Legend	
	EMT
A	A-EMT
P	Paramedic
M	Medical Control

Overview

The purpose of this section is to serve as a drug information supplement and to provide a brief description of the out-of-hospital medications that are authorized by the State of Wisconsin for use in the Dane County EMS System. This document in no way represents the comprehensive pharmaceutical knowledge required for use of these medications by Emergency Medical Technicians providing field care. The comprehensive information about the use of these medications by practicing EMTs and paramedics, requires reference to other detailed sources.

Pregnancy Categories are listed for each of the medications in this book. The pregnancy category of a medication is an assessment of the risk of fetal injury due to the pharmaceutical, if it is used as directed by the mother during pregnancy. It does not include any risks conferred by pharmaceutical agents or their metabolites in breast milk.

Category A – Adequate and well-controlled studies have failed to demonstrate a risk to the fetus in the first trimester of pregnancy (and there is no evidence of risk in later trimesters).

Category B - Animal reproduction studies have failed to demonstrate a risk to the fetus and there are no adequate and well-controlled studies in pregnant women.

Category C - Animal reproduction studies have shown an adverse effect on the fetus and there are no adequate and well-controlled studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks.

Category D - There is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience or studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks.

Category X - Studies in animals or humans have demonstrated fetal abnormalities and/or there is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience, and the risks involved in use of the drug in pregnant women clearly outweigh potential benefits.

Medications are listed alphabetically based on generic names.

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https://www.govinfo.gov/content/pkg/FR-2008-05-29/pdf/E8-11806.pdf
https://chemm.nlm.nih.gov/pregnancycategories.htm

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Acetaminophen

Mechanism of Action
Analgesic effect thought to be due to activation of descending inhibition of the serotonergic pathway in the CNS. Anti-pyretic effect thought to be due to inhibition of the hypothalamic heat-regulating center

Uses
Pain, Fever

Contraindications
Hypersensitivity to acetaminophen or any component of formulation

Protocol Uses
Pain Management, Adult **(p69)**, Pain Management, Pediatric **(p120)**

Side Effects
GI: Nausea, vomiting
GU: Nephrotoxicity (chronic overdose)
Heme: anemia
Skin: Hypersensitivity, skin rash

Pharmacokinetics
Half-life ~ 2 hours; metabolized in liver; crosses the placenta
Pregnancy Category – B

Interactions
Increase: hepatotoxic effects – alcohol, fosphenytoin
Increase: effects of warfarin
Decrease: acetaminophen effects – barbiturates, carbamazepine
Decrease: effect of – lamotrigine

EMT Considerations
Assess: Assess mental status and appropriateness for oral medications
Evaluate: Therapeutic response

Treatment of Overdose
Discontinue product, activated charcoal, N-acetylcysteine, supportive care

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Adenosine

Mechanism of Action
Slows conduction through the AV node, can interrupt reentry pathways through the AV node, and can restore normal sinus rhythm in patients with paroxysmal supraventricular tachycardia; decreases cardiac oxygen demand, decreasing hypoxia

Uses
PSVT, as a diagnostic aid to assess myocardial perfusion defects in CAD, Wolff-Parkinson-White syndrome
Unlabeled Uses: Wide-complex tachycardia diagnosis

Contraindications
Hypersensitivity, 2nd- or 3rd-degree AV block, sick sinus syndrome
Precautions
Pregnancy (C), breast-feeding, children, geriatric patients, asthma, atrial flutter, atrial fibrillation, ventricular tachycardia, bronchospastic lung disease, symptomatic bradycardia, bundle branch block, heart transplant, unstable angina, COPD, hypotension, hypovolemia, vascular heart disease, CV disease

Protocol Uses
Tachycardia With A Pulse, Adult **(p46-47)**, Tachycardia With A Pulse, Peds **(p112)**

Side Effects
CNS: Lightheadedness, dizziness, arm tingling, numbness, headache
CV: Chest Pain, pressure, atrial tachydysrhthmias, sweating, palpitations, hypotension, facial flushing, AV block, cardiac arrest, ventricular dysrhythmias, atrial fibrillation
GI: Nausea, metallic taste
Resp: Dyspnea, chest pressure, hyperventilation, bronchospasm (asthmatics)

Pharmacokinetics
Cleared from plasma in <30sec, half-life 10sec, converted to inosine/adenosine monophosphate
Pregnancy Category - C

Interactions
Increase: risk for higher degree of heart block – Carbamazepine
Increase: risk for ventricular fibrillation – digoxin, verapamil
Increase: effects of adenosine – dypridamole
Decrease: activity of adenosine – theophylline or other methylxanthines (caffeine)

EMT Considerations
Assess cardiopulmonary status – BP, pulse, respiration, rhythm, ECG intervals (PR, QRS, QT); check for transient dysrhythmias (PVCs, PACs, sinus tachycardia, AV block)
Assess respiratory status – rate, rhythm, lung fields for crackles; watch for respiratory depression; bilateral crackles may occur in CHF patient; increased respiration, increased pulse, product should be discontinued
CNS effects – dizziness, confusion, psychosis, paresthesias, seizures; product should be discontinued

Treatment of Overdose
Defibrillation, vasopressor for hypotension, theophylline

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Albuterol

Mechanism of Action
Beta$_2$-adrenergic agonist. Activates beta$_2$ receptors on airway smooth muscle, increasing the cyclic AMP concentration, increasing activation of protein kinase A and lowers intracellular ionic calcium concentrations, leading to muscle relaxation.

Uses
Bronchospasm associated with asthma, exercise induced asthma, COPD
Unlabeled Uses: Hyperkalemia

Contraindications
Hypersensitivity to sympathomimetics, tachydysrhythmias, severe cardiac disease, heart block
Precautions
Pregnancy (C), breast-feeding, cardiac/renal disease, hyperthyroidism, diabetes mellitus, hypertension, prostatic hypertrophy, angle-closure glaucoma, seizures, exercise-induced bronchospasm (aerosol) in children <12 y/o, hypoglycemia

Protocol Uses
Guidelines For Use of Protocols **(p9)**, Paramedic Intercept Guidelines **(p24)**, Radio Report Format **(p30)**, COPD/Asthma/Stridor – Adult **(p38)**, Allergic Reaction – Adult **(p50)**, Prolonged Crush Injury – Adult, Trauma **(p84)**, Hazmat, General – Adult, Trauma **(p90);** Destination Determination – Pediatric **(p101)**, Wheezing / Asthma – Pediatric **(p107)**, Allergic Reaction – Pediatric **(p114)**, Prolonged Crush Injury – Peds, Trauma **(p132)**

Side Effects
CNS: Tremors, anxiety, insomnia, headache, dizziness, stimulation, restlessness, hallucinations, flushing, irritability
CV: Palpitations, tachycardia, angina, hypo/hypertension, dysrhythmias
EENT: Dry nose, irritation of nose and throat
GI: Heartburn, nausea, vomiting
MS: Muscle cramps
Resp: Cough, wheezing, dyspnea, parodoxical bronchospasm, dry throat
Misc: Flushing, sweating, anorexia, bad taste/smell changes, hypokalemia, metabolic acidosis

Pharmacokinetics
Extensively metabolized in the liver and tissues, crosses placenta, breast mild, blood-brain barrier
INH – onset 5-15min, peak 1-1.5hr, duration 3-6hr, half-life 4hr
Pregnancy Category – C

Interactions
Increase: QTc prolongation – other drugs that increase QT prolongation
Increase: ECG changes/hypokalemia – potassium wasting diuretics
Increase: action of albuterol – tricyclics, MAOIs, other adrenergics; do not use together
Decrease: effectiveness of albuterol – other β-blockers

EMT Considerations
Respiratory Function: vital capacity, forced expiratory volume, ABGs; lung sounds, hear rate and rhythm, BP, sputum (baseline and peak); whether patient has not received theophylline therapy before giving dose
Evaluate: therapeutic response: absence of dyspnea, wheezing after 1hr, improved airway exchange, improved ABG

Treatment of Overdose
Administer β_1-adrenergic blocker, IV Fluids

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Amiodarone

Mechanism of Action
Prolongs duration of action potential and effective refractory period, noncompetitive a- and b-adrenergic inhibition; increases PR and QT intervals, decreases sinus rate, decreases peripheral vascular resistance

Uses
Hemodynamically unstable ventricular tachycardia, supraventricular tachycardia, ventricular fibrillation not controlled by 1st-line agents
Unlabeled Uses: Atrial fibrillation treatment/prophylaxis, atrial flutter, cardiac arrest, cardiac surgery, CPR, heart failure, PSVT, Wolff-Parkinson-White (WPW) syndrome, supraventricular tachycardia

Contraindications
Black Box Warning – 2nd- and 3rd-degree AV block, bradycardia, severe hepatic disease, cardiac arrhythmias, pulmonary fibrosis
Pregnancy (D), breastfeeding, neonates, infants, severe sinus node dysfunction, hypersensitivity to this product/iodine/a=benzyl alcohol, cardiogenic shock
Precautions
Children, goiter, Hashimoto's thyroiditis, electrolyte imbalance, CHF, respiratory disease, torsades de pointes

Protocol Uses
Cardiac Arrest – Adult **(p40-41)**, Tachycardia With a Pulse – Adult **(p46-47)**, Tricyclic Overdose – Adult **(p68);**
Cardiac Arrest, General – Peds **(p109-110)**, Tachycardia with a Pulse – Peds **(p112)**,
Double Sequential Defibrillation – Procedure **(p175)**

Side Effects
CNS: Headache, dizziness, involuntary movement, tremors, peripheral neuropathy, malaise, fatigue, ataxia, paresthesia, insomnia
CV: Hypotension, bradycardia, sinus arrest, CHF, dysrhythmias, SA node dysfunction, AV block, increased defibrillation energy
EENT: Blurred vision, halos, photophobia, corneal microdepositis, dry eyes
GI: Nausea, vomiting, diarrhea, abdominal pain, anorexia, constipation, hepatotoxicity
MS: weakness, pain in extremities
Resp: Pulmonary fibrosis/toxicity, pulmonary inflammation, ARDS; gasping syndrome if used with neonates
Misc: Flushing, abnormal taste or smell, edema, abnormal salivation, coagulation abnormalities

Pharmacokinetics
Metabolized by liver (CYP3A4, CYP2C8), excreted by kidneys, 99% protein binding
Pregnancy Category – D

Interactions
Increase: QT prolongation – azoles, fluoroquinolones, macrolides
Increase: amiodarone concentration, possible serious dysrhythmias – protease inhibitors, reduce dose
Increase: anticoagulation effects - warfarin
Increase: bradycardia – b-blockers calcium channel blockers

EMT Considerations
Evaluate: therapeutic response: decreased in ventricular tachycardia, supraventricular tachycardia, fibrillation
CNS Symptoms: confusion, psychosis, numbness, depression, involuntary movements; product should be discontinued

Treatment of Overdose
O_2, artificial ventilation, ECG, administer dopamine for circulatory depression, administer diazepam for seizures

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Aspirin

Mechanism of Action
Blocks pain impulses in CNS, reduces inflammation by inhibition of prostaglandin synthesis; antipyretic action results from vasodilation of peripheral vessels; decreases platelet aggregation

Uses
Mild to moderate pain or fever including RA, osteoarthritis, thromboembolic disorders; TIAs, rheumatic fever, post-MI, prophylaxis of MI, ischemic stroke, angina, acute MI
Unlabeled Uses: Prevention of cataracts, Kawasaki disease, pericarditis, PCI

Contraindications
Pregnancy (D) 3rd trimester, breastfeeding, children <12 y/o, children with flu-like symptoms, hypersensitivity to salicylates, GI bleeding, bleeding disorders, intracranial bleeding, nasal polyps, urticaria
Precautions
Abrupt discontinuation, acid/base imbalance, alcoholism, ascites, asthma, bone marrow suppression in elderly, G6PD deficiency, gout, heart failure, anemia, renal/hepatic disease, gastritis, pregnancy (C) 1st trimester

Protocol Uses
CHF/Pulmonary Edema – Adult **(p39)**, Chest Pain / Suspected Acute Coronary Syndrome – Adult **(p44)**

Side Effects
CNS: Stimulation, drowsiness, dizziness, confusion, seizures, headache, flushing, hallucinations, coma
CV: Rapid pulse, pulmonary edema
EENT: Tinnitus, hearing loss
Endocrine: Hypoglycemia, hyponatremia, hypokalemia
GI: Nausea, vomiting, GI bleeding, diarrhea, heartburn, anorexia, hepatitis, GI ulcer
Heme: Thrombocytopenia, agranulocytosis, leukopenia, neutropenia, hemolytic anemia, increased bleeding time
Resp: Wheezing, hyperpnea, bronchospasm
Skin: Rash, urticaria, bruising
Syst: Reye's syndrome (children), anaphylaxis, laryngeal edema

Pharmacokinetics
Enteric metabolism by liver; inactive metabolites excreted by kidneys; crosses placenta; excreted in breast mild; half-life 15-20min
Pregnancy Category – D

Interactions
Increase: gastric ulcer risk – corticosteroids, anti-inflammatories, NSAIDs, alcohol
Increase: bleeding – alcohol, plicamycin, thrombolytics, anticoagulants
Increase: hypotension - nitroglycerin
Decrease: effects of aspirin – antacids (high dose), urinary alkalizers, corticosteroids

EMT Considerations
Allergic reactions: rash, urticaria; if these occur, product may have to be discontinued; patients with asthma, nasal polyps allergies: severe allergic reaction may occur
Ototoxicity: tinnitus, ringing, roaring in ears; audiometric testing needed before, after long-term therapy

Treatment of Overdose
Lavage, activated charcoal, monitor electrolytes, VS

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Atropine

Atropine

Mechanism of Action
Blocks acetylcholine at parasympathetic neuroeffector sites; increases cardiac output, heart rate by blocking vagal stimulation in heart; dries secretions by blocking vagus nerve stimulation

Uses
Bradycardia <40-50bpm, bradydysrhythmia, reversal of anticholinesterase agents, insecticide poisoning, blocking cardiac vagal reflexes, decreasing secretions before surgery, antispasmodic with GU, biliary surgery, bronchodilator, AV heart block
Unlabeled Uses: Cardiac arrest, CPR, diarrhea, pulseless electrical activity, ventricular asystole, asthma

Contraindications
Hypersensitivity to belladonna alkaloids, closed-angle glaucoma, GI obstructions, myasthenia gravis, thyrotoxicosis, ulcerative colitis, prostatic hypertrophy, tachycardia, asthma, acute hemorrhage, severe hepatic disease, myocardial ischemia
Precautions
Pregnancy ©, breastfeeding, children <6 y/o, geriatric patients, renal disease, CHF, hyperthyroidism, COPD, hypertension, Down Syndrome, spastic paralysis, gastric ulcer

Protocol Uses
Bradycardia With a Pulse – Adult **(p48)**, Cholinergic / Organophosphate Overdose – Adult **(p60)**, Beta Blocker Overdose – Adult **(p61)**, WMD / Nerve Agent Exposure – Adult, Trauma **(p98)**, Cardiac Arrest, General – Peds **(p109-110)**, Bradycardia with a Pulse – Peds **(p113)**

Side Effects
CNS: Headache, dizziness, involuntary movement, confusion, psychosis, anxiety, coma, flushing, drowsiness, insomnia, delirium
CV: Hypo/hypertension, paradoxical bradycardia, angina, PVCs, tachycardia, ectopic ventricular beats, bradycardia
EENT: Blurred vision, photophobia, glaucoma, eye pain, pupil dilation, nasal congestion
GI: Dry mouth, nausea, vomiting, abdominal pain, anorexia, constipation, paralytic ileus, abdominal distention, altered taste
GU: Retention, hesitancy, impotence, dysuria
Skin: Rash, urticaria, contact dermatitis, dry skin, flushing
Misc: Suppression of lactation, decreased sweating, anaphylaxis

Pharmacokinetics
Half-life 2-3hr, terminal 12.5hr. Excreted by kidneys unchanged (70-90% in 24hr), metabolized in liver 40-50% crosses placenta
Pregnancy Category – C

Interactions
Increase: mucosal lesions – potassium chloride tab
Increase: anticholinergic effects – tricyclics, amantadine, antiparkinson agents
Decrease: effect of atropine – antacids

EMT Considerations
Assess ECG for ectopic ventricular beats, PVCs, tachycardia. Assess for increased intraocular pressure; eye pain, nausea, vomiting, blurred vision, increased tearing

Treatment of Overdose
O_2, artificial ventilation, ECG; administer dopamine for circulatory depression; administer diazepam for seizures; assess need for antidysrhythmics

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Calcium

Mechanism of Action
Needed for maintenance of nervous, muscular, skeletal function; enzyme reactions; normal cardiac contractility; coagulation of blood; affects secretory activity of endocrine, exocrine glands

Uses
Prevention and treatment of hypocalcemia, hypermagnesemia, hypoparathyroidism, neonatal tetany, cardiac toxicity caused by hyperkalemia, lead colic, hyperphosphatemia, Vitamin D deficiency, osteoporosis prophylaxis, calcium antagonist toxicity
Unlabeled Uses: Electrolyte abnormalities in cardiac arrest, CPR

Contraindications
Hypercalcemia, digoxin toxicity, ventricular fibrillation, renal calculi
Precautions
Pregnancy (C), breastfeeding, children, respiratory/renal disease, cor pulmonale, patient in digoxin, respiratory failure, diarrhea

Protocol Uses
Cardiac Arrest – Adult **(p40-41)**, Beta Blocker Overdose – Adult **(p61)**, Calcium Channel Blocker Overdose – Adult **(p62)**, Prolonged Crush Injury – Adult, Trauma **(p84);** Cardiac Arerst, General – Peds **(p109-110)**, Overdose and Poisoning, General – Peds **(p119)**, Prolonged Crush Injury – Peds **(p132)**

Side Effects
CV: Shortened QT, heart block, hypotension, bradycardia, dysrhythmias, cardiac arrest
GI: Vomiting, nausea, constipation
Hypercalcemia: Drowsiness, lethargy, muscle weakness, headache, constipation, coma, anorexia, nausea, vomiting, polyuria,
Skin: Pain, burning at IV site, severe venous thrombosis, necrosis, extravasation

Pharmacokinetics
Crosses placenta, enters breast milk, excreted via urine and feces, half-life unknown, protein binding 40-50%
Pregnancy Category – C

Interactions
Increase: dysrhythmias – digoxin glycosides
Increase: toxicity - verpamil
Decrease: effects of atenolol, verapamil

EMT Considerations
Assess: ECG for decreased QT and T-wave inversion; seizure precautions with padded side rails, decreased stimuli, place airway suction equipment
Evaluate: therapeutic response with decreased twitching, paresthesias, muscle spasms; absence of tremor, seizure or dysrhythmia

Treatment of Overdose
Discontinue product; supportive care

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Dextrose

Mechanism of Action
Needed for adequate utilization of amino acids; decreases protein, nitrogen loss; prevents ketosis

Uses
Increases intake of calories; increases fluids in patients unable to take adequate fluids, calories orally; acute hypoglycemia

Contraindications
Hyperglycemia, delirium tremens, hemorrhage (cranial/spinal), CHF, anuria, allergy to corn products

Precautions

Cardiac/renal/hepatic disease, diabetes mellitus, carbohydrate intolerance

Protocol Uses
Documentation of Vital Signs **(p19),** Radio Report Format **(p30),** Cardiac Arrest – Adult **(p40-41),** Altered Mental Status – Adult **(p51),** Diabetic Emergencies – Adult **(p53),** Beta Blocker Overdose – Adult **(p61),** Calcium Channel Blocker Overdose – Adult (**p62),** Opiate Overdose – Adult **(p66),** Cocaine and Sympathomimetic Overdose – Adult **(p67),** Neonatal Resuscitation – Peds **(p108),** Cardiac Arrest, General – Peds **(p109-110),** Altered Mental Status – Peds **(p115),** Diabetic Emergencies – Peds **(p117)**

Side Effects
CNS: confusion, **loss of consciousness**, dizziness
CV: hypertension, **CHF, pulmonary edema, intracranial hemorrhage**
Endo: Hyperglycemia, rebound hypoglycemia, hyperosmolar syndrome, hyperglycemic non-ketotic syndrome, aluminum toxicity, hypokalemia, hypomagnesium
GI: Nausea
GU: Glycosuria, osmotic diuresis
Skin: Chills, flushing, warm feeling, rash, urticarial, extravasation necrosis
Resp: Pulmonary edema

Pharmacokinetics
Metabolized at the cellular level to carbon dioxide and water.
Oral – onset 10 minutes, peak 40 minutes; **IV –** onset immediate, peak 30 minutes
Pregnancy Category – C

Interactions
Increase: fluid retention/electrolyte excretion—corticosteroids

EMT Considerations
Assess: Electrolytes (Potassium), blood glucose; Injection site for extravasation (redness along vein, edema at site, necrosis, pain/ tenderness), site should be changed immediately
Evaluate: Therapeutic response

Treatment of Overdose
Insulin; discontinue product; supportive care

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Diazepam

Mechanism of Action
Potentiates the actions of GABA, especially in the limbic system, reticular formation; enhances presympathetic inhibition, inhibits spinal polysynaptic afferent paths

Uses
Anxiety, EtOH withdrawal, seizure disorder, muscle relaxation

Contraindications
Pregnancy (D), hypersensitivity to benzodiazepines, closed -angle glaucoma, myasthenia gravis, EtOH intoxication, liver disease
Precautions
Breastfeeding, children <6 months, geriatric patients, COPD, CNS depression, labor, Parkinson's disease, psychosis

Protocol Uses
Seizure – Peds **(p122)**

Side Effects
CNS: Dizziness, drowsiness, confusion, headache, anxiety, tremors, fatigue, hallucinations, ataxia
CV: Orthostatic hypotension, tachycardia, hypotension
EENT: Blurred vision, tinnitus, mydriasis, nystagmus
GI: Constipation, dry mouth, nausea, vomiting, anorexia, diarrhea
Heme: Neutropenia
Resp: Respiratory depression

Pharmacokinetics
Metabolized by the liver via CYP2C19, CYP3A4; excreted by kidneys, crosses the placenta, excreted in breast mild; crosses the blood-brain barrier; half life 20-50 hours. **IM**: Onset 15-30min, duration 1-1½ hour; **IV**: Onset immediate, duration 15 min-1 hour
Pregnancy Category – Not Assigned

Interactions
Increase: Diazepam effect – amiodarone, diltiazem, disulfiram, ketoconazole, nicardipine, verapamil, valproic acid
Increase: toxicity – barbiturates, SSRIs, cimetidine, CNS depressants, valproic acid, CYP3A4 inhibitors
Increase: CNS depression – EtOH
Decrease: Diazepam metabolism – oral contraceptives, valproic acid, disulfiram, propranolol
Decrease: Diazepam effect – CYP3A4 inducers (rifampin, barbiturates, carbamazepein, phenytoin, fosphenytoin), smoking

EMT Considerations
Assess BP (lying, standing), pulse; respiratory rate,
Assess EtOH withdrawal symptoms, including hallucinations (visual, auditory), delirium, irritability, agitation, fine or coarse tremor
Assess IV site for thrombosis or phlebitis, which may occur rapidly
Evaluate therapeutic response – decreased anxiety, restlessness, muscle spasms

Treatment of Overdose
Discontinue product, supportive care, monitor VS

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Diltiazem

Mechanism of Action
Inhibits calcium ion influx across cell membrane during cardiac depolarization; produces relaxation of coronary vascular smooth muscle, dilates coronary arteries, slows SA/AV node conduction times, dilates peripheral arteries

Uses
Angina pectoris due to coronary artery spasm, hypertension, atrial fibrillation, atrial flutter, paroxysmal supraventricular tachycardia

Contraindications
Sick sinus syndrome, AV heart block, hypotension <90mmHg systolic, acute MI, pulmonary congestion, cardiogenic shock

Precautions

Pregnancy (C), breastfeeding, children, geriatric patients, CHF, aortic stenosis, bradycardia, GERD, hepatic disease, hiatal hernia, ventricular dysfunction

Protocol Uses
Tachycardia With a Pulse – Adult **(p46-47),** Calcium Channel Blocker Overdose – Adult **(p62)**

Side Effects
CNS: Headache, fatigue, drowsiness, dizziness, depression, weakness, insomnia, tremor, paresthesias
CV: dysrhythmia, edema, CHF, bradycardia, hypotension, palpitations, heart block
GI: Nausea, vomiting, diarrhea, gastric upset, constipation, increased LFTs
GU: Nocturia, polyuria, acute renal failure
Skin: Rash, flushing, photosensitivity, burning or itching at injection site
Resp: Rhinitis, dyspnea, pharyngitis

Pharmacokinetics
Metabolized by the liver, excreted in the urine (96% as metabolites)
IV – onset 30-60 min; peak 2-3 hours
Pregnancy Category – D

Interactions
Increase: toxic effects – theophylline
Increase: effects of -blockers, digoxin, lithium, carbamazepine, cyclosporine, anesthetics, HMG-CoA reductase inhibitorys, benzodiazepines, lovastatin, methylprednisolone
Increase: effects of diltiazem – cimetidine

EMT Considerations
Assess for CHF – look for dyspnea, weight gain, edema, jugular venous distention, rales,
Assess dysrhythmias – BP, pulse, respiratory rate, ECG and PR intervals, QRS and QT intervals

Treatment of Overdose
Discontinue product, atropine for AV block, vasopressors for hypotension

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Diphenhydramine

Mechanism of Action
Acts on blood vessels, GI, respiratory system by competing with histamine for H_1-receptor site; decreases allergic response by blocking histamine

Uses
Allergy symptoms, rhinitis, motion sickness, antiparkinsonism, nighttime sedation, nonproductive cough

Contraindications
Hypersensitivity to H1-receptor antagonist, acute asthma attack, lower respiratory tract disease, neonates

Precautions

Pregnancy (B), breastfeeding, children <2 years old, increased intraocular pressure, cardiac/renal disease, hypertension, bronchial asthma, seizure disorder, stenosed peptic ulcers, hyperthyroidism, prostatic hypertrophy, bladder neck obstruction

Protocol Uses
Allergic Reaction – Adult **(p50),** Antipsychotic Overdose / Acute Dystonic Reaction – Adult **(p65),** Allergic Reaction – Peds **(p114)**

Side Effects
CNS: Dizziness, drowsiness, poor coordination, fatigue, anxiety, euphoria, confusion, paresthesia, neuritis, seizures
CV: hypotension, palpitations
EENT: Blurred vision, dilated pupils, tinnitus, nasal stuffiness, dry nose, throat mouth
GI: Nausea, anorexia, diarrhea
GU: Retention, dysuria, frequency
Heme: thrombocytopenia, agranulocytosis, hemolytic anemia
Misc: **Anaphylaxis**
Resp: Increased thick secretions, wheezing, chest tightness

Pharmacokinetics
Metabolized in liver, excreted by kidneys, crosses placenta, excreted in breast milk, half life 2-7 hours. **IM** – onset ½ hour, peak 1-4 hours, duration 4-7 hours. **IV** – onset immediate, duration 4-7 hours
Pregnancy Category – B

Interactions
Increase: CNS depression – barbiturates, opiates, hypnotics, tricyclics, EtOH
Increase: diphenhydramine effect – MAOIs

EMT Considerations
Assess for urinary retention, frequency, dysuria
Assess respiratory status – rate, rhythm, increase in bronchial secretions, wheezing, chest tightness

Treatment of Overdose
Discontinue product, administer diazepam for seizures, vasopressors for hypotension, phenytoin for refractory seizures

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DuoDote Kit

DuoDote Kit

The DuoDote autoinjector provides a single intramuscular dose of the anti-nerve agent medications atropine and pralidoxime chloride in a self contained unit. The kits are only effective against the nerve agents **tabun** (GA), **sarin** (GB), **soman** (GD) and **VX**. It may also be used in cases of agricultural insecticide exposure, as organophosphates are a key component of the agent. Common examples of insecticides using organophosphates are **malathion**, **parathion**, **diazinon**, **fenthion**, **dichlorvos**, **ethion** and **trichlorfon**.

Mechanism of Action

Atropine counters the parasympathetic response from the muscarinic receptor overstimulation associated with organophosphate and nerve agent poisoning, and reverses the SLUDGEM symptoms.
Pralidoxime chloride ("2-PAM") binds to the organophosphate or nerve agent and changes the conformation of the molecule, which causes it to lose its binding to the acetylcholinesterase enzyme. The joined poison / antidote then releases from the site and regenerates the enzyme, allowing it to function again.

Uses

Organophosphate and nerve agent poisonings.

Contraindications

None in the emergency setting.
Precautions
Known hypersensitivity to the DuoDote or Mark I Kit and Pediatric patients under the age of 3 are *relatively* contraindicated.

Protocol Uses

Cholinergic / Organophosphate Overdose – Adult **(p60),** WMD / Nerve Agent Exposure – Adult, Trauma **(p98)**

Each kit contains: Atropine 2.1mg and Pralidoxime chloride 600mg
Minor initial symptoms – administer **ONE** DuoDote Kit via autoinjector (IM)
Severe symptoms appearing within 10 minutes of first dose – administer **ONE additional** DuoDote Kit via autoinjector (IM)
Severe symptoms present from the beginning – administer **THREE** DuoDote Kits via autoinjector (IM)

Side Effects

HEENT: Dry mouth
Skin: Flushing
CNS: Dilated pupils, Headache, Drowsiness
CV: Tachycardia

Interactions

Morphine, theophylline, aminophylline and **succinylcholine** should be avoided in patients with organophosphate poisoning. Barbiturates are potentiated by the anticholinesterase enzyme and should be used cautiously when treating seizures in the poisoned patient.

EMT Considerations

The use of a DuoDote Kit offers no prophylactic protection and should be administered only if symptoms are present.

There is a high potential for "off-gassing" from patients exposed to both organophosphates and nerve agents. In cases of "off-gassing", vapors are given off by chemically contaminated clothing or exhaled by poisoned individuals. EMS Providers should use all appropriate PPE including SCBA and be vigilant when monitoring for symptoms in themselves and other responders. These patients are generally NOT safe for transport by Helicopter EMS (HEMS).

Pregnancy Category (Atropine) – C; Pregnancy Category (Pralidoxime) – C

Treatment of Overdose

Discontinue product; supportive care

Legend	
	EMT
A	A-EMT
P	Paramedic
M	Medical Control

Epinephrine

Epinephrine (Adrenaline)

Mechanism of Action
β_1- and β_2-agonist causing increased levels of cAMP, thereby producing bronchodilation, cardiac and CNS stimulation; high doses cause vasoconstriction via alpha-receptors; low doses can cause vasodilation vai β_2-vascular receptors

Uses
Acute asthma attacks, hemostasis, bronchospasm, anaphylaxis, allergic reactions, cardiac arrest, shock

Contraindications
Hypersensitivity to sympathomimetics, sulfites, closed-angle glaucoma, nonanaphylactic shock during general anesthesia
Precautions
Pregnancy (C), breastfeeding, cardiac disorders, hyperthyroidism, diabetes mellitus, prostatic hypertrophy, hypertension, organic brain syndrome, local anesthesia in certain areas, labor, cardiac dilation, coronary insufficiency, cerebral atherosclerosis, organic heart disease

Protocol Uses
Termination of Resuscitation **(p16),** COPD / Asthma / Stridor – Adult **(p38),** Cardiac Arrest – Adult **(p40-41),** Bradycardia With a Pulse – Adult **(p48),** Allergic Reaction – Adult **(p50),** Calcium Channel Blocker Overdose – Adult **(p62),** Hypotension / Shock (Non-Trauma) – Adult **(p75),** Hypotension / Shock (Trauma) – Adult **(p97),** Wheezing / Asthma – Peds **(p107),** Neonatal Resuscitation – Peds **(p108),** Cardiac Arrest, General – Peds **(p109-110),** Post Resuscitation Care – Peds **(p111),** Bradycardia With a Pulse – Peds **(p113).** Allergic Reaction – Peds **(p114),** Hypotension / Shock (Non-Trauma) – Peds **(p123)**

Side Effects
CNS: Tremors, anxiety, insomnia, headache, dizziness, confusion, hallucinations, cerebral hemorrhage, weakness, drowsiness
CV: Palpitations, tachycardia, hypertension, dysrhythmias, increased T wave
GI: Anorexia, nausea, vomiting
MISC: Sweating, dry eyes
Resp: Dyspnea

Pharmacokinetics
Crosses placenta, metabolized in the liver. **IM** – onset variable, duration 1-4 hours; **Inhaled -** onset 1-5 minutes, duration 1-3 hours
Pregnancy Category – C

Interactions
Do not use with MAOIs or tricyclics; hypertensive crisis may occur.
Toxicity: other sympathomimetics
Decrease: hypertensive effects – β-adrenergic blockers

EMT Considerations
Assess Asthma – auscultate lungs, pulse, BP, respiratory rate and effort, sputum
ECG completed when continuous albuterol administered
Sulfite sensitivity may be life-threatening
Allergic reactions, bronchospasms

Treatment of Overdose
Discontinue product, administer α -blocker and β -blocker

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P	Paramedic
M	Medical Control

Etomidate

Mechanism of Action
Ultrashort-acting nonbarbiturate hypnotic used for rapid induction of anesthesia with minimal cardiovascular effects; modulates $GABA_A$ receptors to induce general anesthesia. Does NOT have any analgesic properties

Uses
Conscious sedation, anesthesia for rapid-sequence intubation
Unlabeled uses: determine speech lateralization in patients prior to lobectomies to remove epileptogenic centers in the brain

Contraindications
Hypersensitivity
Precautions
Renal impairment, Elderly patients, Pregnancy category (C), unknown if excreted in breast milk

Protocol Uses
Rapid Sequence Airway – Adult **(p35);** Rapid Sequence Airway – Procedure **(p146),** Invasive Airway – Peds **(p104)**

Side Effects
Suppresses corticosteroid synthesis in the adrenal cortex by inhibiting 11-beta-hydroxylase, an enzyme important in adrenal steroid production.
CV: Arrhythmias, bradycardia, HTN, hypotension
GI: Nausea, vomiting on emergence from anesthesia
MS: Pain at injection site
Resp: Hiccups, laryngospasm, hypoventilation

Pharmacokinetics
Protein binding 76%, metabolized by hepatic and plasma esterases, excreted by kidneys, half life 1.25 hours
IV – Onset in 30-60 seconds, peak within 1 minute, duration approximately 3-5 minutes
Pregnancy Category – C

Interactions
No interactions listed on Lexi-Comp

EMT Considerations
Administer IV push over 30-60 seconds. Solution is highly irritating to small vessels
Assess vital signs, note muscle tone prior to and after injection, drug history, hepatic or renal failure
Assess for CNS changes – dizziness, somnolence, hallucinations, euphoria, LOC

Treatment of Overdose
Discontinue product; supportive care

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P	Paramedic
M	Medical Control

Famotidine

Mechanism of Action
Competitively inhibits histamine at histamine H_2-receptor site, thus decreasing gastric secretion while pepsin remains at a stable level.

Uses
Short-term treatment of active duodenal ulcer, maintenance therapy for duodenal ulcer, Zollinger-Ellison syndrome, multiple endocrine adenomas, gastric ulcers; gastroesophageal reflux disease, heartburn
Unlabeled uses: GI disorders in those taking NSAIDs; urticaria; prevention of stress ulcers, aspiration pneumonitis, inactivation of oral pancreatic enzymes in pancreatic disorders

Contraindications
Hypersensitivity
Precautions
Pregnancy (B), breastfeeding, children <12 years old, geriatric patients, severe renal/hepatic disease

Protocol Uses
Allergic Reaction – Adult **(p50),** Allergic Reaction – Peds **(p114)**

Side Effects
CNS: Headache, dizziness, paresthesia, depression, anxiety, somnolence, insomnia, fever, **seizures in renal disease**
CV: **Dysrhythmias, QT prolongation in impaired renal function**
EENT: Taste change, tinnitus, orbital edema
Skin: Rash, **toxic epidermal necrolysis, Stevens-Johnson syndrome**
MS: Myalgias, arthralgias
Resp: **Pneumonia**

Pharmacokinetics
Plasma protein binding 15-20%, metabolized in liver 30% (active metabolites), 70% excreted by kidneys, half life 2½-3½ hours;
IV – onset immediate, peak 30-60 minutes, duration 8-15 hours
Pregnancy Category – B

Interactions
Decrease: absorption – ketoconazole, itraconazole, cefpodoxime, cefditoren
Decrease: famotidine absorption – antacids
Decrease: effect of – atazanavir, delavirdine

EMT Considerations
Assess for signs of ulcers – epigastric pain, abdominal pain, frank or occult blood in emesis
Assess for signs of allergic reaction – redness, hives, itching

Treatment of Overdose
Discontinue product; supportive care

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P	Paramedic
M	Medical Control

Fentanyl

Mechanism of Action
Inhibits ascending pain pathways in the CNS, increases pain threshold, alters pain perception by binding to opiate receptors

Uses
Controls moderate to severe pain; adjunct to general anesthetic, adjunct to regional anesthesia; conscious sedation

Contraindications
Hypersensitivity to opiates, myasthenia gravis

Precautions

Pregnancy (C), breastfeeding, geriatric patients, increased intracranial pressure, seizure disorders, severe respiratory disorders, cardiac dysrhythmias

Protocol Uses
Post Advanced Airway Sedation – Adult, Medical **(p36),** Opiate Overdose – Adult **(p66),** Pain Management – Adult **(p69),** Post Resuscitation Care – Peds **(p111),** Pain Management – Peds **(p120),** Sickle Cell Crisis – Peds **(p124)**

Side Effects
CNS: Dizziness, euphoria, sedation
CV: **Bradycardia, arrest**, hypo/hypertension
EENT: Blurred vision, miosis
GI: Nausea, vomiting, constipation
Skin: Rash, diaphoresis
MS: Muscle rigidity
Resp: **Respiratory depression, arrest, laryngospasm**

Pharmacokinetics
Metabolized by liver, excreted by kidneys, crosses placenta, excreted in breast milk. Half-life IV: 2-4 hours
IM: onset 7-8 minutes, peak 30 minutes, duration 1-2 hours. **IV**: Onset 1 minute, peak 3-5 minutes, duration ½ - 1 hour
Pregnancy Category – C

Interactions
Increase: fentanyl effect (fetal respiratory depression) – cyclosporine, ketoconazole, cimetidine, fluconazole, nefazodine, zafrilukast
Increase: hypotension – droperidol
Increase: CV depression – diazepam
Increase: fentanyl effect with other CNS depressants – EtOH, opioids, sedative/hypnotics, antipsychotics, skeletal muscle relaxants, protease inhibitors
Decrease: fentanyl effect – CYP3A4 inducers (carbamazepine, phenytoin, phenobarbital, rifampin)

EMT Considerations
Assess vital signs, note muscle rigidity, drug history, hepatic or renal failure
Assess for CNS changes – dizziness, drowsiness, hallucinations, euphoria, LOC, pupil reaction

Treatment of Overdose
Discontinue product, naloxone

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P	Paramedic
M	Medical Control

Glucagon

Glucagon

Mechanism of Action
Increases in blood glucose, relaxation of smooth muscle of the GI tract, and a positive inotropic and chronotropic effect on the heart; increases in blood glucose are secondary to stimulation of glycogenolysis

Uses
Hypoglycemia, used to temporarily inhibit movement of GI tract as a diagnostic test

Contraindications
Hypersensitivity, pheochromocytoma, insulinoma (insulin-secreting tumor)

Protocol Uses
Cardiac Arrest – Adult **(p40-41),** Diabetic Emergencies – Adult **(p53),** Beta Blocker Overdose – Adult **(p61),** Calcium Channel Blocker Overdose – Adult **(p62),** Diabetic Emergencies – Peds **(p117),** Overdose and Poisoning, General – Peds **(p119)**

Side Effects
CNS: Dizziness, headache,
CV: Hypotension
GI: Nausea, vomiting

Pharmacokinetics
IV: Onset immediate, peak 30 minutes, duration 1-1½ hours
IM: Onset 5-10 minutes, peak 13-20 minutes, duration 12-30 minutes
Pregnancy Category – B

Interactions
Increase: Bleeding risk – anticoagulants

EMT Considerations
Assess for hypoglycemia – monitor blood glucose levels before and after use; use other products to control hypoglycemia if patient is conscious

Treatment of Overdose
Discontinue product, supportive care

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P	Paramedic
M	Medical Control

Glucose (Oral)

Glucose

Mechanism of Action
Needed for adequate utilization of amino acids; decreases protein, nitrogen loss; prevents ketosis

Uses
Increases intake of calories; increases fluids in patients unable to take adequate fluids, calories orally; acute hypoglycemia

Contraindications
Inability to swallow effectively, impaired airway reflexes / inability to protect airway, hyperglycemia, delirium tremens, hemorrhage (cranial/spinal), CHF, anuria, allergy to corn products

Precautions

Cardiac/renal/hepatic disease, diabetes mellitus, carbohydrate intolerance

Protocol Uses
General Approach – Adult, Medical **(p33),** Airway Management – Adult **(p34),** Rapid Sequence Airway – Adult **(p35),** CHF / Pulmonary Edema – Adult **(p39),** Altered Mental Status – Adult **(p51),** Diabetic Emergencies – Adult **(p53),** Refusal Protocol – Adult **(p70),** Refusal After EMS Treatment – Adult **(p71),** Seizure – Adult **(p72),** Suspected Stroke – Adult **(p73),** Sepsis Screening – Adult **(p74),** Hypotension / Shock (Non-Trauma) – Adult **(p75),** Environmental, Hypothermia – Adult, Trauma **(p87),** Head Injury – Adult, Trauma **(p91),** Lightning Strike – Adult, Trauma **(p93),** General Approach – Peds, Medical **(p102),** Airway management – Peds **(p103),** Neonatal Resuscitation – Peds **(p108),** Altered Mental Status – Peds **(p115),** Brief Resolved Unexplained Event (BRUE – formerly "ALTE") – Peds **(p116),** Diabetic Emergencies – Peds **(p117),** Overdose and Poisoning, General – Peds **(p119),** Refusal Protocol – Peds **(p121),** Seizure – Peds **(p122),** Hypotension / Shock (Non-Trauma) – Peds **(p123),** Environmental, Hypothermia – Peds, Trauma **(p135),** Head Injury – Peds, Trauma **(p138),** Blood Glucose Analysis – Procedure **(p169),** BE-FAST Stroke Screen – Procedure **(p182),** FAST-ED Stroke Screen – Procedure **(p183)**

Side Effects
CNS: confusion, **loss of consciousness**, dizziness
CV: hypertension, **CHF, pulmonary edema, intracranial hemorrhage**
Endo: Hyperglycemia, rebound hypoglycemia, hyperosmolar syndrome, hyperglycemic non-ketotic syndrome, aluminum toxicity, hypokalemia, hypomagnesium
GI: Nausea
GU: Glycosuria, osmotic diuresis
Skin: Chills, flushing, warm feeling, rash, urticarial, extravasation necrosis
Resp: Pulmonary edema

Pharmacokinetics
Metabolized at the cellular level to carbon dioxide and water
Oral – onset 10 minutes, peak 40 minutes
Pregnancy Category – C

Interactions
Increase: fluid retention/electrolyte excretion—corticosteroids

EMT Considerations
Assess: Mental status and appropriateness for oral medications, electrolytes (Potassium), blood glucose
Evaluate: Therapeutic response

Treatment of Overdose
Insulin, IVF, discontinue product, supportive care

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M	Medical Control

Haloperidol

Mechanism of Action
Depresses cerebral cortex, hypothalamus, limbic system, which control activity and aggression; blocks neurotransmission produced by dopamine at synapse; exhibits, strong α-adrenergic, anticholinergic blocking action; mechanism for antipsychotic effects unclear

Uses
Psychotic disorders, control of tics, vocal utterances in Gilles de la Tourette's syndrome, short-term treatment of hyperatcive children showing excessive motor activity, prolonged parenteral therapy in chronic schizophrenia, organic mental syndrome with psychotic features, hiccups (short-term), emergency sedation of severely agitated or delirious patients, ADHD
Unlabeled uses: Intraoperative nausea, vomiting; autism; migraine

Contraindications
Hypersensitivity, coma, Parkinson's disease
Precautions
Pregnancy (C), breastfeeding, geriatric patients, seizure disorders, hypertension, pulmonary/cardiac/hepatic disease, QT prolongation, torsades de pointes, prostatic hypertrophy, hyperthyroidism, thyrotoxicosis, children, blood dyscrasias, brain damage, bone marrow depression, EtOH and barbiturate withdrawal states, angina, epilepsy, urinary retention, closed angle glaucoma, CNS depression **Black Box Warning**: Increased mortality in elderly patients with dementia-related psychosis

Protocol Uses
Behavioral / Excited Delirium – Adult **(p52)**

Side Effects
CNS: EPS – pseudoparkinsonism, akathisia, dystonia, tardive dyskinesia, drowsiness, headache, **seizures, neuroleptic malignant syndrome**, confusion
CV: Orthostatic hypotension, hypertension, **cardiac arrest**, ECG changes, **tachycardia, QT prolongation, sudden death, torsades de pointes**
EENT: Blurred vision, glaucoma, dry eyes
GI: Dry mouth, nausea, vomiting, anorexia, constipation, diarrhea, jaundice, weight gain, **ileus, hepatitis**
GU: Urinary retention, dysuria, urinary frequency, enuresis, impotence, amenorrhea, gynecomastia
Skin: Rash, photosensitivity, dermatitis
Resp: **laryngospasm**, dyspnea, respiratory depression

Pharmacokinetics
Metabolized by liver, excreted in urine, bile; crosses placenta; enters breast mild; protein binding 92%; terminal half-life 12-36 hours (metabolites) **IM**: Onset 15-30 minutes, peak 15-20 minutes, half life 21 hours
Pregnancy Category – C

Interactions
Increase: serotonin syndrome, neuroleptic malignant syndrome – SSRIs, SNRIs
Increase: QT prolongation – class 1A, III antidysrhythmics, tricyclics, amoxapine, maprotiline, phenothiazines, pimozide, risperidone, sertindole, ziprasidone, β-blockers, chloroquine, clozapine, dasatinib, dolasetron, droperidol, dronedarone, flecainide, methadone, erythromycin, ondansetron, tacrolimus
Increase: oversedation – other CNS depressants, EtOH, barbiturate anesthetics
Increase: toxicity – epinephrine, lithium
Decrease: effects – lithium, levodopa

EMT Considerations
Assess patient response to medications, scene safety, evaluate for dystonic reaction

Treatment of Overdose
Discontinue product, supportive care, ECG monitoring, diphenhydramine for dystonia

Legend	
	EMT
A	A-EMT
P	Paramedic
M	Medical Control

Hydroxocobalamin

Mechanism of Action
Precursor to cyanocobalamin (vitamin B12). Cyanocobalamin acts as a coenzyme for various metabolic functions including fat and carbohydrate metabolism and protein synthesis. In the presence of cyanide, each hydroxocobalamin molecule can bind one cyanide ion and form cyanocobalamin, which is then excreted in the urine.

Uses
Cyanide antidote, vitamin B12 deficiency, pernicious anemia, vitamin B12 malabsorption syndrome, increased requirements with pregnancy, thyrotoxicosis, hemolytic anemia, hemorrhage, renal/hepatic disease, nutritional supplementation

Contraindications
Hypersensitivity, optic nerve atrophy

Precautions

Pregnancy (A), breastfeeding, children

Protocol Uses
Cyanide Poisoning – Adult **(p64)**

Side Effects
CNS: Flushing, optic nerve atrophy
CV: **CHF**, peripheral vascular thrombosis**, pulmonary edema**
GI: Diarrhea
Skin: Itching, rash, pain at injection site
Endo: Hypokalemia
Systemic: **Anaphylactic shock**

Pharmacokinetics
Stored in liver/kidneys/stomach; 50%-90% excreted in urine; crosses placenta; excreted in breast milk
Pregnancy Category – C

Interactions
Increase: absorption—prednisone
Decrease: absorption—aminoglycosides, anticonvulsants, colchicine, chloramphenicol, aminosalicylic acid, potassium preparations, cimetidine

EMT Considerations
Assess: For vitamin B12 deficiency (red/beefy tongue, psychosis, pallor, neuropathy); For pulmonary edema, worsening of CHF in cardiac patients
Perform/provide: Protection from light, heat
Evaluate: Therapeutic response:, dyspnea on exertion, palpitations, paresthesias, psychosis, visual disturbances

Treatment of Overdose
Discontinue product, IVF, supportive care

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P	Paramedic
M	Medical Control

Ibuprofen

Mechanism of Action
Reversibly inhibits cyclooxygenase-1 and 2 (COX-1 and 2) enzymes, which results in decreased formation of prostaglandin precursors, has antipyretic, anti-inflammatory and analgesic effects

Uses
Pain, osteoarthritis, rheumatoid arthritis
Off-label use: Gout (acute flares), migraines, pericarditis

Contraindications
Hypersensitivity to ibuprofen, active gastric/duodenal/peptic ulcers, active GI bleeding

Protocol Uses
Pain Management – Adult **(p69),** Pain Management – Peds **(p120)**

Side Effects
CNS: Headache, nervousness, dizziness
CV: Edema
EENT: Tinnitus
GI: Epigastric pain, heartburn, nausea, abdominal pain, abdominal distress, flatulence, nausea and vomiting
Heme: Anemia, prolonged bleeding time
Skin: Skin rash, maculopapular rash, pruritus

Pharmacokinetics
Half-life 2 hours; metabolized in liver, eliminated in the urine, crosses the placenta
Pregnancy Category – D in 3rd Trimester

Interactions
Increase: effects of anticoagulants and other blood thinners (increased bleeding)
Decrease: effects of anti-hypertensives

EMT Considerations
Assess: Assess mental status and appropriateness for oral medications
Evaluate: Therapeutic response

Treatment of Overdose
Discontinue product, supportive care

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Legend	
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P	Paramedic
M	Medical Control

Ipratropium

Mechanism of Action
Inhibits interaction of acetylcholine at receptor sites on the bronchial smooth muscle, thereby resulting in decreased cGMP and bronchodilation

Uses
COPD, Asthma

Contraindications
Hypersensitivity to this product, atropine, bromide, soybean or peanut products

Precautions

Breastfeeding, children <12 yr, angioedema, heart failure, surgery, acute bronchospasm, bladder obstruction, closed-angle glaucoma, prostatic hypertrophy, urinary retention, pregnancy (B)

Protocol Uses
COPD / Asthma / Sridor – Adult **(p38),** Hazmat, General – Adult, Trauma **(p90),** Wheezing / Asthma – Peds **(p107)**

Side Effects
CNS: *Anxiety, dizziness, headache*, nervousness
CV: Palpitations
EENT: Dry mouth, blurred vision, nasal congestion
GI: *Nausea, vomiting, cramps*
Skin: Rash
RESP: *Cough, worsening of symptoms*, **bronchospasms**

Pharmacokinetics
15% of dose reaches lower airways. Protein binding <9%, half-life elimination 2 hours
INH – onset 15 minutes, peak 1-2 hours, duration 2-5 hours
Pregnancy Category – B

Interactions
Increase: toxicity—other bronchodilators (INH)
Increase: anticholinergic action—phenothiazines, antihistamines, disopyramide

EMT Considerations
Assess: Palpitations; respiratory status (rate, rhythm, auscultate breath sounds prior to and after administration
Perform/provide: Storage at room temp
Evaluate: Therapeutic response: ability to breathe adequately

Treatment of Overdose
Discontinue product; supportive care

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P	Paramedic
M	Medical Control

Ketamine

Ketamine

Mechanism of Action
Produces a cataleptic-like state in which the patient is dissociated from the surrounding environment by direct action on the cortex and limbic system. Noncompetitive NMDA receptor antagonist that blocks glutamate in the brain. Low doses produce analgesia and modulate central sensitization, hyperalgesia and opioid tolerance. Reduces polysynaptic spinal reflexes.

Uses
Induction and maintenance of general anesthesia
Unlabeled uses: Complex regional pain syndrome, analgesia, sedation

Contraindications
Hypersensitivity, conditions in which increased blood pressure would be hazardous. Additional contraindications per American College of Emergency Physicians (ACEP) – Infants <3 months of age, known or suspected schizophrenia (even if currently stable or controlled with medications)
Precautions
Increased intracranial pressure, increased ocular pressure, thyroid disorders, cardiovascular disease, respiratory depression, airway complications, CNS depression, emergence reaction
Ketamine crosses the placenta and can be detected in fetal tissue; it is not known if ketamine is excreted in breast milk

Protocol Uses
Rapid Sequence Airway – Adult **(p35),** Post Advanced Airway Sedation - Adult, Medical **(p36),** Behavioral / Excited Delirium – Adult **(p52),** Pain Management – Adult **(p69)**

Side Effects
CNS: Prolonged emergence, confusion, **hallucinations**, irrational behavior, **increased CSF pressure**, hypertonia (may resemble seizures), drug dependence
CV: Bradycardia, arrhythmia, hypotension, HTN, tachycardia
Derm: Erythema (transient), morbilliform rash (transient), rash at injection site
Endo: Central diabetes insipidus
GI: Anorexia, nausea, **sialorrhea** (drooling), vomiting
EENT: Diplopia, **increased intraocular pressure**, nystagmus
Resp: **Airway obstruction**, apnea, respiratory depression, laryngospasm

Pharmacokinetics
Metabolized in liver via hydroxylation and N-demehtylation, excreted primarily in the urine
IV – onset 30 seconds, peak 5-10 minutes; IM – onset 3-4 minutes, peak 12-25 minutes. Half life 2.5 hours
Pregnancy Category – Not Assigned

Interactions
Increase: CNS depression – **alcohol**, buprenorphine, **cannabis**, **magnesium sulfate**, minocycline, mirtazapine, zolpidem, **hydrocodone**, **antihistamines**, thalidomide
Increase: active metabolites – quazepam, stiripentol,memantine
Ketamine may increase the toxic effects of – memantine, mifepristone, thiopental, **SSRI antidepressants**

EMT Considerations
Assess heart rate, blood pressure, respiratory rate, SpO2
Assess for emergence reaction
Assess cardiac function continuously in patients with increased blood pressure or cardiac decompensation

Treatment of Overdose
Discontinue product; respiratory support for laryngospasm and respiratory depression, airway suctioning for increased salivation and secretions, supportive care for psychomotor agitation and hallucinations

Legend	
	EMT
A	A-EMT
P	Paramedic
M	Medical Control

Ketorolac

Mechanism of Action
Reversibly inhibits cyclooxygenase-1 and 2 (COX-1 and 2) enzymes, which results in decreased formation of prostaglandin precursors, has antipyretic, analgesic and anti-inflammatory

Uses
Acute Pain

Contraindications
Hypersensitivity to ketorolac, aspirin and other NSAIDs, contraindicated during labor and delivery, active or history of peptic ulcer disease, active or recent GI bleed. *Ketorolac should not be administered to females of reproductive age without a documented negative pregnancy test*. This is due to harm that may be caused to a developing fetus, as well as potential bleeding complications in the Mother.

Protocol Uses
Pain Management – Adult **(p69)**

Side Effects
CV: Edema, hypertension
EENT: Tinnitus
GI: GI pain, dyspepsia, nausea, diarrhea
Heme: Anemia, prolonged bleeding time, purpura
Skin: pruritus, diaphoresis

Pharmacokinetics
Onset IV 1 to 3 minutes, half-life elimination 5 hours, eliminated in the urine, crosses the placenta
Pregnancy Category – D

Interactions
Increase: effects of anticoagulants and other blood thinners (increased bleeding)
Increase: effects of ketorolac
Increase: effects of quinolones – neuroexcitatory and seizure potentiating
Decrease: effects of anti-hypertensives

EMT Considerations
Assess: Injection site of extravasation
Evaluate: Therapeutic response

Treatment of Overdose
Discontinue product, Supportive Care

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P	Paramedic
M	Medical Control

Lidocaine

Lidocaine

Mechanism of Action
Increases electrical stimulation threshold of ventricle, His-Purkinje system, which stabilizes cardiac membrane, decreases automaticity

Uses
Ventricular tachycardia, ventricular dysrhythmias during cardiac surgery, digoxin toxicity, cardiac catheterization
Unlabeled uses: Attenuation of intracranial pressure increases during intubation/endotracheal tube suctioning

Contraindications
Hypersensitivity to amides, severe heart block, supraventricular dysrhythmias, Adams-Stokes syndrome, Wolff-Parkinson-White syndrome
Precautions: Pregnancy (B), breastfeeding, children, geriatric patients, renal/hepatic disease, CHF, respiratory depression, malignant hyperthermia, myasthenia gravis, weight <50 kg

Protocol Uses
Rapid Sequence Airway – Adult **(p35),** Cardiac Arrest, General – Peds **(p109-110),** Rapid Sequence Airway (RSA) – Procedure **(p146),** IO Intraosseous Venous Access – Procedure **(p195)**

Side Effects
CNS: *Headache, dizziness*, involuntary movement, confusion, tremor, drowsiness, euphoria, **seizures**, shivering
CV: *Hypotension, bradycardia*, **heart block, CV collapse, arrest**
EENT: Tinnitus, blurred vision
GI: Nausea, vomiting, anorexia
Hematology: **Methemoglobinemia**
Skin: Rash, urticaria, edema, swelling, petechiae, pruritus
Misc: Febrile response, phlebitis at injection site
Resp: Dyspnea, **respiratory depression**

Pharmacokinetics
Half-life 8 min, 1-2 hr (terminal); metabolized in liver; excreted in urine; crosses placenta
IV: Onset 2 minutes, duration 20 min
Pregnancy Category – B

Interactions
Increase: cardiac depression, toxicity—amiodarone, phenytoin, procainamide, propranolol
Increase: hypotensive effects—MAOIs, antihypertensives
Increase: neuromuscular blockade—neuromuscular blockers, tubocurarine
Increase: lidocaine effects—cimetidine, beta blockers, protease inhibitors, ritonavir
Decrease: lidocaine effects—barbiturates, ciprofloxacin, voriconazole
Decrease: effect of—cyclosporine
Decrease: effect—coltsfoot

EMT Considerations
Assess: ECG continuously to determine increased PR or QRS segments; if these develop, discontinue or reduce rate; watch for increased ventricular ectopic beats, may have to re-bolus; Blood pressure; Malignant hyperthermia (tachypnea, tachycardia, changes in BP, increased temp); Respiratory status (rate, rhythm, lung fields for crackles, watch for respiratory depression); CNS effects (dizziness, confusion, psychosis, paresthesias, convulsions-- product should be discontinued)
Evaluate: Therapeutic response: decreased dysrhythmias

Treatment of Overdose
Discontinue product, O_2, artificial ventilation, ECG; administer Dopamine for circulatory depression, diazepam for seizures

Legend	
	EMT
A	A-EMT
P	Paramedic
M	Medical Control

Lorazepam

Mechanism of Action
Potentiates the actions of GABA, especially in the limbic system and the reticular formation

Uses
Anxiety, irritability with psychiatric or organic disorders, preoperatively; insomnia; adjunct for endoscopic procedures, status epilepticus
Unlabeled uses: Antiemetic prior to chemotherapy, rectal use, alcohol withdrawal, seizure prophylaxis, agitation, insomnia, sedation maintenance

Contraindications
Pregnancy (D), breastfeeding, hypersensitivity to benzodiazepines, benzyl alcohol; closed-angle glaucoma, psychosis, history of drug abuse, COPD, sleep apnea
Precautions: Children <12 yr, geriatric patients, debilitated, renal/hepatic disease, addiction, suicidal ideation, abrupt discontinuation

Protocol Uses
Tachycardia With a Pulse – Adult **(p46-47),** Bradycardia With a Pulse – Adult **(p48),** Behavioral / Excited Delirium – Adult **(p52),** OB General – Adult **(p56),** Antipsychotic Overdose / Acute Dystonic Reaction – Adult **(p65),** Cocaine and Sympathomimetic Overdose – Adult **(p67),** Tricyclic Overdose – Adult **(p68),** Seizure – Adult **(p72),** Bradycardia With a Pulse – Peds **(p113),** Seizure – Peds **(p122)**

Side Effects
CNS: *Dizziness, drowsiness*, confusion, headache, anxiety, tremors, stimulation, fatigue, depression, insomnia, hallucinations, weakness, unsteadiness
CV: *Orthostatic hypotension*, **ECG changes, tachycardia**, hypotension; **apnea, cardiac arrest (IV, rapid)**
EENT: *Blurred vision*, tinnitus, mydriasis
GI: Constipation, dry mouth, nausea, vomiting, anorexia, diarrhea
Skin: Rash, dermatitis, itching
Misc: Acidosis

Pharmacokinetics
Metabolized by liver; excreted by kidneys; crosses placenta, excreted in breast milk; half-life 14 hr
IM: Onset 15-30 min, peak 1-1.5 hours; duration 6-8 hours
IV: Onset 5-15 min, peak unknown, duration 6-8 hours
Pregnancy Category – D

Interactions
Increase: Lorazepam effects—CNS depressants, alcohol, disulfiram, oral contraceptives
Decrease: Lorazepam effects—valproic acid

EMT Considerations
Assess: Anxiety (decrease in anxiety; mental status); Physical dependency (withdrawal symptoms: headache, nausea, vomiting, muscle pain, weakness, tremors, seizures)
Perform/provide: Assistance with ambulation during beginning therapy, since drowsiness, dizziness occurs; Refrigerate parenteral form
Evaluate: Therapeutic response: decreased anxiety, restlessness

Treatment of Overdose
GI lavage, VS, supportive care, flumazenil

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P	Paramedic
M	Medical Control

Magnesium

Mechanism of Action
When taken orally, promotes bowel evacuation by causing osmotic retention of fluid which distends the colon with increased peristaltic activity. Parenteral infusion decreases acetylcholine in motor nerve terminals and acts on myocardium by slowing rate of SA node impulse formation and prolonging conduction time. Magnesium is necessary for the movement of calcium, sodium and potassium into and out of the cells as well as stabilizing excitable membranes.

Uses
Anticonvulsant for preeclampsia/eclampsia
Unlabeled uses: persistent pulmonary hypertension of the newborn (PPHN), cardiac arrest, CPR, digitoxin/digoxin toxicity, premature labor, seizure prophylaxis, status asthmaticus, torsades de pointes, ventricular fibrillation/tachycardia

Contraindications
Hypersensitivity, abdominal pain, nausea/vomiting, obstruction, acute surgical abdomen, rectal bleeding, heart block, myocardial damage
Precautions: Pregnancy (A), renal/cardiac disease

Protocol Uses
Asthma / COPD – Adult **(p38),** Cardiac Arrest – Adult **(p40-41),** Tachycardia With A Pulse – Adult **(p46-47),** OB General – Adult **(p56),** Beta Blocker Overdose – Adult **(p61),** Seizure – Adult **(p72),** Wheezing / Asthma – Peds **(p107),** Seizure – Peds **(p122)**

Side Effects
CNS: Muscle weakness, flushing, sweating, confusion, sedation, depressed reflexes, **flaccid paralysis**, hypothermia
CV: Hypotension, heart block, **circulatory collapse**, vasodilation
GI: *Nausea, vomiting, anorexia, cramps*, diarrhea
Hematology: Prolonged bleeding time
Metabolic: Electrolyte, fluid imbalances
Resp: Respiratory depression/paralysis

Pharmacokinetics
Protein binding 30% to albumin, excreted in the urine as magnesium
IM – onset 1 hour, duration 3-4 hours; **IV –** onset immediate, duration 30 min
Pregnancy Category – D

Interactions
Increase: effect of neuromuscular blockers
Increase: hypotension—antihypertensives
Decrease: absorption of tetracyclines, fluoroquinolones, nitrofurantoin
Decrease: effect of digoxin

EMT Considerations
Assess: Eclampsia (seizure precautions, BP, ECG)
Evaluate: Therapeutic response (absence of seizures, stabilization of dysrhythmia, improvement in respiratory status)

Treatment of Overdose
Discontinue product; support respirations with positive pressure ventilation, supportive care

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Mark 1 Kit

Mark I NAAK ("Nerve Agent Antidote Kit") is a dual-chamber autoinjector with two anti-nerve agent drugs. The kits are only effective against the nerve agents **tabun** (GA), **sarin** (GB), **soman** (GD) and **VX**. It may also be used in cases of agricultural insecticide exposure, as organophosphates are a key component of the agent. Common examples of insecticides using organophosphates are **malathion**, **parathion**, **diazinon**, **fenthion**, **dichlorvos**, **ethion** and **trichlorfon**.

Mechanism of Action

Atropine counters the parasympathetic response from the muscarinic receptor overstimulation associated with organophosphate and nerve agent poisoning, and reverses the SLUDGEM symptoms.
Pralidoxime chloride ("2-PAM") binds to the organophosphate or nerve agent and changes the conformation of the molecule, which causes it to lose its binding to the acetylcholinesterase enzyme. The joined poison / antidote then releases from the site and regenerates the enzyme, allowing it to function again.

Uses

Organophosphate and nerve agent poisonings.

Contraindications

None in the emergency setting.
Precautions
Known hypersensitivity to the Mark I or DuoDote Kit and Pediatric patients under the age of 3 are *relatively* contraindicated.

Protocol Uses

Cholinergic / Organophosphate Overdose – Adult **(p60)**

Each kit contains: Atropine 2mg and Pralidoxime chloride 600mg
Minor initial symptoms – administer **ONE** Mark I Kit via autoinjector (IM)
Severe symptoms appearing within 10 minutes of first dose – administer **ONE additional** Mark I Kit via autoinjector (IM)
Severe symptoms present from the beginning – administer **THREE** Mark I Kits via autoinjector (IM)
Tube one (atropine) is always administered before tube two (2-PAM)

Side Effects

HEENT: Dry mouth
Skin: Flushing
CNS: Dilated pupils, Headache, Drowsiness
CV: Tachycardia

Interactions

Morphine, theophylline, aminophylline and **succinylcholine** should be avoided in patients with organophosphate poisoning. Barbiturates are potentiated by the anticholinesterase enzyme and should be used cautiously when treating seizures in the poisoned patient.

EMT Considerations

The use of a Mark I Kit offers no prophylactic protection and should be administered only if symptoms are present.

There is a high potential for "off-gassing" from patients exposed to both organophosphates and nerve agents. In cases of "off-gassing", vapors are given off by chemically contaminated clothing or exhaled by poisoned individuals. EMS Providers should use all appropriate PPE including SCBA and be vigilant when monitoring for symptoms in themselves and other responders. These patients are generally NOT safe for transport by Helicopter EMS (HEMS).

Pregnancy Category (Atropine) – C; Pregnancy Category (Pralidoxime) – C

Treatment of Overdose

Discontinue product; supportive care

Legend	
	EMT
A	A-EMT
P	Paramedic
M	Medical Control

Methylprednisolone

Mechanism of Action
In a tissue-specific manner, corticosteroids regulate gene expression subsequent to binding specific intracellular receptors and translocation into the nucleus. Corticosteroids exert a wide array of physiologic effects including modulation of musculoskeletal, endocrine and neurologic physiology are influenced by corticosteroids. Decreases inflammation by suppression of migration of polymorphonuclear leukocytes, reversal of increased capillary permeability, and lysosomal stabilization

Uses
Anaphylaxis, Asthma, COPD. Used primarily as an anti-inflammatory or immunosuppressant agent in the treatment of a variety of diseases.
Unlabeled uses: bronchiolitis, cadaveric organ recovery, COPD exacerbation

Contraindications
Hypersensitivity, neonates
Precautions
Pregnancy (C), breastfeeding, diabetes mellitus, glaucoma, osteoporosis, seizure disorders, ulcerative colitis, CHF, myasthenia gravis, renal disease, esophagitis, peptic ulcer, viral infection, TB, trauma.

Protocol Uses
COPD / Asthma / Stridor – Adult **(p38),** Allergic Reaction – Adult **(p50),** Wheezing / Asthma – Peds **(p107),** Allergic Reaction – Peds **(p114)**

Side Effects
CNS: Sedations, fatigue, restlessness, headache, sleeplessness, dystonia, dizziness, suicidal ideation, seizures, neuroleptic malignant syndrome, tardive dyskinesia (>3 months at high doses)
CV: hypotension, SVT
GI: Dry mouth, constipation, nausea, vomiting, diarrhea, anorexia
GU: Decrease libido, amenorrhea, galactorrhea
Hematology: Neutropenia, leukopenia, agranulocytosis
Skin: urticaria , rash

Pharmacokinetics
Metabolized by the liver, excreted in urine
Half-life 2.5-6 hours
IV: onset 1-2 minutes, duration 1-2 hours
Pregnancy Category – C

Interactions
Avoid use with MAOIs
Increase: sedation- alcohol, other CNS depressants
Increase: risk of EPS- haloperidol, phenothiazines
Decrease: action of metoclopramide, anticholinergics, opiates

EMT Considerations
Assess: respiratory status (rate, rhythm, auscultate breath sounds prior to administration)
Evaluate: therapeutic response, ability to breathe adequately

Treatment of Overdose
Discontinue product; supportive care

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M	Medical Control

Midazolam

Mechanism of Action
Binds to BZD receptors on the postsynaptic receptors on the postsynaptic GABA neuron at several sites within the CNS, including the limbic system, reticular formation. Enhancement of GABA on neuronal excitability results in hyperpolarization (less excitable state) and stabilization. BZD receptors and effects appear to be linked to $GABA_A$ receptors, BZDs do not bind $GABA_B$ receptors.

Uses
Seizure, anxiolysis, pre-sedation for intubation, anesthesia
Unlabeled uses: Status epilepticus

Contraindications
Pregnancy (D), hypersensitivity to benzodiazepines, acute closed-angle glaucoma
Precautions
Breastfeeding, children, geriatric patients, COPD, CHF, chronic renal failure, chills, debilitated, hepatic disease, shock, coma, alcohol intoxication, status asthmaticus

Protocol Uses
Airway Management – Adult **(p32),** Post Advanced Airway Sedation – Adult, Medical **(p34),** CHF / Pulmonary Edema – Adult **(p37),** Tachycardia With A Pulse – Adult **(p44-45),** Bradycardia With A Pulse – Adult **(p46),** OB General – Adult **(p54),** Antipsychotic Overdose / Acute Dystonic Reaction – Adult **(p63),** Cocaine and Sympathomimetic Overdose – Adult **(p65),** Tricyclic Overdose – Adult **(p66),** Seizure – Adult **(p70),** Bites and Envenomations – Adult, Trauma **(p77),** Environmental, Hyperthermia – Adult, Trauma **(p84),** Airway Management – Peds **(p101),** Post Resuscitation Care – Peds **(p109),** Bradycardia with a Pulse – Peds **(p111),** Seizure – Peds **(p120),** Bites and Envenomations – Peds, Trauma **(p127),** Environmental, Hyperthermia – Peds, Trauma **(p132),** Head Injury – Peds, Trauma **(p136)**

Side Effects
CNS: retrograde amnesia, euphoria, confusion, headache, anxiety, insomnia slurred speech, paresthesia, tremors, weakness, chills, agitation, paradoxical reactions
CV: hypotension, PVCs, tachycardia, bigeminy, nodal rhythm, cardiac arrest
EENT: blurred vision, nystagmus, diplopia, loss of balance
GI: nausea, vomiting, increased salivation, hiccups
Skin: urticaria, pain/swelling/pruritus at injection site, rash
Resp: coughing, apnea, bronchospasm, laryngospasms, dyspnea, respiratory depression

Pharmacokinetics
Protein binding 97%, half-life 1.8-6.4 hr, metabolized in liver; metabolites excreted in urine; crosses placenta and the blood brain barrier
IV – onset 3-5 minutes, duration <2 hours (6 hours in liver failure); **IM –** onset 15 minutes, duration 6 hours; **IN –** onset 4-8 minutes, duration 41 minutes
Pregnancy Category – D

Interactions
Increase: hypotension- antihypertensives, opiates, alcohol, nitrates
Increase: extended half-life—CYP3A4 inhibitors (cimetidine, erythromycin, ranitidine)
Increase: respiratory depression—other CNS depressants, alcohol, barbiturates, opiate analgesics, verapamil, ritonavir, indinavir
Decrease: midazolam metabolism—CYP3A4 inducers (azole antifungals, theophylline)

EMT Considerations
Assess: BP, pulse, respirations during IV; Injection site for redness, pain and swelling; Degree of amnesia in geriatric patients; may be increased; Anterograde amnesia; Vital signs during recovery period in obese patients, since half-life may be extended
Preform/Provide: Assistance with ambulation until drowsy period ends; Storage at room temp, protect from light; Immediate availability of resuscitation equipment, O2 to support airway, do NOT give by rapid bolus
Evaluate: Therapeutic response

Treatment of Overdose
Discontinue product, supportive care, flumazenil (may induce seizures if used in patients with chronic benzodiazepine use), O_2

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Naloxone

Mechanism of Action
Pure opioid antagonist that competes and displaces opioids at opioid receptor sites

Uses
Opiate overdose, respiratory depression induced by opioids, pentazocine, propoxyphene
Unlabeled uses: opiate-induced pruritis

Contraindications
Hypersensitivity
Precautions
Pregnancy (C), breastfeeding, children, neonates, CV disease, opioid dependency, seizure disorder, drug dependency

Protocol Uses
Documentation of Vital Signs **(p19),** Cardiac Arrest – Adult **(p40-41),** Opiate Overdose – Adult **(p66),** Neonatal Resuscitation – Peds **(p108),** Overdose and Poisoning, General – Peds **(p119)**

Side Effects
CNS: Drowsiness, nervousness, seizures, tremor
CV: Rapid pulse, increase systolic BP (high doses), ventricular tachycardia/fibrillation, hypo/hypertension, cardiac arrest, sinus tachycardia
GI: Nausea, vomiting, hepatotoxicity
Resp: Tachypnea, pulmonary edema

Pharmacokinetics
Metabolized by liver, crosses placenta; excreted in urine/breast milk
IV – onset 1 minute, duration 45 min. Half-life 30-81 minutes
Pregnancy Category – B

Interactions
Increase: seizures - tramadol
Decrease: effect of opioid analgesics

EMT Considerations
Assess: *Withdrawal*: cramping, hypertension, anxiety, vomiting; signs of withdrawal in drug-dependent individuals may occurs <2 hours after administration;
Vital Signs q3-5 minutes;
Cardiac Status: tachycardia, hypertension, monitor ECG ;
Respiratory Function: respiratory depression, character, rate, rhythm, if respiration <10/min, administer naloxone; probably due to opioid overdose; monitor LOC;
Pain: duration, intensity, location before and after administration
Preform/Provide: Dark storage at room temp
Evaluate: Therapeutic Response: reversal of respiratory depression; change in level of consciousness

Treatment of Overdose
Discontinue product; supportive care

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M	Medical Control

Nitroglycerin

Mechanism of Action
Produces a vasodilator effect on the peripheral veins and arteries with more prominent effects on the veins. Primarily reduces cardiac oxygen demand by decreasing preload (left ventricular end-diastolic pressure). May modestly reduce afterload. Dilates coronary arteries and improves collateral flow

Uses
Unstable angina, Hypertension, Flash Pulmonary Edema
Unlabeled use: esophageal spasms, uterine relaxation, short-term management of pulmonary hypertension

Contraindications
Known hypersensitivity, increased intracranial pressure, cerebral hemorrhage
Precautions
Used with caution in postural hypotension, pregnancy, breastfeeding, children, renal disease, hepatic injury, **inferior STEMI**

Protocol Uses
CHF / Pulmonary Edema – Adult **(p39),** Chest Pain / Suspected Acute Coronary Syndrome – Adult **(p44),** ST Elevation Myocardial Infarction – Adult **(p45)**

Side Effects
CNS: Headache, flushing, dizziness
CV: Hypotension, tachycardia, collapse, syncope, palpitations
GI: Nausea, vomiting
Skin: Pallor, sweating, rash

Pharmacokinetics
Metabolized by liver, excreted in urine
Half-life 1-4 min.
Sublingual – onset 1-3 minutes, duration 30 minutes. **IV –** onset 1-2 minutes, duration 3-5 minutes
Pregnancy Category – C

Interactions
Severe hypotension, CV collapse: alcohol
Increase: effects of beta-blockers, diuretics, antihypertensives, calcium channel blockers
Increase: erectile dysfunction meds (fatal hypotension - sildenafil, tadalafil, vardenafil; do not use together)
Increase: nitrate level - aspirin
Decrease: heparin - IV nitroglycerin

EMT Considerations
Assess: Orthostatic BP, pulse; Pain: duration time started, activity being preformed, character; Tolerance: if taking over long period of time; Headache, lightheadedness, decreased BP
Perform/Provide: Storage protected from light, moisture; store in cool environment
Evaluate: Therapeutic response: decrease in anginal pain

Treatment of Overdose
Discontinue product, IV fluids, supportive care

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Nitrous Oxide

Nitrous Oxide

Mechanism of Action
The mechanism of action of nitrous oxide is not completely understood. It is trifold and includes analgesia, anxiolysis and anesthesia.
Its analgesic mechanism of action is described as opioid in nature and may involve a number of spinal neuromodulators.
The anxiolytic effect is similar to that of benzodiazepines and may involve gamma aminobutyric (GABA) receptors
The anesthetic mechanism may involve GABA and possibly N-methyl-D-aspartate receptors as well.

Uses
Nitrous is commonly used in dental surgery and as part of a procedural sedation during short, painful procedures in the Emergency Department. It acts as an analgesic and mild sedative when dispensed at the standard 2:1 ratio of N2O to O2. It is often used with other anesthetics.

Unlabeled use:
Nitrous is sometimes used in auto racing. It is safe and stable at room temperature, but at ~600^{o}C it decomposes into a gas with 33% oxygen per unit volume. Atmospheric air has only ~21% oxygen and thus can burn less fuel in a given volume.
Nitrous is commonly used as a short-term euphoric high which features audio and visual strobing effects. This use is generally illegal.

Contraindications
Respiratory compromise, or inability to reliably follow commands.
Nitrous rapidly diffuses into air-filled cavities, and patients in whom expansion of these air-filled cavities could compromise patient safety. This includes patients with pneumothorax, pulmonary blebs, air embolism, bowel obstruction, and those undergoing surgery of the eye or middle ear.
Nitrous is known to be teratogenic and is contraindicated in pregnancy.
Precautions
Patients on chronic opiates may be highly tolerant to the analgesic effects of nitrous. When animals are given morphine chronically, they develop tolerance to its pain-killing effects, and this also renders the animals tolerant to the analgesic effects of N2O.

Because nitrous oxide is minimally metabolized in humans (with a rate of 0.004%), it retains its potency when exhaled into the room by the patient, and can pose an intoxicating and prolonged exposure hazard to the staff if the room is poorly ventilated. Where nitrous oxide is administered, a continuous-flow fresh-air ventilation system or N2O scavenger system must be used to prevent a waste-gas buildup.

Protocol Uses
Pain Management – Adult **(p69),** Nitrous Oxide – Procedure **(p199)**

Inhalational gas that MUST be self-administered by the patient.

Side Effects
CNS: Headache (especially if pt. not given inhaled O2 for 5 min after administration), Blurred Vision, Lethargy
CV: Orthostatic Hypotension, Dizziness, Faintness, or Lightheadedness
GI: Nausea, Vomiting
Heme: Methemoglobinemia
Misc: Exposure to nitrous oxide may cause vitamin B_{12} deficiency. It inactivates the cobalamin form of vitamin B_{12} by oxidation. Symptoms of vitamin B_{12} deficiency, including sensory neuropathy, myelopathy, and encephalopathy, may occur within days or weeks of exposure to nitrous oxide anesthesia in people with subclinical vitamin B_{12} deficiency.

Pharmacokinetics
Onset of action: Inhalation: 2-5 minutes
Absorption: Rapid via lungs; blood/gas partition coefficient is 0.47
Metabolism: Body: <0.004%
Excretion: Primarily exhaled gases; skin (minimal amounts)
Half-life: Approximately 5 minutes; depends on patient ventilatory volume, rate and quality. In general, the clinical effects of nitrous cease when inhalation stops, with minimal residual effect.
Pregnancy Category – C

Interactions
Increase:effects of CNS depressants (EtOH, benzodiazepines, opiates, cannabis)

EMT Considerations
Assess: Vital signs for systemic hypotension
Perform/Provide: Store at room temperature, should be stored in a cool, fire resistant area away from heat sources and combustibles
Evaluate: Therapeutic response

Treatment of Overdose
Discontinue product; IV Fluids; 100% inhaled O2 (preferably via NRB); antiemetics; supportive care

Legend	
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P	Paramedic
M	Medical Control

Norepinephrine

Mechanism of Action
β_1 and α agonist causing increased contractility, increased heart rate, and vasoconstriction. Thus, increasing systemic blood pressure and coronary blood flow. Has greater alpha (vasoconstriction) than beta effects (contractility and heart rate).

Uses
Hypotension, shock

Contraindications
Extravasation, hypersensitivity to sympathomimetics or sulfites

Protocol Uses
Hypotension / Shock (Non-Trauma) – Adult **(p75),** Hypotension / Shock (Trauma) – Adult **(p97),** Hypotension / Shock (Non-Trauma) – Peds **(p123)**

Side Effects
CNS: anxiety, headache, tremor
CV: hypertension, arrhythmia
GI : Nausea, vomiting, gut ischemia
Misc: Skin necrosis with extravasation

Pharmacokinetics
Onset of action: 1-2 minutes
Excretion: Kidney
Pregnancy Category – C

Interactions
Concurrent use with the following may increase blood pressure further: linezolid, dihydroergotamine, TCAs

EMT Considerations
Assess: Vital Signs: BP and pulse
Evaluate: Change in blood pressure

Treatment of Overdose
Discontinue product, administer α-blocker and/or β-blocker

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P	Paramedic
M	Medical Control

Ondansetron

Ondansetron

Mechanism of Action
Selective 5-HT3-receptor antagonist, blocking serotonin both peripherally on vagal nerve terminals and centrally in the chemoreceptor trigger zone

Uses
Chemotherapy associated nausea and vomiting, radiotherapy associated nausea and vomiting, postoperative nausea and/or vomiting
Unlabeled use: Hyperemesis gravidarum (severe or refractory), breakthrough nausea and/or vomiting associated with chemotherapy

Contraindications
Hypersensitivity, congenital OR acquired prolonged QT, history of Torsades de Pointes
Precautions
Pregnancy (B), breastfeeding, children, geriatric patients

Protocol Uses
Post Advanced Airway Sedation – Adult, Medical **(p36),** Chest Pain / Suspected Acute Coronary Syndrome – Adult **(p44),** ST Elevation Myocardial Infarction – Adult **(p45),** Abdominal Pain / GI Bleeding – Adult **(p49),** Pain Management – Adult **(p69),** Environmental, Hyperthermia – Adult, Trauma **(p86),** Eye Pain – Adult, Trauma **(p89),** Post Resuscitation Care – Peds **(p111),** Pain Management – Peds **(p120),** Sickle Cell Crisis – Peds **(p124),** Environmental, Hyperthermia – Peds, Trauma **(p134),** Eye Pain – Peds, Trauma **(p137),** Pain Management – Peds **(p120)**

Side Effects
CNS: Headache, dizziness, drowsiness, fatigue, EPS
GI: Diarrhea, constipation, abdominal pain, dry mouth
Misc: Rash, bronchospasm (rare), musculoskeletal pain, wound problems, shivering, fever, hypoxia, urinary retention

Pharmacokinetics
Metabolized in the liver, excreted primarily in urine
Half-life 3.5-4.7 hr
Pregnancy Category – B

Interactions
Decrease: ondansetron effect- rifampin, carbamazepine, phenytoin

EMT Considerations
Assess: Hypersensitivity reaction: rash, bronchospasm (rare); EPS: shuffling gait, tremors, grimacing, period rigidity
Perform/Provide: Storage at room temp
Evaluate: Therapeutic response: absence of nausea/vomiting

Treatment of Overdose
Evaluate QT for prolongation; monitor for dysrhythmias; discontinue product; supportive care

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P	Paramedic
M	Medical Control

Rocuronium

Mechanism of Action
Blocks acetylcholine from binding to receptors on motor endplate inhibiting depolarization. Inhibits transmission of nerve impulses by binding with cholinergic receptor sites, antagonizing action of acetylcholine

Uses
Facilitation of endotracheal intubation; skeletal muscle relaxation during mechanical ventilation
Unlabeled use: preinduction to blunt defasciculation

Contraindications
Hypersensitivity
Precautions
Pregnancy (C), breastfeeding, children, geriatric patients, electrolyte imbalances, dehydration, respiratory/neuromuscular/cardiac/ renal/hepatic disease

Protocol Uses
Rapid Sequence Airway – Adult **(p35),** Rapid Sequence Airway (RSA) – Procedure **(p146)**

Side Effects
CV: Bradycardia, tachycardia, change in BP, edema
GI: Nausea, vomiting
Skin: Rash, flushing, pruritus, urticarial
MSK: Myopathy
Resp: Prolonged apnea, bronchospasm, cyanosis, respiratory depression, dyspnea, pulmonary vascular resistance

Pharmacokinetics
Metabolized in liver
Half-Life 30 min, duration 60-70 min
Pregnancy Category – B

Interactions
Theophylline increases risk of dysrhythmias
Increase: neuromuscular blockade caused by amphotericin B, verapamil, aminoglycosides, clindamycin, enflurane, isoflurane, lincomcin, lithium, opiates, local anesthetics, polymyxin, anti-infectives, quinidine, thiazides

EMT Considerations
Assess: Vital Signs: BP, pulse, respirations, airway until fully recovered; Allergic reactions: rash, fever, respiratory distress, pruritus
Preform/Provide: Storage in light-resistant area, stable at room temp for 30 days
Evaluate: Therapeutic response

Treatment of Overdose
Discontinue product, Edrophonium or Neostigmine, Atropine, Monitor VS

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P	Paramedic
M	Medical Control

Sodium Bicarbonate

Sodium Bicarbonate

Mechanism of Action
Increase plasma bicarbonate which buffers hydrogen ion concentrations and reverses acidosis

Uses
Acidosis (metabolic), cardiac arrest, salicylate poisoning, tricyclic antidepressant overdose

Contraindications
Metabolic/respiratory alkalosis, hypochloremia, hypocalcemia

Precautions

Pregnancy (C), children, CHF, toxemia, renal disease, hypertension, hypokalemia, breastfeeding, hypernatremia, Cushing's syndrome, hyperaldosteronism

Protocol Uses
Cardiac Arrest – Adult **(p40-41),** Beta Blocker Overdose – Adult **(p61),** Tricyclic Overdose – Adult **(p68),** Prolonged Crush Injury – Adult, Trauma **(p84),** Cardiac Arrest, General – Peds **(p109-110),** Prolonged Crush Injury – Peds, Trauma **(p132)**

Side Effects
CNS: Irritability, confusion, headache, stimulation, tremors, hyperreflexia, weakness, seizures of alkalosis
CV: Irregular pulse, cardiac arrest, water retention, edema, weight gain
GI: Flatulence, belching, distension
MSK: Muscular twitching, tetany, irritability

Pharmacokinetics
Excreted in urine
Onset 15 minutes. Duration 1-2 hours
Pregnancy Category – C

Interactions
Increase: effects- amphetamines, mecamylamine, quinine, quinidine, pseudophedrine, flecainide, anorexiants, sympathomimetics
Increase: sodium and decrease potassium- corticosteroids
Decrease: effects- lithium, chlorpropamide, barbiturates, salicylates, benzodiazepines, ketoconazole, corticosteroids

EMT Considerations
Assess: Respiratory and pulse rate/rhythm; Fluid balance: edema, crackles, shortness of breath; Alkalosis: irritability, confusion, twitching, hyperreflexia, slow respirations, cyanosis, irregular pulse; Milk-Alkali Syndrome: confusion, headache, nausea, vomiting, anorexia, urinary stones, hypercalcemia

Treatment of Overdose
Discontinue product; ventilatory support to exhale excess CO2; supportive care

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P	Paramedic
M	Medical Control

Succinylcholine

Mechanism of Action
Acts similar to acetylcholine, producing depolarization of the motor endplate at the myoneural junction which causes sustained flaccid skeletal muscle paralysis.

Uses
Facilitation of endotracheal intubation

Contraindications
Hypersensitivity, malignant hyperthermia, trauma (crush injuries)

Precautions

Pregnancy (C), breastfeeding, geriatric or debilitated patients, cardiac disease, severe burns, fractures (fasciculations may increase damage), electrolyte imbalances (**hyperkalemia**), dehydration, **neuromuscular disease**, respiratory/cardiac/renal/hepatic disease, collagen disease, glaucoma, eye surgery

Protocol Uses
Rapid Sequence Airway – Adult **(p35),** Rapid Sequence Airway (RSA) – Procedure **(p146)**

Side Effects
CV: Bradycardia, tachycardia, hypo/hypertension, sinus arrest, dysrhythmias, edema
EENT: Increased secretions, Increased intraocular pressure
Heme: Myoglobinemia
Skin: Rash, flushing, pruritus, urticaria
MSK: Weakness, muscle pain, fasciculations, prolonged relaxation, myalgia, rhabdomyolysis
Resp: Prolonged apnea, bronchospasm, cyanosis, respiratory depression, wheezing, dyspnea
Systemic: **anaphylaxis, angioedema, malignant hyperthermia**

Pharmacokinetics
Hydrolyzed in blood, excreted in urine
IV - onset 1 min, peak 2-3 min, duration 6-10 min
Pregnancy Category – C

Interactions
Dysrhythmias: theophylline
Increase: neuromuscular blockade- aminoglycosides, beta-blockers, cardiac glycosides, clindamycin, lincomycin, procainamide, quinidine, local anesthetics, polymyxin antibiotics, lithium, opiates, thiazides, enflurane, isoflurane, magnesium salts, oxytocin

EMT Considerations
Assess: Electrolyte imbalances (potassium, magnesium); may lead to increase action of product; Vital Signs: BP, pulse, respirations, airway; Recovery: decreased paralysis; Allergic Reactions: rash, fever, respiratory distress, pruritus
Perform/Provide: Storage in refrigerator powder at room temp
Evaluate: Therapeutic response: paralysis of jaw, eyelid, head, neck rest of body

Treatment of Overdose
Discontinue product, supportive care, Neostigmine, Atropine

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Legend	
	EMT
A	A-EMT
P	Paramedic
M	Medical Control

Tranexamic Acid (TXA)

Tranexamic Acid (TXA)

Mechanism of Action
Displaces plasminogen from fibrin, inhibiting fibrinolysis (clot breakdown). Has inhibitory effects on plasmin, preventing further fibrinolysis.

Uses
Trauma associated hemorrhage, menorrhagia, tooth extraction in hemophiliac patients

Contraindications
IV: Hypersensitivity to tranexamic acid, active intravascular clotting, subarachnoid hemorrhage
PO: hypersensitivity to tranexamic acid, active thromboembolic disease, concurrent use with hormonal contraception

Protocol Uses
OB / Vaginal Bleeding – Adult **(p7),** Head Injury – Adult **(p91),** Hemorrhage Control – Adult **(p92),** Hypotension / Shock (Trauma) – Adult **(p97),** Head Injury – Peds **(p138),** Hemorrhage Control – Peds **(p139)**

IV indicated for trauma associated hemorrhage
PO indicated for menorrhagia, tooth extraction in hemophiliac patients

Side Effects
CNS: Headache (PO), Dizziness (IV)
CV: **Hypotension** (IV)
GI: Abdominal pain (PO), Diarrhea, nausea, vomiting (IV)
Heme: thromboembolic complications (i.e. DVT), anemia (PO)
Misc: Backache (PO), blurred vision (IV and PO)

Pharmacokinetics
Onset of Action: IV: 5 minutes, PO: 2.5 hours
Excretion: Renal
Half-life: IV: 2 hours, PO: 11 hours
Pregnancy Category – B

Interactions
May enhance tranexamic acid: Estrogen derivatives, progestins

EMT Considerations
Assess: Hypersensitivity
Evaluate: Serial Blood Pressure, Mental Status, HR

Treatment of Overdose
Discontinue product, supportive care

TXA Administration Chart (To Achieve 1gm Infusion over 10min)

Diluent Volume	Drip Chamber	Rate (gtt/min)
50mL		
	Micro Drip (60 gtt/mL)	300 gtt/min
	Macro Drip (10 gtt/mL)	50 gtt/min
	Macro Drip (15 gtt/mL)	75 gtt/min
	Macro Drip (20 gtt/mL)	100 gtt/min
100mL		
	Micro Drip (60 gtt/mL)	600 gtt/min
	Macro Drip (10 gtt/mL)	100 gtt/min
	Macro Drip (15 gtt/mL)	150 gtt/min
	Macro Drip (20 gtt/mL)	200 gtt/min
150mL		
	Micro Drip (60 gtt/mL)	900 gtt/min
	Macro Drip (10 gtt/mL)	150 gtt/min
	Macro Drip (15 gtt/mL)	225 gtt/min
	Macro Drip (20 gtt/mL)	300 gtt/min
250mL		
	Micro Drip (60 gtt/mL)	1500 gtt/min
	Macro Drip (10 gtt/mL)	250 gtt/min
	Macro Drip (15 gtt/mL)	375 gtt/min
	Macro Drip (20 gtt/mL)	500 gtt/min

****Too Rapid Of Administration May Cause Hypotension****

TXA Has Only Been Evaluated With Normal Saline, LR and D5 As Diluents
At the time of this publication, compatibility with other diluents has not been tested and is unknown. Similarly, no medications have been evaluated for compatibility in a line that is infusing TXA.
NO Medications May Be Given Through An IV Access Infusing TXA