



**Lincoln Fire & Rescue
Emergency Medical Services
Drug Guide**

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Adenosine

Generic Name: Adenosine

Trade Name: Adenocard, Adenoscan

Therapeutic Class: Antiarrhythmic

Actions: Adenosine is a naturally occurring substance that is present in all body cells. Adenosine decreases conduction of the electrical impulse through the AV node and interrupts AV reentry pathways in paroxysmal supraventricular tachycardia such as PSVT. Because of its rapid onset and very short half-life, the administration of adenosine is sometimes referred to as chemical cardioversion.

Pharmacokinetics: Adenosine is cleared from plasma in less than 30 seconds.

Indications: Stable narrow QRS tachycardia refractory to vagal maneuvers. **NOTE:** Unstable signs include altered mental status, ongoing chest pain, hypotension and other signs of shock.

Contraindications:

1. Second or third degree heart block
2. Sick sinus syndrome
3. Hypersensitivity to the drug

Precautions:

1. Adenosine typically causes dysrhythmias at the time of cardioversion. These generally last a few seconds or less and may include PVC's, PAC's, sinus bradycardia, sinus tachycardia and various degrees of AV block. In extreme cases, transient asystole may occur. If this occurs, appropriate therapy should be initiated.
2. Use with caution in patients with asthma as adenosine may induce bronchospasm.

Side Effects: CNS: dizziness, headache
CV: dysrhythmias, chest pain, hypotension, palpitations,
GI: nausea
Resp: chest pressure, dyspnea

Administration: **Stable PSVT**

- Adult: 6 mg RIVP, if not effective after 2 minutes give 12 mg RIVP.
- Pediatric: 0.1 mg/kg RIVP (max first dose 6 mg). If not effective after 2 minutes, give 0.2mg/kg RIVP (maximum second dose 12 mg).

Notes:

1. Administer adenosine rapidly over 1 to 3 seconds, into the medication administration port closest to the patient, through a large vein followed by a 10mL saline flush and elevation of the arm.
2. Print continuous ECG tracing prior to, during, and post administration of medication for physician review.

Albuterol

Generic Name: Albuterol

Trade Name: AccuNeb, ProAir, Proventil, Ventolin

Therapeutic Class: Bronchodilator

Actions: Albuterol is a selective B₂-adrenergic agonist causing bronchodilation.

Pharmacokinetics: Onset: 5-15 minutes Peak: 1 to 1 ½ hours Duration: 4-6 hours Half-life: 2.5 to 4 hours

- Indications:
1. Bronchial asthma
 2. Reversible bronchospasm associated with chronic bronchitis, emphysema, and crush syndrome.
 3. Anaphylactic respiratory distress
-

- Contraindications:
1. Hypertension (SBP greater than 180).
 2. Tachycardia (HR greater than 140 in an adult or 180 in a child).
 3. Severe cardiac disease.
 4. Hypersensitivity to the drug.
-

- Precautions:
1. Hyperthyroidism
 2. Diabetes mellitus
 3. Convulsive disorder
-

Side Effects: CNS: Dizziness, headache, stimulation, tremors
CV: Dysrhythmias, hypertension, palpations, tachycardia
GI: Nausea/vomiting

- Administration: Using a small volume nebulizer, adjust the oxygen flow meter to 6-10 L/min to produce a steady, visible mist.
- Adult: 2.5mg, may repeat every 10 minutes up to 3 treatments, if needed.
 - Pediatric: 2.5mg, repeat every 10 minutes up to 3 treatments, if needed.
-

- Notes:
1. The possibility of developing unpleasant side effects increases when albuterol is administered with other sympathetic agonists.
 2. Beta blockers may blunt the pharmacological effects of albuterol.
 3. Albuterol is also supplied in metered-dose inhalers (MDI) that deliver 90 mcg per inhalation. Be sure to obtain a complete medication history detailing administration times and frequency of use of home inhalation therapy. Overdose of inhalers can cause bronchoconstriction and possibly death.

Amiodarone

Generic Name: Amiodarone

Trade Name: Cordarone, Pacerone, Nexterone

Therapeutic Class: Antiarrhythmic

Actions: Amiodarone prolongs myocardial action potential and the effective refractory period. Causes noncompetitive alpha and beta adrenergic inhibition. Amiodarone suppresses atrial and ventricular ectopy (PSVT, AF, A-TACH, VT, VF, etc.) and slows conduction through the AV node (ventricular rate control; useful in WPW). Amiodarone also causes peripheral and coronary vasodilation, resulting in reduced cardiac work as well as increased myocardial oxygenation. Amiodarone may have a mild negative inotropic effect after acute IV dosing.

Pharmacokinetics: Half-life: 20-47 days

Indications:

1. Defibrillation refractory ventricular fibrillation and pulseless ventricular tachycardia.
2. Ventricular tachycardia.
3. Wide complex tachycardia of unknown type.

Contraindications:

1. Cardiogenic shock
2. Marked sinus bradycardia
3. Second or third degree heart block
4. Hypersensitivity to the drug
5. Enters breastmilk and causes harm to the neonate

Precautions:

1. Amiodarone prolongs the QT interval and is associated with a known risk of torsades de pointes, use caution in any patient with a long QT.
2. May worsen existing or precipitate new dysrhythmias, including VF.
3. Use with beta-blocking agents could increase risk of hypotension and bradycardia. Amiodarone inhibits atrioventricular conduction and decreases myocardial contractility, increasing the risk of AV block with Verapamil or Diltiazem or of hypotension with any calcium channel blocker.

Side Effects: CNS: Dizziness, headache, confusion
CV: Bradycardia, cardiac conduction abnormalities, CHF, dysrhythmias, hypotension, SA node dysfunction, sinus arrest
Resp: dyspnea, pulmonary inflammation, adult respiratory distress syndrome.

Administration: V-fib or pulseless v-tach:

- Adult: 300 mg IV bolus, may repeat once in 3-5 min with 150 mg IV bolus.
- Pediatric: 5mg/kg IV bolus (no subsequent doses)

Return of circulation from VF/pulseless VT:

- Adult: If pulseless patient was given Amiodarone bolus, do not administer Amiodarone rapid infusion. If Amiodarone was not given and patient regains pulse start rapid infusion of 150 mg Amiodarone in 100 mL of NS, infuse over ten minutes.

Administration
Continued:

- Pediatric: If pulseless patient was given Amiodarone bolus, do not administer Amiodarone rapid infusion. If Amiodarone was not given and patient regains pulse start rapid infusion of 5mg/kg of Amiodarone in 100 mL NS, infuse over 20 minutes.

V-tach with pulses:

- Adult: 150 mg in NS 100 mL rapid infusion over ten min. If no conversion may repeat once.
- Pediatric: 5mg/kg in 100 mL NS, infuse over 20 minutes. Do not repeat.

Ventricular ectopy or runs of V-tach (3 or more PVC's in a row) and underlying heart rate of 60 or above:

- Adult: 150 mg in NS 100 mL rapid infusion over 10 min. If no response may repeat once.

Notes: Never treat the combination of 3rd degree heart block and ventricular escape beats with Amiodarone, Lidocaine, or any agent that suppresses ventricular escape rhythms.

Aspirin

Generic Name: Aspirin

Trade Name: Bayer, St Joseph

Therapeutic Class: Antipyretic, salicylate

Actions: Aspirin blocks the formation of the substance Thromboxane A2 which causes platelets to aggregate and arteries to constrict. This will result in an overall reduction in mortality associated with myocardial infarction. It also appears to reduce the rate of nonfatal re-infarction and nonfatal stroke.

Pharmacokinetics: Onset: 15 to 30 minutes Peak: 1-2 hours Duration: 4-6 hours Half-life: 3 hours at low doses

Indications: New chest pain suggestive of an acute myocardial infarction

Contraindications:

1. Hypersensitivity to the drug, NSAIDS, and Tartrazine, (FDC yellow dye #5)
2. Bleeding disorders including GI hemorrhage and hemophilia
3. Hemorrhagic states

Precautions:

1. Children or teenagers with flu like symptoms (may be associated with the development of Reye's syndrome)
2. Asthma

Side Effects: GI: GI bleeding, heart burn, nausea/vomiting
HEMAT: Anemia, prolonged bleeding time

Administration: Administer four (4) 81 mg chewable tablets (324 mg total dose) PO as soon as possible after the onset of chest pain.

Notes:

Atropine

Generic Name: Atropine

Trade Name: Atropine Care, Atropen autoinjector, Atrosulf – 1

Therapeutic Class: Antiarrhythmic, anticholinergic

Actions: Atropine is a potent parasympatholytic that increases cardiac output and heart rate. Atropine acts by blocking acetylcholine receptors, thus inhibiting parasympathetic stimulation. Although it has positive chronotropic properties, it has little or no inotropic effect.

Pharmacokinetics: Peak: 2-4 minutes Duration: 4-6 hours

Indications: Bradycardia with signs and symptoms of poor perfusion.

Contraindications: 1. Hypersensitivity to the drug
2. Acute hemorrhage

Precautions: 1. Use atropine cautiously in the presence of acute coronary ischemia or myocardial infarction; increased heart rate may worsen ischemia or increase the zone of infarction.
2. Avoid relying on atropine in type II second-degree or third-degree AV block or in patients with third degree AV block with a new wide complex and poor perfusion. These patients require immediate pacing.

Side Effects: CNS: Drowsiness, confusion
CV: Tachycardia, palpitations, arrhythmias
RESP: Tachypnea, pulmonary edema
GI: Dry mouth, constipation

Administration: **Bradycardia with signs and symptoms of poor perfusion:**

- Adult: 0.5 mg IVP, repeat every 3-5 min, as needed up to a max dose of 3 mg.
- Pediatric: 0.02 mg/kg IV/IO (min. dose is 0.1 mg, max dose of 0.5 mg). May repeat once.

RSI premedication:

- Pediatric: 0.02 mg/kg IV/IO (min. dose is 0.1 mg, max dose of 0.5 mg) for the pediatric patient with potential bradycardia.

Notes: 1. Do not delay TCP while waiting for IV access or for waiting for atropine to take effect if patient is unstable.
2. Atropine is not effective for denervated transplanted hearts.

Calcium Chloride 10%

Generic Name: Calcium Chloride

Trade Name: N/A

Therapeutic Class: Electrolyte

Actions: Calcium chloride replaces calcium in cases of hypocalcemia. Calcium chloride acts as an antidote to counter the effects of Magnesium Sulfate in cases of hypermagnesia (respiratory depression, hypotension, and potential circulatory collapse). Calcium chloride reduces the effects of potassium at the myocardial cell membrane (stabilizes the cell membrane) in hyperkalemia secondary to end stage renal failure.

Pharmacokinetics: Rapid increase in serum levels, with return to pre-drug level within 30 minutes to two hours.

Indications:

1. Renal dialysis code
2. Known or suspected hyperkalemia (increased potassium)
3. Calcium channel blocker overdose (nifedipine, verapamil, diltiazem).
4. Magnesium sulfate toxicity (hypermagnesia)

Contraindications:

1. Calcium chloride is contraindicated for cardiac resuscitation in the presence of ventricular fibrillation or in patients with the risk of existing digitalis toxicity. (Except for the cases of known dialysis patient, hyperkalemia, or calcium channel blocker overdose.)
2. Calcium chloride is not recommended in the treatment of asystole and electromechanical dissociation.

Precautions:

1. Ensure administration by slow IV push
2. Extravasation can cause tissue necrosis at the injection site

Side Effects: CNS: dizziness, syncope
CV: Bradycardia, cardiac arrest, dysrhythmias, heart block, hemorrhage, hypotension, shortened Q-T interval
GI: Nausea, vomiting

Administration: **V-fib or pulseless v-tach, asystole or PEA in known hyperkalemic or dialysis patient:**

- Adult: 0.5 – 1 gm IVP

Calcium channel blocker overdose:

- Adult: 1 gm mixed with 100 mL NS and infused IV over 5 minutes.

Excited Delirium: Patient who suffers cardiac arrest

- Adult: 1 gm IVP

Crush syndrome: After release of compression and signs of hyperkalemia

- Adult: 1 gm mixed with 100 mL NS and infused IV over 5 minutes.
-

Notes: Do not mix with sodium bicarbonate in same IV.

D10W

Generic Name: Dextrose

Trade Name: Glucose, Glutose, Insta-glucose

Therapeutic Class: Nutrient, caloric

Actions: Dextrose supplies supplemental glucose in cases of hypoglycemia and restores blood sugar.

Pharmacokinetics: N/A

Indications: 1. Hypoglycemia (less than 60 mg/dl) based on glucose determination
2. Oral hypoglycemic agent overdose

Contraindications: No contraindications for a patient with suspected hypoglycemia.

Precautions: 1. Use with caution in patients with increased intracranial pressure because dextrose may worsen cerebral edema.
2. Localized venous irritation may occur when smaller veins are used.
3. Infiltration may result in tissue necrosis

Side Effects: Tissue necrosis and phlebitis at the injection site.

Administration: **Hypoglycemia:**

- Adult: Administer D10W with a macrodrip IV set. Initially administer 100 ml (10 gm), with a macrodrip IV set, and recheck level of consciousness. If patient is able to eat, and food is available, discontinue administering D10W. If patient is obtunded, administer D10W in 50 mL (5 gm) boluses until patient's level of consciousness improves.
 - **Pediatric:** Administer D10W 0.5g/kg of body weight up to a maximum of 10 G or 100 mL using a macrodrip IV set.
-

Notes: 1. Establish a free flowing IV of normal saline in a large vein. Aspirate blood before and during administration of dextrose to ensure IV patency.
2. Hypoglycemic states require immediate intervention. Prolonged hypoglycemia can result in permanent brain damage.

Diphenhydramine

Generic Name: Diphenhydramine hydrochloride

Trade Name: Benadryl

Therapeutic Class: Antihistamine

Actions: Diphenhydramine is an antihistamine with anticholinergic (drying) effects. Diphenhydramine decreases the allergic response by blocking histamine at H1 receptor sites.

Pharmacokinetics: Onset: IM 20-30 minutes IV-rapid Duration: 4-8 hours

Indications: 1. Allergic reactions
2. Medication induced dystonic reactions
3. Anaphylaxis in conjunction with Epinephrine

Contraindications: 1. Bronchial Asthma
2. Nursing mothers
3. Children less than 7 kg (6 months old)
4. Hypersensitivity to the drug or other antihistamines

Precautions: 1. Use with caution in patients with a history of severe liver disease, seizure disorders and peptic ulcers.

Side Effects: CNS: Dizziness, drowsiness, headache
CV: Hypotension, palpitations
GI: Dryness of mouth, nose and throat
RESP: Thickening of bronchial secretions, wheezing, chest tightness

Administration: **Allergic Reaction:**

- Adult: Administer 50 mg slow IVP or deep IM.
 - Pediatric: Administer 1 mg/kg up to 50 mg slow IVP or deep IM.
-

Notes: 1. The IV route is preferred for the patient in severe shock. If an IV cannot be readily established, give diphenhydramine via the IM route. Administer deep IM into large muscle mass.
Dystonic reactions can occur after administration of neuroleptic drugs, including (trade name listed in parenthesis; haloperidol (Haldol), metaclopramide (Reglan), prochlorperzine (Compazine), and promethazine (Phenergan)

Dopamine

Generic Name: Dopamine hydrochloride

Trade Name: Intropin

Therapeutic Class: Vasopressor, alpha and beta adrenergic sympathomimetic

Actions: Dopamine stimulates both adrenergic and dopaminergic receptors in a dose dependent manner. Intermediate doses (5-10 mcg/kg/min) stimulate both dopaminergic and beta 1 adrenergic receptors producing cardiac stimulation and renal dilation. Large doses (10-20 mcg/kg/min) stimulate alpha-adrenergic receptors producing vasoconstriction and increases in peripheral vascular resistance and blood pressure.

Pharmacokinetics: Onset: 5 minutes Duration: < 10 minutes Half-life: 2 minutes

Indications: 1. Hemodynamically significant bradycardia that does not respond to atropine.
2. Hemodynamically significant hypotension associated with cardiogenic shock.

Contraindications: 1. Hypovolemic shock; volume replacement must be accomplished prior to using dopamine.
2. Pheochromocytoma (tumor of the adrenal gland)
3. Dopamine should not be administered in the presence of tachydysrhythmias or ventricular fibrillation.

Precautions: 1. Dopamine increases heart rate and can induce or worsen supraventricular and ventricular dysrhythmias.

Side Effects: CNS: Headache
CV: Angina, arrhythmias, hypertension, palpitations, vasoconstriction
GI: Nausea, vomiting
RESP: Dyspnea

Administration: **Unstable Bradycardia with BP less than 90 systolic, Cardiogenic Shock, or Post Cardiac Arrest with BP less than 90 systolic:**

- Adult: Dopamine drip @ 5 mcg/kg/min. Titrate to BP of 90-100 systolic. Dose should not exceed 20 mcg/kg/min.
-

Notes: 1. To prepare a dopamine infusion, mix 400 mg dopamine in a 250 mL bag of normal saline and mix well. Resultant concentration is 1600 mcg/mL. Infuse using a 60 drop administration set. Use the formula below to calculate the drip rate.
2. Tissue sloughing may occur with extravasation. AC veins are preferable sites.
3. Dopamine Infusion Formula:
➤ Infusion Rate (gtts/min) = $\frac{\text{Dose} \times \text{Weight in kg} \times 60 \text{ gtts/mL}}{\text{Concentration of drug in 1 mL}}$

Epinephrine Auto Injector

Generic Name: Epinephrine

Trade Name: EpiPen

Therapeutic Class: Antiasthmatic, bronchodilator, vasopressor

Actions: Epinephrine is a naturally occurring catecholamine. It acts directly on alpha and beta adrenergic receptors. Its effects on beta receptors is much more profound than its effects on alpha receptors. The effects of epinephrine on beta 1 adrenergic receptors include a positive chronotropic effect (increased heart rate) and a positive inotropic effect (cardiac contractile force). The effects of epinephrine on alpha-adrenergic receptor sites include increased systemic vascular resistance. The effects on these receptors sites together cause an increased blood pressure. Epinephrine also causes bronchodilation due to its effects on beta-2 adrenergic receptors.

Pharmokinetics: Onset: Rapid

Indications: Severe allergic reactions caused by insect stings or bites, foods, drugs, and other allergens. It can also be used in the treatment of anaphylaxis of unknown causes or exercise-induced asthma.

Contraindications: No contraindications when used for indicated conditions.

Precautions: 1. No precautions when used for indicated conditions.

Side Effects: CV: Increased pulse rate
CSN: Tremors, nervousness

Administration: **Severe Allergic Reaction or Asthma:**

- Adult: 0.3mg IM, if patient condition worsens may repeat using a second epinephrine auto injector.
-

Notes: EMT basics who have completed a Nebraska state certifying epinephrine auto injector course are authorized to administer agency stocked epinephrine auto injector.

Epinephrine (1:10,000 or 1:1,000)

Generic Name: Epinephrine

Trade Name: Adrenalin

Therapeutic Class: Bronchodilator, vasopressor

Actions: Epinephrine is a naturally occurring catecholamine. It acts directly on alpha and beta-adrenergic receptors. Its effect on beta-receptors is much more profound than its effect on alpha-receptors. The effects of epinephrine on beta1 adrenergic receptors include a positive chronotropic effect (increased heart rate) and a positive inotropic effect (cardiac contractile force). The effects of epinephrine on alpha-adrenergic receptor sites together cause an increased blood pressure. Epinephrine also causes bronchodilation due to its effects on beta-2 adrenergic receptors.

Pharmacokinetics: Onset: IV-rapid IM: 6-12 minutes

Indications: 1. Cardiac arrest
2. Symptomatic bradycardia
3. Anaphylaxis
4. Bronchial asthma

Contraindications: 1. Known hypersensitivity

Precautions: 1. Cardiac disease
2. Hypertension
3. Tachydysrhythmias

Side Effects: CNS: Anxiety, dizziness, restlessness, tremulousness, headache
CV: Angina, arrhythmias, hypertension, palpitations
GI: Nausea, Vomiting

Administration: **Cardiac arrest dose:**

- Adult:
 - 1 mg (1:10,000) IV, repeat every 3-5 minutes if needed
 - 2 mg (1:1,000) ET, repeat every 3-5 minutes if needed
- Pediatric:
 - 0.01 mg/kg (1:10,000) IV, repeat every 3-5 minutes if needed
 - 0.1 mg/kg (1:1,000) ET, repeat every 3-5 minutes if needed

Bradycardia- HR < 60 in infant/child:

- Pediatric
 - 0.01 mg/kg (1:10,000) IV, repeat every 3-5 minutes if needed
 - 0.1 mg/kg (1:1,000) ET, repeat every 3-5 minutes if needed

Difficulty Breathing – Asthma:

- Adult: 0.3 mg 1:1,000 IM
- Pediatric: 0.01 mg/kg (1:1,000) IM, max initial dose of 0.3mg. May repeat in 20 minutes if needed.

Administration
Continued:

Difficulty Breathing - Allergic Reaction:

- Adult:
 - 0.3 mg (1:1,000) IM
 - 0.3 mg (1:10,000) IV, may repeat every 5 -10 minutes
 - Drip: 2-10 mcg/min
 - Pediatric:
 - 0.01 mg/kg (1:1,000) IM, max initial dose of 0.3mg. May repeat in 20 minutes if needed.
 - Drip: 2-10 mcg/min
-

Notes: Epinephrine may be administered by the endotracheal route. However, the preferred route of administration is IV or IO because it will provide more predictable drug delivery and pharmacologic effect.

Use extreme caution if the patient has cardiac chest pain or is being treated for angina or has a history of AMI within the last year.

To prepare an epinephrine infusion, mix 1mg epinephrine in a 250 mL bag of normal saline and mix well. Resultant concentration is 4 mcg/mL. Infuse using a 60-drop administration set. Use the formula below to calculate the drip rate.

$$\text{➤ Infusion Rate (gtts/min)} = \frac{\text{Dose} \times 60 \text{ gtts/mL}}{\text{Concentration of Drug in 1mL}}$$

Epinephrine Racemic

Generic Name: Racemic Epinephrine

Trade Name: MicroNefrin

Therapeutic Class: Bronchodilator, vasopressor

Actions: Racemic epinephrine stimulates both alpha and beta adrenergic receptors. However, racemic epinephrine has a slight preference for beta-2 adrenergic receptors and causes bronchodilation. It also has some effect in relieving the subglottic edema associated with croup.

Pharmacokinetics: Onset: <5 minutes Peak effects: 5-15 minutes Duration: 1-3 hours

Indications: Moderate to severe croup

Contraindications: Racemic Epinephrine should not be used in the management of epiglottitis.

Precautions: 1. Tachycardia

Side Effects: Tachycardia

Administration: **Difficulty breathing – Croup**

- **Pediatric:**

- >6 months old: 0.5 mL diluted in 3 ml saline by nebulizer.
 - <6 months old: 0.25 mL diluted in 3 ml saline by nebulizer.
-

Notes: Due to rebounding, all children who receive racemic epinephrine should be transported to the hospital.

Fentanyl

Generic Name:	Fentanyl
Trade Name:	Sublimaze, Actiq, Durogesic, Duragesic, Fentora, Matrifen, Haldid, Onsolis, Instanyl, Abstral, Lazanda
Therapeutic Class:	Opioid analgesic, opioid agonist
Actions:	Binds to opiate receptors in the CNS, altering the response to and the perception of pain.
Pharmacokinetics:	Onset: 1-2 minutes Duration: 30-60 minutes
Indications:	Pain relief and maintenance of analgesia in tracheal intubation
Contraindications:	1. Severe hemorrhage or shock 2. Known hypersensitivity
Precautions:	1. Bradydysrhythmias as fentanyl can produce bradycardia. 1. Use with caution to patients with liver and kidney dysfunction because of the importance of these organs in the metabolism and excretion of drugs. 2. Respiratory support therapy equipment should be available for treatment of possible respiratory depression.
Side Effects:	RESP: Apnea, laryngospasm, bronchospasm, respiratory depression. CV: Arrhythmias, bradycardia, circulatory depression, hypotension. CNS: Confusion, drowsiness. GI: Nausea, vomiting.
Administration:	Pain management: <ul style="list-style-type: none">• Adult: 25-50 mcg SIVP. May repeat every 5 minutes to a max dose of 100 mcg if needed.• Pediatric: 1 mcg/kg SIVP, max initial dose of 25 mcg. Do not repeat. Premedication for TCP or cardioversion <ul style="list-style-type: none">• Adult: 25 mcg SIVP. May repeat once to a max total dose of 50 mcg.• Pediatric: 1 mcg/kg SIVP to a max initial dose of 25 MCG. Do not repeat. RSI maintenance sedation: <ul style="list-style-type: none">• Adult: 25-50 mcg SIVP. May repeat to max dose of 100 mcg.• Pediatric: 1 mcg/kg SIVP to a max initial dose of 25 mcg. Do not repeat.
Notes:	1. Fentanyl may be given intranasal route for pain management purposes only. 2. Alterations in respiratory rate may last longer than the analgesic effect. Large doses may produce apnea. 3. Fentanyl appears to have less emetic activity than other narcotic analgesics. 4. Use of waveform capnography encouraged for all patients given narcotics to monitor for respiratory changes.

Glucagon

Generic Name: Glucagon

Trade Name: GlucaGen

Therapeutic Class: Antihypoglycemic

Actions: Glucagon is a protein secreted by the alpha cells of the pancreas. When released, it causes the breakdown of glycogen, stored in the liver, to glucose. It also inhibits the synthesis of glycogen from glucose. Both actions tend to cause an increase in circulating blood glucose. A return to consciousness following the administration of glucagon usually takes 5-20 minutes. Glucagon is only effective if there are sufficient stores of glycogen in the liver.

Pharmacokinetics: Onset: within 15 minutes Half-life: 3-6 minutes

Indications: 1. Hypoglycemia (less than 60 mg/dl) based on a rapid glucose determination or clinical judgement.
2. Oral hypoglycemic agent overdose.

Contraindications: Hypersensitivity to the drug

Precautions: 1. Glucagon is only effective if there are sufficient stores of glycogen with the liver. In emergency situations, intravenous dextrose is the agent of choice.

Side Effects: CNS: dizziness, headache
CV: hypotension
GI: Nausea, vomiting

Administration: **Hypoglycemia:**

- Adult: 1 mg IM
- Pediatric: 0.5 mg IM for children less than 20 kg

Notes:

Ketamine

Generic Name: Ketamine

Trade Name: Ketalar

Therapeutic Class: Aesthetic, analgesic agent

Actions: Blocks afferent transmission of impulses associated with pain perception, causes short-acting amnesia without muscular relaxation.

Pharmacokinetics: Onset: Less than 1 minute Duration: 10-15 minutes Half Life: 1-2 hours

Indications: Used as a sedative and as an induction agent for RSI

Contraindications: 1. Known hypersensitivity.

Precautions: 1. Use with caution in patients with severe hypertension where worsening HTN is detrimental.
2. Use with caution in the chronic alcoholic and the acutely alcohol-intoxicated patient.

Side Effects: RESP: Apnea, respiratory depression, excess bronchial secretions
CV: Tachycardia, bradycardia, hypertension, arrhythmias
CNS: Hallucinations, explicit dreams
GI: Nausea, vomiting

Administration: **CPR induced conscious sedation:**

- Adult: 1 mg/kg IV

Excited Delirium pharmacological restraint:

- Adult: 2 mg/kg IV or 250 mg IM

RSI initial sedation:

- Adult: 2 mg/kg IV
 - Pediatric: 2 mg/kg IV
-

Notes:

Lidocaine

Generic Name: Lidocaine

Trade Name: Xylocaine

Therapeutic Class: Anesthetic, antiarrhythmic

Actions: May blunt the intracranial pressure rise associated with RSI. Lidocaine stabilizes the neuronal membrane by inhibiting the ionic fluxes required for the initiation and conduction of impulses thereby effecting local anesthetic action. Lidocaine also suppresses automaticity and spontaneous depolarization of the ventricles.

Pharmacokinetics: Onset: Immediate Duration: 10 to 20 minutes Half-life: 1.5 -2 hours

Indications: 1. IO pain relief in conscious patient

Contraindications: 1. Third degree heart block
2. Hypersensitivity to the drug

Precautions: 1. Use with caution in patients with liver disease, CHF, or those with respiratory depression or shock.

Side Effects: CNS: confusion, drowsiness, unconsciousness, tremors, convulsions
CV: Hypotension, bradycardia, CV collapse, cardiac arrest
EENT: Tinnitus, diplopia

Administration: **IO**

- Adult: 20-40 mg SIOF
- Pediatric: 0.5 mg/kg SIOF

Notes:

Magnesium Sulfate

Generic Name: Magnesium Sulfate

Trade Name: Magnesium Sulfate

Therapeutic Class: Electrolyte, anticonvulsant

Actions: Magnesium Sulfate is a salt that dissociates into the magnesium cation and the sulfate anion when administered. Magnesium is an essential element in many of the biochemical processes that occur in the body. It acts as a physiological calcium channel blocker and blocks neuromuscular transmission by decreasing acetylcholine release at the neuromuscular junction. Magnesium slows the rate of SA node impulse formation and prolongs conduction time.

Pharmacokinetics: Onset: Immediately Duration: 30 minutes

Indications:

1. Refractory ventricular fibrillation
2. Torsades de pointes
3. Anticonvulsant associated with eclampsia

Contraindications:

1. Heart block
2. Hypermagnesia or hypocalcemia
3. Known hypersensitivity

Precautions:

1. If patellar reflexes disappear in the eclampsia patient, do not repeat the doses.
2. Magnesium sulfate should be administered slowly to minimize side effects.
3. Magnesium sulfate should be given very cautiously in the presence of serious impairment of renal function since it is excreted almost entirely by the kidneys.

Side Effects: CV: Heart block, hypotension, bradycardia
RESP: Respiratory depression
CNS: Drowsiness
Skin: Flushing, sweating

Administration: Pulseless Torsades or refractor V-fib:

- Adult: 1 gm diluted in 10 mL of NS SIVP. May repeat X 1
- Pediatric: 50 mg/kg in 100 mL NS up to 1 gm. Deliver over 5 minutes using a macrodrip set at 20 mL/minute. May repeat once.

Torsades with pulses:

- Adult: 1 gm in 100 mL of NS over 5 min. Use a macrodrip set at 20 mL/min

Eclampsia: (50%)

- Adult: 1 gm in 100 mL NS. Deliver over 5 minutes using a macrodrip set at 20 mL/min. If still seizing after 5 minutes consider repeating.
-

Notes: Any Patient receiving intravenous magnesium sulfate should have continuous cardiac monitoring and frequent monitoring of vital signs.

Midazolam

Generic Name:	Midazolam
Trade Name:	Versed
Therapeutic Class:	Sedative/hypnotic
Actions:	Midazolam causes central nervous systems depression via facilitation of inhibitory GABA 1 at benzodiazepine receptor sites (BZ1 – associated with sleep; BZ2 – associated with memory, motor sensory and cognitive function). Midazolam is a short acting benzodiazepine that is three to four times more potent than Diazepam. Midazolam has important amnesic properties.
Pharmacokinetics:	Onset: 2 minutes (IV), 15 minutes (IM) Half-life 1-12 hours Duration: 2-6 hours IV/IM
Indications:	1. Premedication for cardioversion and transcutaneous pacing 2. Seizures not caused by hypoglycemia 3. Sedation for RSI
Contraindications:	1. Hypersensitivity to the drug 2. Depressed vital signs 3. Hypotension (systolic BP less than 90 mmHg) 4. CNS depression or alcoholic coma
Precautions:	1. Use with caution in patients with pulmonary disease, CHF, renal or liver impairment
Side Effects:	CNS: Drowsiness, amnesia, altered mental status CV: Hypotension, tachycardia, PVC's RESP: Bronchospasm, coughing, laryngospasm, respiratory depression and arrest
Administration:	Seizures: <ul style="list-style-type: none">• Adult:<ul style="list-style-type: none">○ 10 mg IM if patient is seizing upon EMS arrival. Do not wait for IV/IO access.○ 2.5 mg IV/IM/IN if the patient continues to seize, or begins seizing after arrival. May repeat every 3-5 minutes for continued seizures to a maximum of 10 mg. Total max dose in a status epilepticus patient could be 20mg.• Pediatric:<ul style="list-style-type: none">○ 0.2 mg/kg IM if patient is seizing upon EMS arrival. Do not wait to obtain an IV/IO. Maximum initial dose is 5 mg.○ 0.2 mg/kg IV/IM/IN if the patient continues to seize, or begins seizing after arrival, maximum initial dose of 2.5 mg. May repeat once after five minutes for persistent seizures. Total max dose in a status epilepticus patient could be 10mg. Combative: <ul style="list-style-type: none">• Adult:<ul style="list-style-type: none">○ 2.5 mg IV/IM/IN. May repeat to a maximum dose of 5 mg.○ 5 mg IN (2.5 mg per nare)

Administration **Excited Delirium:**

- Continued:
- Adult:
 - 2.5 mg IV or IM
 - 5 mg IN (2.5 mg per nare)

Post therapeutic hypothermia shivering and or agitation:

- Adult: 1-2mg IV

RSI sedation: (Use caution in the hypotensive patient)

- Adult:
 - Initial sedation: 5 mg IV
 - Maintenance sedation: 2.5 mg SIVP
- Pediatric:
 - Initial sedation: 0.3 mg/kg IV, maximum initial dose 5 mg
 - Maintenance sedation: 0.1 mg/kg SIVP, maximum initial dose of 2 mg

Notes: The effects of midazolam can be accentuated by CNS depressants such as narcotics and alcohol.

Morphine Sulfate

Generic Name: Morphine Sulfate

Trade Name: Astramorph, Duramorph, MS Contin, Roxanol

Therapeutic Class: Opioid analgesic

Actions: Morphine is a CNS depressant that acts on opioid receptors in the brain, providing both analgesia and sedation. It increases peripheral venous capacitance and decrease venous return. Morphine also reduces myocardial oxygen demand due to both the decreased systemic vascular resistance and the sedative effects of the drug.

Pharmacokinetics: Onset: Immediately IV Duration: 4-5 hours IV

Indications: 1. Pain associated with acute myocardial infarction unresponsive to nitrates
2. Severe pain

Contraindications: 1. Respiratory depression
2. Hypotension (systolic BP less than 90 mmHg)
3. Known hypersensitivity

Precautions: 1. Use with caution in patients with head trauma, increased intracranial pressure, renal or liver dysfunction, or pulmonary disease.

Side Effects: CV: Hypotension, bradycardia
RESP: Respiratory depression
CNS: Confusion, sedation, dizziness, euphoria, hallucinations
Skin: Flushing, sweating

Administration: **Pain Management: (Use caution in the hypotensive patient)**

- Adult: 1-4 mg SIVP, depending on blood pressure. May repeat every 5 minutes to a max dose of 10 mg.
- Pediatric: 0.1 mg/kg to a maximum of 2 mg SIVP. May repeat every 5 minutes to a max dose of 6 mg.

Notes: 1. Have naloxone available for administration to reverse respiratory depression and overdose.
2. Use of waveform capnography encouraged for all patients given narcotics to monitor for respiratory changes.

Naloxone

Generic Name:	Naloxone
Trade Name:	Narcan
Therapeutic Class:	Narcotic antagonist
Actions:	Naloxone is chemically similar to narcotics. However, it has only antagonistic properties. Naloxone competes for opiate receptors in the brain and displaces narcotic molecules from opiate receptors. It can reverse respiratory depression associated with narcotic overdose.
Pharmacokinetics:	IV onset: 2 minutes Duration: 45 minutes IV
Indications:	Reversal of respiratory depression caused by suspected opioid overdose
Contraindications:	Hypersensitivity to the drug
Precautions:	1. Naloxone should be administered cautiously to patients who are known or suspected to be physically dependent on narcotics. Abrupt and complete reversal by naloxone can cause withdrawal type effects (this includes newborns of mothers with known or suspected narcotic dependence).
Side Effects:	CNS: Seizures, tremulousness CV: Hypertension, hypotension, ventricular dysrhythmias GI: Nausea, vomiting
Administration:	Suspected narcotic overdose: <ul style="list-style-type: none">• Adult:<ul style="list-style-type: none">○ 0.4 mg IVP. Repeat every 2-3 minutes to desired effect, total max dose not to exceed 4.0 mg.○ 2.0 mg IN. May repeat once after 5 minutes if needed.• Pediatric:<ul style="list-style-type: none">○ 0.1 mg/kg IV to a max initial dose 0.4 mg. May repeat every 2-3 minutes to desired effect, total max dose is 2.0 mg.○ 0.1 mg/kg IN to a max initial dose of 2.0 mg.
Notes:	The duration of action of naloxone is shorter than that of narcotics. Therefore, repeat doses may be necessary. Titrate administration of naloxone to respiratory rate.

Nitroglycerin

Generic Name:	Nitroglycerin
Trade Name:	Nitrolingual, Nitroquick, Nitro-bid, Nitrol
Therapeutic Class:	Anginal, vasodilator
Actions:	Nitroglycerin is a rapid smooth muscle relaxant that causes vasodilation and, to a lesser degree, dilates the coronary arteries. This results in increased coronary blood flow and improved perfusion of the ischemic myocardium. Relief of ischemia causes reduction and alleviation of chest pain. Vasodilation decreases preload and leads to decreased cardiac work that can help reverse the effects of angina pectoris. Additionally, decreases preload and afterload in cardiogenic pulmonary edema. Peripheral vasodilation will result in a decrease in blood pressure which may be useful in the treatment of hypertensive crisis.
Pharmacokinetics:	Onset: 1-3 minutes Peak: 5 minutes Duration: 30-60 minutes Half-life: 2-3 minutes
Indications:	<ol style="list-style-type: none">1. Chest pain suspected cardiac in origin2. Cardiogenic pulmonary edema3. Hypertensive crisis
Contraindications:	<ol style="list-style-type: none">1. Hypotension (systolic BP less than 90 mmHg)2. Increased intracranial pressure3. Hypersensitivity to the drug4. Patient has taken anti-impotence agent within 48 hours5. Inferior wall MI (leads II, III, AVF)
Precautions:	<ol style="list-style-type: none">1. Patients taking the drug routinely may develop a tolerance and require an increased dose.2. Postural syncope sometimes occurs following administration of nitroglycerin; it should be anticipated and the patient kept supine when possible.3. Careful clinical or hemodynamic monitoring must be used because of the possibility of hypotension and tachycardia.
Side Effects:	CNS: dizziness, headache, weakness CV: Dysrhythmias, palpitations, hypotension, tachycardia GI: Nausea: vomiting Skin: Diaphoresis, flushing, pallor, rash
Administration:	Cardiac Chest Pain: <ul style="list-style-type: none">• Adult: 0.4 mg SL, every 5 minutes if systolic BP remains greater than 90 mmHg Pulmonary Edema: <ul style="list-style-type: none">• Adult: 0.4 mg SL, every 5 minutes if systolic BP remains greater than 90 mmHg Hypertensive crisis: <ul style="list-style-type: none">• Adult: 0.4 mg SL every 3-5 minutes
Notes:	Additive hypotension is possible when used in conjunction with antihypertensives, beta-blockers, or calcium channel blockers.

Norepinephrine

Generic Name: Norepinephrine

Trade Name: Levophed

Therapeutic Class: Sympathomimetic

Actions: Causes peripheral vasoconstriction

- Indications:
1. Non-hemorrhagic hypotension in adult patients (systolic blood pressure <70mmHg refractory to fluid boluses or other sympathomimetics)
 2. Cardiogenic shock
 3. Septic shock
 4. Neurogenic shock
-

- Contraindications:
1. Known allergy to norepinephrine
 2. Hypotension secondary to blood volume deficits
-

- Precautions:
1. Can be deactivated by alkaline solutions
 2. Constant monitoring of blood pressure is essential
 3. Extravasation can cause tissue necrosis
-

- Side Effects:
1. Anxiety
 2. Palpitations
 3. Headache
 3. Hypertension
-

Administration: **Must be administered with an IV infusion pump, NO EXCEPTIONS**

Adults 0.1 mcg /kg /min

DO NOT EXCEED A MAXIMUM DOSE OF 30 MCG / MIN

Blood pressure goal: Titrate to a blood pressure of 90 mmHg systolic or Mean Arterial Pressure (MAP) of 65-70 mmHg

NOTES: The administration of norepinephrine will be limited to the Lincoln Fire and Rescue EMS Supervisors.

Ondansetron

Generic Name:	Ondansetron
Trade Name:	Zofran
Therapeutic Class:	Anti-nausea, anti-emetic
Actions:	Ondansetron's effects are thought to be on both peripheral and central nerves. One part is to reduce the activity to the vagus nerve, which is a nerve that activates the vomiting center in the medulla oblongata, the other is a blockage of serotonin receptors or muscarinic receptors.
Pharmacokinetics:	Onset: 15-30 minutes Duration: 4-8 hours
Indications:	Nausea/vomiting
Contraindications:	1. Concomitant use of apomorphine will cause profound hypotension and loss of consciousness. 2. Known hypersensitivity to the drug.
Precautions:	
Side Effects:	CNS: Headache, dizziness, fatigue, weakness GI: Constipation, diarrhea, abdominal pain
Administration:	Nausea/vomiting: <ul style="list-style-type: none">• Adult: 4 mg IV, do not repeat.• Pediatric: 0.1 mg/kg IV, max initial dose is 4 mg, do not repeat.
Notes:	

Oral Glucose

Generic Name: Dextrose

Trade Name: Glucose, Insta-Glucose

Overview: Oral glucose is used to treat patients with a history of diabetes exhibiting an altered mental status and the ability to swallow. Oral glucose is a form of glucose that can reverse a diabetic's hypoglycemic condition. Time of administration can make a critical difference.

Indications: Patient with altered mental status and a known history of diabetes controlled by medication.

Contraindications:

1. Unresponsive
2. Unable to swallow
3. Unable to self-administer
4. Known hypersensitivity to the drug

Precautions:

Side Effects: None when given properly. May be aspirated by the patient without a gag reflex.

Administration: **Hypoglycemia:**

- Adult: 15 g, repeat once in 15 minutes if necessary
-

Notes: Have the patient squeeze a generous amount of gel into their mouth and allow the gel to dissolve between their cheek and gum. Emphasize to the patient to allow the gel to dissolve, not to swallow it.

Rocuronium

Generic Name:	Rocuronium
Trade Name:	Zemuron
Therapeutic Class:	Non-depolarizing neuromuscular blocker
Actions:	Rocuronium is a non-depolarizing neuromuscular blocking agent. It competes with acetylcholine for receptor sites causing muscular paralysis; must be accompanied by adequate sedation; does not affect consciousness or pain threshold.
Pharmacokinetics:	Onset: 2-8 minutes Half-life 14-18 minutes Duration: 30 minutes
Indications:	Paralysis for RSI
Contraindications:	Known hypersensitivity to the drug
Precautions:	
Side Effects:	RESP: Bronchospasm, wheezing CV: Arrhythmias, tachycardia, transient hypotension or hypertension
Administration:	RSI: <ul style="list-style-type: none">• Adult:<ul style="list-style-type: none">○ Initial Paralysis: 1 mg/kg IV○ Maintenance Paralysis: 1mg/kg IV• Pediatric:<ul style="list-style-type: none">○ Initial Paralysis: 1 mg/kg IV○ Maintenance Paralysis: 1mg/kg IV
Notes:	Intensity and duration of paralysis may be prolonged by pretreatment with succinylcholine, lidocaine, quinidine, procainamide, beta-adrenergic blockers or magnesium sulfate.

Sodium Bicarbonate

Generic Name:	Sodium Bicarbonate
Trade Name:	Sodium Bicarbonate
Therapeutic Class:	Alkalinizing agent, electrolyte supplement
Actions:	Buffers excess acid to assist returning the blood to a physiological pH, in which normal metabolic processes work more effectively.
Pharmacokinetics:	Onset: Immediate Duration: Unknown
Indications:	<ol style="list-style-type: none">1. Cardiac arrest and known hyperkalemia, dialysis patient, or pre-existing bicarbonate responsive acidosis.2. Symptomatic TCA overdose3. Excited delirium cardiac arrest4. Crush syndrome
Contraindications:	<ol style="list-style-type: none">1. Known hypersensitivity2. Patients with metabolic or respiratory alkalosis3. Hypocalcemia
Precautions:	<ol style="list-style-type: none">1. Use with caution in patients with CHF or kidney insufficiency
Side Effects:	CV: Edema Electrolytes: metabolic alkalosis, hypocalcemia, hypokalemia
Administration:	Cardiac arrest: <ul style="list-style-type: none">• Adult: 1 mEq/kg IVP TCA overdose: <ul style="list-style-type: none">• Adult: 1 mEq/kg SIVP Excited delirium cardiac arrest: <ul style="list-style-type: none">• Adult: 1 mEq/kg SIVP Crush syndrome: <ul style="list-style-type: none">• Prior to release of compression:<ul style="list-style-type: none">○ Adult: 50 mEq SIVP. After the first 1000 CC of NS has been infused, mix 50 mEq of Sodium Bicarbonate into the second IV bag and adjust the second IV to 500 mL per hour.
Notes:	Do not use routinely in cardiac arrest; do not mix with calcium chloride in the same IV.