:

- Hypotension (systolic BP < 90 mmHg or ≥ 30 mm below patient's baseline).
- Recent use of erectile dysfunction medications (see drug interactions below).
- Extreme bradycardia (heart rate < 50 bpm).
- Tachycardia in the absence of heart failure (> 100 bpm).
- Right ventricular infarction.
- Increased intracranial pressure.
- Severe anemia.
- Narrow angle glaucoma (controversial).

Warnings

- May cause hypotension, especially if given in conjunction with other vasodilators.
- Frequent nitroglycerine users may build up a tolerance and require higher doses.

Drug Interactions:

- Erectile dysfunction medications (sildenafil (Viagra®) – within last 24 hours or tadalafil (Cialis®)/vardenafil (Levitra®) – within the last 48 hours)), or other phosphodiesterase-5 inhibitors) – may cause profound hypotension – withhold nitrates.
- Beta-blockers – may cause orthostatic hypotension.
- Alcohol (recent) – may cause hypotension.

Adverse Reactions

Dose-related but may include headache, hypotension, nausea, vomiting, and dizziness.

Protocols Containing Nitroglycerine:

Pulmonary Edema due to Congestive Heart Failure
Acute Coronary Syndrome
ST Elevation Myocardial Infarction (STEMI)

NOREPINEPHRINE (LEVOPHED®)

Class – Sympathetic agonist

Pharmacologic Action – Norepinephrine is a naturally occurring catecholamine that acts on both alpha- and beta-adrenergic receptors. The action on alpha-receptors is stronger and results in peripheral vasoconstriction. This increases the blood pressure in hypotensive states such as cardiogenic shock and sepsis

Onset: Immediate **Peak Effect:** < 1 minute **Duration:** 1-2 minutes

Indications:

- Hypotension not related to hypovolemia.
- Neurogenic shock.

Contraindications:

- Hypotension caused by hypovolemia.

Warnings:

- Monitor blood pressure closely.
- Ensure adequate fluid replacement before starting norepinephrine.
- Administer through largest vein possible to reduce risk of tissue necrosis if it extravasates.
- Use caution in cases of cardiac ischemia as norepinephrine increases myocardial oxygen demand.

Drug Interactions:

- Sodium Bicarbonate – deactivates norepinephrine
- Beta-blockers – drastically elevate blood pressure

Adverse Reactions:

Usually dose-related but may include tremors, headache, myocardial ischemia, nausea, vomiting, and dizziness. May also cause bradycardia (usually because of increased peripheral vasoconstriction).

Protocols Containing Norepinephrine:

Adult Non-traumatic Hypotension
Sepsis
Adult Asystole/Pulseless Electrical Activity (PEA)
Adult Post Resuscitation Care with Targeted Temperature Management

ONDANSETRON (Zofran®)

Class – Antiemetic

Pharmacologic Action - Mechanism not fully characterized; selective 5-HT3 receptor antagonist; binds to serotonin receptors in the chemoreceptor trigger zone (located in the medulla). The primary effects occur in GI tract (stomach and small intestine). Has no effect on dopamine receptors and therefore does not cause extrapyramidal symptoms.

Onset: 10 – 30 minutes **Peak Effect:** 1.5 hours **Duration:** 8 hours

Indications:

- Nausea or vomiting.

Contraindications:

- Co-administration with apomorphine (used in treatment of Parkinson's disease).

Warnings:

- May cause dose-dependent QT prolongation, avoid in patients with congenital long QT syndrome.
- EKG monitoring is recommended in patients who have electrolyte abnormalities, CHF, or bradyarrhythmias or who are also receiving other medications that cause QT prolongation.

Drug Interactions:

- Apomorphine (Apokyn®, Ixense®, Spontane®, Uprima®) – profound hypotension and loss of consciousness may occur
- Serotonin blockers

Adverse Reactions:

Headache, lightheadedness, dizziness, constipation, and fever. Rarely seen are angina chest pain, seizures, akathisia and acute dystonic reactions.

Protocols Containing Ondansetron:

Adult General Patient Care
Pediatric General Patient Care
Buprenorphine

OXYGEN

Description - Naturally occurring gas.

Pharmacologic Action - 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.

Onset: Immediate **Peak Effect:** < 1 minute **Duration:** < 2 minutes

Indications:

- Suspected hypoxemia of any etiology

Contraindications:

- Non-hypoxic patients.

Warnings:

- Caution when administered to patients with COPD and chronic carbon dioxide retention – monitor pulse oximetry and capnography closely.
- Titrate oxygen to avoid hypoxia.
- Never withhold oxygen from those in obvious need.
- May increase toxicity of certain ingested herbicides (paraquat and diaquat).

Drug Interactions:

- None known

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.

Protocols Containing Oxygen:

Adult General Patient Care, Opioid Overdose, Suspected Stroke, ACS, STEMI, Pediatric General Patient Care, Pediatric and Adult Airway, and Suspected EID Management.

PRALIDOXIME (2-PAM)

Class – Cholinergic

Pharmacologic Action - Binds to organophosphates and breaks alkyl phosphate-cholinesterase bond (removes phosphate group from cholinesterase) to restore activity of acetylcholinesterase. Detoxifies some organophosphates by direct chemical reaction. Reverses respiratory depression and skeletal muscle paralysis. Must be administered before the alkyl phosphate-cholinesterase bond becomes permanent (this is referred to as aging).

Onset: Variable **Peak Effect:** 10 – 20 minutes (IM) **Duration:** Variable

Indications:

- Poisoning by organophosphate insecticides and related nerve gases (e.g. tabun, sarin, soman).

Contraindications:

- Not required for carbamate poisoning.

Warnings:

- Rapid injection may cause laryngospasm, tachycardia, and muscle rigidity - intubation may be required.
- Speeds the effect of atropine when used together.
- Excitement and manic behavior can occur immediately after recovery from unconsciousness.

Drug Interactions:

- Respiratory depressants (narcotics, phenothiazines, antihistamines, alcohol) – may potentiate the effect of the organophosphate.

Adverse Reactions:

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

Protocols Containing Pralidoxime:

Cholinesterase Inhibitor Exposure (Tox Medic)

PREDNISOLONE (Prednisone®)

Description - Corticosteroid.

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

Onset: Variable **Peak Effect:** 1 – 2 hours (PO) **Duration:** 1 – 1.5 days

Indications:

- Bronchoconstriction (COPD, asthma)
- Anaphylaxis.

Contraindications:

- Known hypersensitivity to prednisolone.

Warnings:

- Caution in patients with diabetes mellitus - the hypoglycemic responses to insulin and oral hypoglycemic agents may be blunted.
- Use with caution in pregnant patients and patient with GI bleeding.
- Hold steroids for suspected pneumonia, CHF or "metabolic hyperventilation" (DKA, sepsis, etc.).

Drug Interactions:

- Anticoagulants – their actions could be enhanced or inhibited.
- Potassium-depleting agents - may potentiate hypokalemia

Adverse Reactions

Headache, hypertension, sodium and water retention, hypokalemia, alkalosis, and gastritis.

Protocols Containing Prednisolone:

Adult Acute Respiratory Distress
Adult Allergic/Adverse Reactions/Dystonic Reaction (Moderate)
Pediatric Acute Respiratory Distress

ROCURONIUM BROMIDE (Zemuron®)

Description – Non-depolarizing neuromuscular blocker

Pharmacologic Action – Binds to nicotinic cholinergic receptor sites at the motor end plate. Antagonizes acetylcholine binding at these sites to result in neuromuscular blockade. The effects are reversible by using an acetylcholinesterase inhibitor (neostigmine, edrophonium).

Onset: 30 – 60 seconds **Peak Effect:** 1 – 3 minutes **Duration:** 30 – 60 minutes

Indications:

- Induction of paralysis to facilitate endotracheal intubation in cases where succinylcholine is contraindicated.
- After successful advanced airway placement to facilitate muscle relaxation during mechanical ventilation.

Contraindications:

- Known hypersensitivity.

Warnings:

- **Use of Rocuronium limited to medical control consult only.**
- Use ideal body weight for dosing.
- Slightly elevates heart rate and blood pressure.
- Tachycardia may occur in children.

Drug Interactions:

- Succinylcholine, general anesthesia, lidocaine, quinidine, procainamide, beta-blockers, potassium depleting diuretics, magnesium sulfate – prolong paralysis.

Adverse Reactions

Bronchospasm (rare).

Protocols Containing Rocuronium:

Pediatric and Adult Airway Management

SODIUM BICARBONATE

Class – Alkalinizing agent

Pharmacologic Action - Sodium bicarbonate reacts with hydrogen ions, forming water and carbon dioxide, correcting metabolic acidosis and increasing blood pH (this speeds excretion of some medications from the body).

Onset: Immediate **Peak Effect:** <15 minutes **Duration:** 1-2 hours

Indications:

- Known acidotic states.
- Aspirin overdose.
- Tricyclic antidepressant (TCA) overdose.

Contraindications:

- Hypocalcemia.
- Hypokalemia.
- Alkalosis.
- Electrolyte loss due to vomiting and diarrhea.

Warnings:

- **Use of Sodium Bicarbonate limited to medical control consult only.**
- May worsen hyperosmolality, hypernatremia, metabolic alkalosis, and acute hypokalemia.

Drug Interactions:

- Calcium - may precipitate
- Vasopressors and catecholamines – may be deactivated by sodium bicarbonate

Adverse Reactions

Metabolic alkalosis, hypoxia, electrolyte imbalance, and seizures.

Protocols Containing Sodium Bicarbonate:

Adult Altered Mental Status
Adult Hemodynamically Compromising Bradycardia
Adult Stable Tachycardia
Adult Unstable Tachycardia
Adult Ventricular Fibrillation (VF) and/or Pulseless Ventricular Tachycardia (VT)
Adult Asystole/Pulseless Electrical Activity (PEA)

SODIUM NITRITE

Class – Nitrate

Pharmacologic Action - Oxidizes hemoglobin to form methemoglobin. Methemoglobin is incapable of oxygen transport but has a high affinity for cyanide. Cyanide preferentially binds to methemoglobin instead of cytochrome a3 in the mitochondria. This forms cyanomethemoglobin that carries the cyanide to the liver for detoxification and elimination.

Onset: 2 – 5 minutes **Peak Effect:** 30 – 70 minutes **Duration:** Variable

Indications:

- Cyanide toxicity

Contraindications:

- Asymptomatic patients.
- Do not administer to patients experiencing isolated carbon monoxide poisoning.

Warnings:

- Risk of worsening hypoxia due to methemoglobin formation. If hypotension is severe, consider skipping the sodium nitrite and proceeding directly to sodium thiosulfate.
- Can cause serious adverse reactions and death from hypotension and methemoglobin formation.
- Monitor closely to ensure adequate perfusion and oxygenation.
- Caution with use in pregnancy – crosses the placenta and can induce fetal methemoglobinemia.
- Signs of excessive methemoglobinemia: persistent cyanosis unresponsive to oxygen, chocolate-brown color to blood.
- May precipitate an acute hemolytic reaction in patients with glucose-6-phosphodehydrogenase (G6PD) deficiency.
- Do not administer to isolated carbon monoxide poisoning.

Drug Interactions:

- Amyl nitrite - may potentiate methemoglobin formation.

Adverse Reactions:

Syncope, hypotension and potential for excessive methemoglobinemia with decreased O2 saturations.

Protocols Containing Sodium Nitrite:

Cyanide Exposure (Tox Medic)

SODIUM THIOSULFATE

Class – Cyanide antidote

Pharmacologic Action – In the treatment of cyanide poisoning, nitrate administration creates a state of methemoglobinemia that aids to remove cyanide from the cellular mitochondria and attach it to the methemoglobin molecule. This facilitates the removal of cyanide from the cell and transports it to the liver to for detoxification. At the liver, rhodanese (an enzyme) uses sulfur to detoxify the cyanide. Normally there is sufficient rhodanese for this process. The limiting factor most times is the element sulfur. Thiosulfate is a sulfur donor and supplies the needed sulfur for detoxification to occur. The result is the production of thiocyanate that is less toxic than cyanide and eliminated through the kidneys.

Onset: 2 – 5 minutes **Peak Effect:** Variable **Duration:** Variable

Indications:

- 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, nausea, vomiting, and joint aches.

Protocols Containing Sodium Thiosulfate:

Cyanide Exposure (Tox Medic)

TRANEXAMIC ACID (TXA)

Class – Antifibrinolytic agent

Pharmacologic Action – Binds reversibly to lysine receptor sites on plasminogen or plasmin. Prevents plasmin from binding to and degrading fibrin. Slows the breakdown of blood clots.

Onset: Variable **Peak Effect:** 2.5 hours **Duration:** 10 hours

Indications:

- Adult patients in hemorrhagic shock as a result of trauma < 3 hours old with suspected need for massive blood transfusion, AND a sustained heart rate ≥ 110, AND sustained hypotension with a systolic blood pressure ≤ 90 mmHg.

Contraindications:

- Arterial or venous thromboembolism.
- Renal impairment.

Warnings:

- To avoid hypotension, do not inject faster than 100 mg/min..

Drug Interactions

- Anticoagulants

Adverse Reactions

GI upset (nausea/vomiting, diarrhea), allergic dermatitis, hypotension (from rapid administration).

Protocols Containing Tranexamic Acid:

Adult Allergic/Adverse Reactions/Dystonic Reaction (Angioedema)
Pediatric and Adult Trauma
Penetrating Trauma
Adult Blood Administration

Delaware Protocol Medication Dose Reference
(For pediatric dosing refer to Handtevy)

Medication	Adult Protocol and Dose
Acetaminophen • Contraindicated in liver disease	**Pediatric and Adult Pain Management:** • 975-1000 mg PO • Pediatric: 15 mg/kg
Adenosine • Contraindicated in WPW • Use half dose with patients taking Persantine®	**Stable Tachycardia:** **Unstable Tachycardia:** • 6 mg rapid IV. • Repeat at 12 mg rapid IV if no response. • Max of 3 total doses.
Albuterol	**Acute Respiratory Distress:** • Up to 5 mg nebulized.

Medication	Adult Protocol and Dose
Amiodarone • Caution with use in heart failure/cardiogenic shock.	**Acute Coronary Syndromes:** **ST Elevation Myocardial Infarction:** • 150 mg IV over 10 minutes for persistent ventricular ectopy (hold if heart rate < 50 bpm). **Stable Tachycardia:** **Unstable Tachycardia:** • 150 mg over 10 minutes (for wide complex tachycardia rate > 150 bpm). **Ventricular Fibrillation and/or Pulseless Ventricular Tachycardia:** • 300 mg IV. • Repeat dose of 150 mg IV after 10 minutes. • 150 mg IV infused over 10 minutes with ROSC (if patient received ≤1 dose during resuscitation).

Medication	Adult Protocol and Dose
Amyl Nitrate • Monitor BP and watch for hypotension. • Not for CO poisoning.	**Cyanide Exposure (Tox Medic):** • Inhale ampule 30 seconds of each minute. • Change ampule after 3 minutes.
Aspirin	**Acute Coronary Syndromes:** **ST Elevation Myocardial Infarction:** • 324 mg PO.

Medication	Adult Protocol and Dose
Atropine • Doses < 0.5 mg in adults can induce paradoxical bradycardia	**Hemodynamically Compromising Bradycardia:** • 1 mg IV. • Repeat 1 mg IV every 3 – 5 minutes to a max of 3 mg or a heart rate ≥ 50 bpm **Patient Restraint (for hypersecretion/salivation):** • 0.5 mg IV or, • 0.5 mg IM. **Cholinesterase Inhibitor Exposure (Tox Medic):** • 2 mg IV every 5 minutes until bronchorrhea, bronchospasm, and bradycardia resolve. • May be given via autoinjector.
Buprenorphine • Adult patient consenting to participate • Contraindicated in pregnancy and methadone use < 72 hours prior.	**Buprenorphine:** * If COWS score > 5 OR opioid-free for 72 hours, administer 16 mg SL If symptoms worsen or persist after 10 minutes, contact medical control to administer additional 8 mg SL. Max dose 24 mg.

Medication	Adult Protocol and Dose
Calcium Chloride • Contraindicated in hypercalcemia and severe hypokalemia. • Precipitates when given in same line as bicarb.	**Altered Mental Status:** *Contact Medical Control for dose in suspected calcium channel blocker OD* **Hemodynamically Compromising Bradycardia:** **Stable Tachycardia:** **Unstable Tachycardia:** *Contact Medical Control for order in patients with chronic renal failure and either hemodialysis or peritoneal dialysis* **Ventricular Fibrillation and/or Pulseless Ventricular Tachycardia:** **Asystole/Pulseless Electrical Activity:** History of chronic renal failure or suspected hyperkalemia: • 1 gm IV **Adult Blood Administration** • 1 g IV/IO over 3 minutes
Calcium Gluconate	**Cholinesterase Inhibitor Exposure (Tox Medic):** • 0.5 mL per cm^2 SQ titrate to pain relief. • 10 – 30 mLs IV titrated to cardiac dysrhythmias.

Medication	Adult Protocol and Dose
Dextrose	**Altered Mental Status:** **Suspected Stroke:** **Seizures (Active):** • Up to 25 g IV (FSBS < 60 mg/dl) OR in 50 mL boluses 1 minute apart.
Diazepam • Monitor for respiratory depression.	**Cholinesterase Inhibitor Exposure (Tox Medic):** • 10 mg autoinjector.
Diltiazem • Contraindicated in CHF, hypotension, heart blocks.	**Stable Tachycardia:** • 0.25 mg/kg (25 mg) IV over 2 minutes. *Contact Medical Control (after 15 minutes if no response to initial dose) for 0.35 mg/kg (max dose 35 mg) IV over 2 minutes.
Diphenhydramine	**Dystonic Reaction:** **Moderate Allergic Reaction:** • 50 mg IV/IM. **Severe Allergic Reaction:** • 50 mg IV or IM.
Droperidol	**Adult General Patient Care** • 1.25 mg slow IVP for nausea and vomiting refractory to Zofran. **Patient Restraint** **Moderate Agitation:** • 2.5-5 mg IV, IM **Lower dose for elderly

Medication	Adult Protocol and Dose
Epinephrine • Increases myocardial oxygen demand. • Effects may be blunted in patients on beta-blockers.	**Acute Respiratory Distress:** • 0.5 mg (1 mg/mL) IM – (< 60 y/o in pending respiratory failure). **Severe Allergic Reaction:** • 0.5 mg (1 mg/mL) IM – may repeat every 5 minutes times three as needed. • 0.25 mg (0.1 mg/mL) IV over one minute (may mix 0.25 mg (0.1 mg/mL) epinephrine with 100 mL NSS and run wide open). **Hemodynamically Compromising Bradycardia:** • 2 – 10 mcg/min infusion if pacing and atropine ineffective. Titrate to sBP ≥ 90 mmHg. **Ventricular Fibrillation and/or Pulseless Ventricular Tachycardia:** **Asystole/Pulseless Electrical Activity:** • 1 mg (0.1 mg/mL) every 3-5 minutes.

Medication	Adult Protocol and Dose
Esmolol	**<u>Ventricular Fibrillation and/or Pulseless Ventricular Tachycardia</u>:** • 0.5 mg/kg IV/IO (after 5 mg of Epinephrine). • May repeat once after 5 minutes if needed.
Etomidate	**<u>Unstable Tachycardia</u>:** • 0.1 mg/kg (max 10 mg) IV prior to cardioversion of an alert patient (if IV established).

Medication	Adult Protocol and Dose
Fentanyl • Monitor ventilation ($etCO_2$) closely.	**Acute Coronary Syndromes:** **ST Elevation Myocardial Infarction:** • Up to 200 mcg in 100 mcg increments every 5 minutes IV (for continued pain after 3 NTG and sBP > 90 mmHg). In cases of STEMI, may be administered as soon as IV is established. **Hemodynamically Compromising Bradycardia:** • Up to 200 mcg in 50 mcg increments every 5 minutes IV (for discomfort from pacing and sBP ≥ 90 mmHg). **Pediatric and Adult Airway Management:** • 100 mcg IV after intubation or rescue airway. • 100 mcg every 10 min if needed (max dose 400 mcg before contacting Medical Control **Pediatric and Adult Pain Management:** • 50 – 100 mcg IV/IM/IN. • Repeat after 5 minutes for continued moderate to severe pain. *Contact Medical Control for additional doses*

Medication	Adult Protocol and Dose
Glucagon • May take 5 – 20 minutes to work. • Requires adequate glycogen stores in patient.	**Altered Mental Status:** **Suspected Stroke:** **Seizures (Active):** • 1 mg IM/IN (FSBS < 60 mg/dl and no IV).
Glucose, Oral	**Altered Mental Status:** • 15-24 grams PO • Must be able to follow command, maintain patent airway
Hydroxocobalamin • Draw blood before administration if possible	**Pediatric and Adult Smoke Inhalation:** **Cyanide Exposure (Tox Medic):** • 5 g IV over 15 minutes. • Under the Tox Medic protocol, a second 5 g dose may be administered if the initial response is incomplete.
Ipratroprium	**Acute Respiratory Distress:** • 0.5 mg nebulized with albuterol.

Medication	Adult Protocol and Dose
Ketamine • Contact medical control for Ketamine dosing in patients ≤ 8 yrs. • Can cause severe hallucinations (more frequently in adults).	**Acute Respiratory Distress:** • 25 mg IV (may repeat in 5 minutes) or 50 mg IM – to allow for CPAP tolerance. **Hemodynamically Compromising Bradycardia** • 0.25 mg/kg IV/IO for pacing **Patient Restraint:** • 5 mg/kg IM. **Pediatric and Adult Airway Management:** • 2 mg/kg IV (pre-induction). 2 mg/kg IV (post-intubation/rescue airway established) - may repeat in 20 minutes. **Pediatric and Adult Pain Management:** • 0.25 mg/kg IV over 5 minutes (max dose 25 mg) – for severe pain from extrication/burns/ortho injuries.
Ketorolac • May cause local irritation	**Pediatric and Adult Pain Management:** • 15 mg IV/IM

Medication	Adult Protocol and Dose
Labetolol • Contraindicated in bradycardias, heart blocks, CHF, patients on beta- and calcium channel blockers.	**Hypertensive Crisis:** *Contact Medical Control for administration of 10 mg IV slow over 2 minutes. * *Contact Medical Control for repeat dose of 10 – 20 mg IV if dBP remains ≥ 120 mmHg*
Lidocaine • Monitor for toxicity.	**General Patient Care:** • 20 – 40 mg over 1 minute before infusing fluid or meds via an IO in conscious patients.
Maalox	**Acute Respiratory Distress:** **Moderate Allergic Reaction:** • 50 mg PO (to facilitate prednisone administration).

Medication	Adult Protocol and Dose
Magnesium Sulfate	**Acute Respiratory Distress:** • 2 g IV over 10 minutes (for pending respiratory failure secondary to asthma). **Hypertensive Crisis** • 5g IV over 20 minutes **Seizures (Active):** • 5 g IV over 20 minutes (for seizures secondary to eclampsia). **Ventricular Fibrillation and/or Pulseless Ventricular Tachycardia:** • 2 g IV over 1-2 minutes (for Torsades).
Methylprednisolone • Hold steroids for pneumonia, CHF, DKA, sepsis.	**Acute Respiratory Distress (secondary to asthma/COPD):** **Severe Allergic Reaction:** • 125 mg IV or IM.
Metoprolol • Caution with heart blocks, bradycardia, CHF, and beta- or calcium channel blocker use.	**Stable Tachycardia:** • 5 mg IV given over 1 – 2 minutes. • May repeat every 5 minutes if needed for a total of 3 doses (15 mg).

Medication	Adult Protocol and Dose
Midazolam • Monitor for respiratory depression.	**Seizures (Active):** • 10 mg IM (if no IV). • 5 mg IV slowly – may repeat up to 5 mg IV/IM in 5 minutes **Patient Restraint:** • Up to 2.5 – 5 mg IV / IM (use lower dose in elderly).
Naloxone • Ensure ventilation and oxygenation before administering. • Monitor for withdrawal symptoms.	**Altered Mental Status:** • Up to 2 mg IV, IN, or IM. • Additional dose of up to 2 mg if required to maintain respirations. *Contact Medical Control for additional doses. *

Medication	Adult Protocol and Dose
Nitroglycerin • IV before NTG for patients with sBP ≤ 150 mmHg or patients not prescribed and taking NTG • Withhold NTG if patient used: ○ Sildenafil (Viagra® / Revatio®) or vardenafil (Levitra®) within last 24 hours ○ Tadalafil (Cialis®, Adcirca®) of any other prescription ED drugs within last 48 hours.	**Pulmonary Edema Due to Congestive Heart Failure:** • 0.8 mg SL. • Repeat at 0.8 mg every 3 – 5 minutes (as long as BP remains > 120 mmHg) • Apply 1” paste TD (if sBP > 120 mmHg). **Acute Coronary Syndromes:** **ST Elevation Myocardial Infarction:** • 0.4 mg SL. • Repeat 0.4 mg every 3 – 5 minutes (as long as BP remains > 90 mmHg) until chest pain or signs of ischemia/injury resolve. • If sBP < 90 mmHg, hold NTG until sBP > 100 mmHg. • Apply 1” paste TD (if sBP > 90 mmHg) even if pain free.

Medication	Adult Protocol and Dose
Norepinephrine • After 2000 mL NSS • 30 mL/kg in sepsis	**Non-traumatic Hypotension:** **Sepsis:** • 10 - 50 mcg/min infusion (titrate to maintain MAP > 65 mmHg). **Asystole/Pulseless Electrical Activity:** **Adult Post Resuscitation Care with Targeted Temperature Management:** • 10 - 50 mcg/min infusion (titrate to maintain MAP 80-90 mmHg).
Ondansetron	**General Patient Care:** **Buprenorphine:** • 4 - 8 mg ODT, IV, or IM.
Pralidoxime	**Cholinesterase Inhibitor Exposure (Tox Medic):** • 600 mg IM via autoinjector
Prednisone • Hold steroids for pneumonia, CHF, DKA, sepsis.	**Acute Respiratory Distress (Mild):** **Moderate Allergic Reaction:** • 60 mg PO

Medication	Adult Protocol and Dose
Rocuronium • Used for induction in cases where succinylcholine is contraindicated. • Use ideal weight for dosing.	**Pediatric and Adult Airway Management:** • 1 mg/kg IV.
Sodium Bicarbonate • Can precipitate when given with calcium. • Can deactivate some vasopressors and catecholamines.	**Altered Mental Status:** *Contact Medical Control for dose in suspected tricyclic antidepressant OD* **Hemodynamically Compromising Bradycardia:** **Stable Tachycardia:** **Unstable Tachycardia:** *Contact Medical Control for order in patients with chronic renal failure and either hemodialysis or peritoneal dialysis* **Ventricular Fibrillation and/or Pulseless Ventricular Tachycardia:** **Asystole/Pulseless Electrical Activity:** 50 mEq IV – history of chronic renal failure or suspected underlying hyperkalemia.

Medication	Adult Protocol and Dose
Sodium Nitrite • Monitor for hypotension.	**Cyanide Exposure (Tox Medic):** • 1 amp (300 mg) IV over no less than 5 minutes (may dilute in 50 – 100 mL of NSS and titrated to avoid hypotension).
Sodium Thiosulfate	**Cyanide Exposure (Tox Medic):** • 1 amp (12.5 g) IV over 10 - 20 minutes (may dilute in 50 – 100 mL of NSS and titrated to avoid hypotension).
Tranexamic Acid • Do not inject faster than 100 mg/minute.	**Allergic/Adverse Reactions/Dystonic Reaction (Angioedema):** • Consider 1 g infusion **Adult Blood Administration** • 2 g IV/IO **Pediatric and Adult Trauma:** • 2 g IV / IO over 10 minutes (Hemorrhagic shock < 3 hours old – anticipated need for blood transfusion).

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