

Overview

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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.

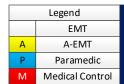
Medications are listed alphabetically based on generic names.

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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



Acetaminophen

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

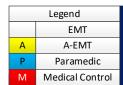
Assess: Assess mental status and appropriateness for oral medications

Evaluate: Therapeutic response

Treatment of Overdose

Discontinue product, activated charcoal, N-acetylcysteine, supportive care

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Adenosine

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

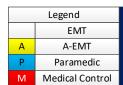
Assess cardiopulmonary status – BP, pulse, respiration, rhythm, ECG intervals (PR, QRS, QT); check for transient dysrhythmias (PVCs, PACs, sinus tachycardia, AV block)

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



Albuterol

Albuterol

Mechanism of Action

Beta₂-adrenergic agonist. Activates beta₂ 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

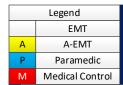
EMT Considerations

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



Amiodarone

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

O₂, artificial ventilation, ECG, administer dopamine for circulatory depression, administer diazepam for seizures



Aspirin

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

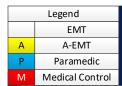
EMT Considerations

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



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

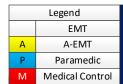
Decrease: effect of atropine - antacids

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

O₂, artificial ventilation, ECG; administer dopamine for circulatory depression; administer diazepam for seizures; assess need for antidysrhythmics



Calcium

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

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

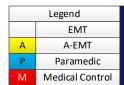
Assess: Electrolytes (Potassium), blood glucose; Injection site for extravasation (redness along vein, edema at site, necrosis, pain/

tenderness), site should be changed immediately

Evaluate: Therapeutic response

Treatment of Overdose

Insulin; discontinue product; supportive care



Diazepam

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

Legend		
	EMT	
Α	A-EMT	
Р	Paramedic	
М	Medical Control	

Diltiazem

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

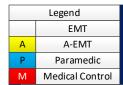
Increase: effects of diltiazem - cimetidine

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



Diphenhydramine

Diphenhydramine

Mechanism of Action

Acts on blood vessels, GI, respiratory system by competing with histamine for H₁-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

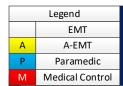
EMT Considerations

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



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

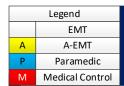
The use of a DuoDote Kit offers no prophylactic protection and should be administered only if symptoms are present.

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



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

Legend		
	EMT	
Α	A-EMT	
Р	Paramedic	
М	Medical Control	

Etomidate

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

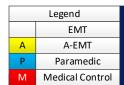
EMT Considerations

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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Famotidine

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, delayirdine

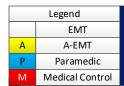
EMT Considerations

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



Fentanyl

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

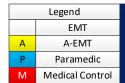
Decrease: fentanyl effect - CYP3A4 inducers (carbamazepine, phenytoin, phenobarbital, rifampin)

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



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

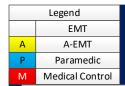
Increase: Bleeding risk – anticoagulants

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



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

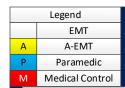
EMT Considerations

Assess: Mental status and appropriateness for oral medications, electrolytes (Potassium), blood glucose

Evaluate: Therapeutic response

Treatment of Overdose

Insulin, IVF, discontinue product, supportive care



Haloperidol

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 nointes

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

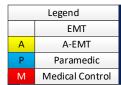
Increase: toxicity – epinephrine, lithium Decrease: effects – lithium, levodopa

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



Hydroxocobalamin

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

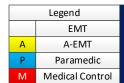
Perform/provide: Protection from light, heat

Evaluate: Therapeutic response:, dyspnea on exertion, palpitations, paresthesias, psychosis, visual disturbances

Treatment of Overdose

Discontinue product, IVF, supportive care

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Ibuprofen

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

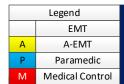
EMT Considerations

Assess: Assess mental status and appropriateness for oral medications

Evaluate: Therapeutic response

Treatment of Overdose

Discontinue product, supportive care



Ipratropium

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

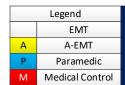
Assess: Palpitations; respiratory status (rate, rhythm, auscultate breath sounds prior to and after administration

Perform/provide: Storage at room temp

Evaluate: Therapeutic response: ability to breathe adequately

Treatment of Overdose

Discontinue product; supportive care



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

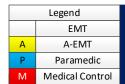
Assess heart rate, blood pressure, respiratory rate, SpO2

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



Ketorolac

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

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

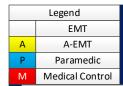
EMT Considerations

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, O₂, artificial ventilation, ECG; administer Dopamine for circulatory depression, diazepam for seizures



Lorazepam

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

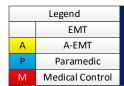
EMT Considerations

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



Magnesium

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

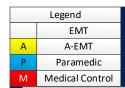
EMT Considerations

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



Mark 1 Kit

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

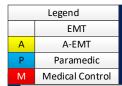
The use of a Mark I Kit offers no prophylactic protection and should be administered only if symptoms are present.

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



Methylprednisolone

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

HSES

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

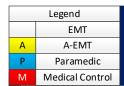
EMT Considerations

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



Midazolam

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.

Hses

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

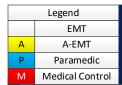
Assess: BP, pulse, respirations during IV; Injection site for redness, pain and swelling; Degree of amnesia in geriatric patients; may be increased; Anterograde amnesia; Vital signs during recovery period in obese patients, since half-life may be extended

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), O2



Naloxone

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;

 $\textit{Respiratory Function}: respiratory \ depression, \ character, \ rate, \ rhythm, \ if \ respiration < 10/min, \ administer \ naloxone; \ probably \ due \ to \ administer \ due \ du$

opioid overdose; monitor LOC;

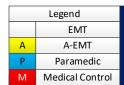
Pain: duration, intensity, location before and after administration

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



Nitroglycerin

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

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.

HSAS

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 $^{\circ}600^{\circ}$ C it decomposes into a gas with 33% oxygen per unit volume. Atmospheric air has only $^{\circ}21\%$ 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 freshair 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

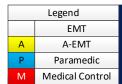
Assess: Vital signs for systemic hypotension

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



Norepinephrine

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

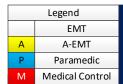
Concurrent use with the following may increase blood pressure further: linezolid, dihydroergotamine, TCAs

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



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

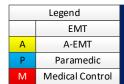
Assess: Hypersensitivity reaction: rash, bronchospasm (rare); EPS: shuffling gait, tremors, grimacing, period rigidity

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



Rocuronium

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

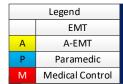
Preform/Provide: Storage in light-resistant area, stable at room temp for 30 days

Evaluate: Therapeutic response

Treatment of Overdose

Discontinue product, Edrophonium or Neostigmine, Atropine, Monitor VS

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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



Succinylcholine

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,

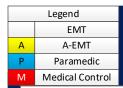
airway; Recovery: decreased paralysis; Allergic Reactions: rash, fever, respiratory distress, pruritus

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



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 Admini	stration May Cause Hypote	ension		

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

Pharmaceuticals