



EMS Solutions

Presents

EMS Drug Formulary

A Guide to Popular EMS Field Medications

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0.9% Normal Saline

Class:

Isotonic Crystalloid Solution

Description:

Normal Saline contains 154mEq/L of sodium ions and approximately 154mEq/L of chloride ions. Because the concentration of sodium is near that of the blood, the solution is considered isotonic.

Mechanism of Action:

Normal Saline replaced water and electrolytes.

Indications:

Heat related problems (heat exhaustion, heat stroke).

Contraindications:

The use of 0.9%NaCl should not be considered in patients with congestive heart failure because circulatory overload can easily be induced.

Precautions:

When large amounts of Normal Saline are administered, it is quite possible for other physiological electrolytes to become depleted.

Side Effects:

Rare in therapeutic doses.

Interactions:

Few in the emergency setting.

Activated Charcoal with Sorbitol

Class:

Adsorbent

Description:

Activated charcoal is used to adsorb ingested toxins that cannot be removed through emesis, or after emesis has been induced, to adsorb remaining toxins.

Mechanism of Action:

Adsorbs toxins by chemical binding and prevents gastrointestinal adsorption.

Indications:

Poisoning following emesis, or when emesis is contraindicated.

Contraindications:

None in severe poisoning.

Precautions:

Use with caution in patients with altered mental status. May adsorb ipecac before emesis; if ipecac is administered, wait at least 10 minutes to administer Activated Charcoal.

Side Effects:

Nausea and vomiting, constipation.

Interactions:

None reported in the emergency setting.

Adenosine

Class:

Antiarrhythmic

Description:

Adenosine is a naturally occurring nucleoside that slows AV conduction through the AV node. It has an exceptionally short half-life and a relatively good safety profile.

Mechanism of Action:

Adenosine decreases conduction of the electrical impulse through the AV node and interrupts AV re-entry pathways in PSVT. The half-life of Adenosine is about 5 seconds. Because of its rapid onset of action and very short half-life, the administration of Adenosine is sometimes referred to as chemical cardioversion.

Indications:

Adenosine is used in PSVT refractory to common vagal maneuvers.

Contraindications:

Adenosine is contraindicated in patients with second or third degree heart block, sick sinus syndrome, or those with known hypersensitivity to the drug.

Precautions:

Adenosine typically causes arrhythmias at the time of cardioversion; in extreme cases transient asystole may occur. Adenosine should be used cautiously in patients with asthma.

Side Effects:

Facial flushing, headache, shortness of breath, dizziness and nausea.

Interactions:

Methylxanthines (Aminophylline and Theophylline) may decrease the effectiveness of Adenosine, requiring larger doses. Dipyridamole (Persantine) can potentiate the effects of Adenosine.

Albuterol

Class:

Sympathetic Agonist

Description:

Albuterol is a sympathomimetic that is selective for Beta-2 adrenergic receptors.

Mechanism of Action:

Albuterol is a selective Beta-2 agonist with a minimal number of side effects. It causes prompt bronchodilation and has duration of action of approximately 5 hours.

Indications:

Bronchial asthma, reversible bronchospasm associated with COPD and emphysema.

Contraindications:

Known hypersensitivity to the drug.

Precautions:

Use caution when administering this drug to elderly patients and those with cardiovascular disease or hypertension. If possible, peak flow rate should be measured before and after administration.

Side Effects:

Palpitations, anxiety, dizziness, headache, nervousness, tremor, hypertension, arrhythmias, chest pain, nausea, vomiting.

Interactions:

The possibility of developing unpleasant side effects increases when administered with other sympathetic agonists. Beta blockers may blunt the effects of Albuterol.

0.9% Normal Saline

Class:

Isotonic Crystalloid Solution

Description:

Normal Saline contains 154mEq/L of sodium ions and approximately 154mEq/L of chloride ions. Because the concentration of sodium is near that of the blood, the solution is considered isotonic.

Mechanism of Action:

Normal Saline replaced water and electrolytes.

Indications:

Heat related problems (heat exhaustion, heat stroke).

Contraindications:

The use of 0.9%NaCl should not be considered in patients with congestive heart failure because circulatory overload can easily be induced.

Precautions:

When large amounts of Normal Saline are administered, it is quite possible for other physiological electrolytes to become depleted.

Side Effects:

Rare in therapeutic doses.

Interactions:

Few in the emergency setting.

Aspirin

Class:

Platelet Aggregator Inhibitor

Description:

Aspirin is an anti-inflammatory agent and an inhibitor of platelet function.

Mechanism of Action:

Aspirin blocks the formation of the substance thromboxane A₂, which causes platelets to aggregate and arteries to constrict.

Indications:

Aspirin is used for new chest pain suggestive of acute myocardial infarction.

Contraindications:

Known hypersensitivity. Aspirin is relatively contraindicated in patients with active ulcer disease and asthma.

Precautions:

Aspirin can cause GI upset and bleeding. Aspirin should be used with caution in patients who report allergies to NSAIDS.

Side Effects:

Heartburn, GI bleeding, nausea, vomiting, wheezing, and prolonged bleeding.

Interactions:

When administered together, aspirin and other anti-inflammatory agents may cause an increased incidence of side effects. Administration of aspirin with antacids may reduce blood levels by reducing absorption.

Atropine Sulfate

Class:

Anticholinergic

Description:

Atropine is a parasympatholytic that is derived from parts of the *Atropa Belladonna* plant.

Mechanism of Action:

Atropine is a potent parasympatholytic and is used to increase the heart rate in hemodynamically significant bradycardias. Atropine acts by blocking acetylcholine receptors, thus inhibiting parasympathetic stimulation. Atropine has positive chronotropic properties, and little or no inotropic effect. It plays an important role as an antidote in organophosphate poisonings. Atropine is also used in the treatment of respiratory emergencies due to its bronchodilation and drying of respiratory tract secretions.

Indications:

Hemodynamically significant bradycardia, and asystole.

Bronchial asthma, reversible bronchospasm associated with chronic bronchitis and emphysema.

Organophosphate overdose.

Contraindications:

Known hypersensitivity.

Precautions:

Atropine may worsen the bradycardia associated with second-degree type II and third-degree AV blocks. In these instances, pacing should be attempted prior to administration of Atropine. For respiratory use: Use caution when administering this drug to elderly patients and those with cardiovascular disease or hypertension. If possible, peak flow rate should be measured before and after administration.

Side Effects:

Blurred vision, dilated pupils, dry mouth, tachycardia, drowsiness, confusion, palpitations, anxiety, dizziness, headache, nervousness, rash, nausea, and vomiting.

Interactions:

There are few interactions in the pre-hospital setting.

Calcium Chloride 10%

Class:

Calcium supplement

Description:

Calcium Chloride provides elemental calcium in the form of the cation. Calcium is required for many physiological activities.

Mechanism of Action:

Calcium Chloride replaces calcium in cases of hypocalcemia. It causes a significant increase in myocardial contractile force, and increases ventricular automaticity. Calcium Chloride is an antidote for Magnesium Sulfate, and can minimize the some of the side effects of calcium channel blocker usage.

Indications:

Acute hyperkalemia, acute hypocalcemia, calcium channel blocker toxicity.

Contraindications:

Calcium may precipitate Digitalis toxicity in patients taking Digoxin.

Precautions:

Flush IV line between administrations of Calcium Chloride and Sodium Bicarbonate to avoid precipitation.

Side Effects:

Bradycardia, arrhythmias, syncope, nausea, vomiting, cardiac arrest.

Interactions:

Flush IV line between administrations of Calcium Chloride and Sodium Bicarbonate to avoid precipitation. Calcium Chloride can cause elevated Digoxin levels, and Digitalis toxicity in those patients receiving Digitalis preparations.

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Contraindications:

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Side Effects:

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Interactions:

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Amiodarone

Class:

Antiarrhythmic Agent

Description:

Amiodarone is a class III Antiarrhythmic agent used to treat ventricular arrhythmias unresponsive to other antiarrhythmics.

Mechanism of Action:

Amiodarone prolongs the action potential duration in all cardiac tissues.

Indications:

Ventricular fibrillation, ventricular tachycardia.

Contraindications:

Breast-feeding patients in cardiogenic shock, severe sinus node dysfunction resulting in marked bradycardia, second or third degree AV block, symptomatic bradycardia, or known hypersensitivity.

Precautions:

Amiodarone should be used with caution in patients with latent or manifest heart failure because failure may be worsened by its administration.

Side Effects:

Hypotension, bradycardia, increased ventricular beats, prolonged P-R interval, prolonged QRS complex, prolonged Q-T interval. The patient should also be monitored for signs of pulmonary toxicity such as dyspnea and cough.

Interactions:

Amiodarone may react with Warfarin, Digoxin, Procainamide, Quinidine, and Phenytoin.

Diphenhydramine

Class:

Antihistamine

Description:

Diphenhydramine is a potent antihistamine that blocks H1 and H2 histamine receptors.

Mechanism of Action:

Diphenhydramine blocks the effects of H1 receptor stimulation (bronchoconstriction, visceral contractions) and that of H2 receptor stimulation (peripheral vasodilation and secretion of gastric acids). Diphenhydramine is also useful in the treatment of dystonic reactions accompanying phenothiazine use.

Indications:

Anaphylaxis, Allergic reactions, Dystonic (extrapyramidal) reactions due to phenothiazines

Contraindications:

Asthma, nursing mothers

Precautions:

The primary drug for treatment of severe allergic reactions is epinephrine, as it reverses the effects of histamines. Diphenhydramine will block histamine receptors, preventing subsequent stimulation.

Side Effects:

Sedation, dries bronchial secretions, blurred vision, headache, palpitations, tachycardia

Interactions:

Potentiation can occur by the administration of CNS depressants, other antihistamines, narcotics, and alcohol.

Dopamine

Class:

Sympathetic Agonist

Description:

Dopamine is a naturally occurring catecholamine. It acts on alpha, beta-1, and Dopaminergic adrenergic receptors. Its effect on alpha-receptors is dose dependent.

Mechanism of Action:

Dopamine's effect on beta-1 receptors causes a positive inotropic effect on the heart. Dopamine also acts on alpha-adrenergic receptors causing peripheral vasoconstriction. Dopamine maintains renal and mesenteric blood flow because of its effect on the Dopaminergic receptors. Dopamine increases both systolic and pulse pressure. There is usually less effect on the diastolic pressure.

Indications:

Hemodynamically significant hypotension not resulting from hypovolemia, and cardiogenic shock.

Contraindications:

Dopamine should not be used as the sole agent in the management of hypovolemic shock unless fluid resuscitation is well under way. Pheochromocytoma.

Precautions:

Dopamine can induce or worsen SVT and ventricular arrhythmias. Dopamine should not be administered in the presence of tachyarrhythmias or ventricular fibrillation.

Side Effects:

Nervousness, headache, dysrhythmias, palpitations, chest pain, dyspnea, nausea, vomiting.

Interactions:

Dopamine can be deactivated by alkaline solutions. If a patient is taking a monoamine oxidase inhibitor, the dose should be reduced. Dopamine can cause hypotension when used concomitantly with Phenytoin.

Epinephrine

Class:

Sympathetic Agonist

Description:

Epinephrine is a naturally occurring catecholamine. It is a potent alpha- and beta-adrenergic stimulant with more profound beta effects.

Mechanism of Action:

Epinephrine works directly on alpha- and beta-adrenergic receptors with effects of increased heart rate, cardiac contractile force, increased electrical activity in the myocardium, systemic vascular resistance, increased blood pressure, and increased automaticity. It also causes bronchodilation. Effects usually appear within 90 seconds of administration, and last only a short duration.

Indications:

Bronchial asthma, exacerbation of COPD, anaphylaxis.

Contraindications:

Underlying cardiovascular disease, hypertension.

Precautions:

Epinephrine should be protected from light. It also tends to be deactivated by alkaline solutions.

Side Effects:

Palpitations, anxiety, tremulousness, headache, dizziness, nausea, vomiting, myocardial oxygen demand.

Interactions:

Effects can be intensified in patients taking antidepressants

Etomidate

Class:

General anesthetic and adjunct to general anesthesia

Description:

Etomidate is a short-acting, intravenously administered sedative hypnotic. Etomidate has a rapid onset of action and recovery. It has minimal cardiac and respiratory-depressive effects and causes no histamine release, so it is useful in patients with compromised cardiopulmonary function.

Mechanism of Action:

Etomidate appears to facilitate GABAergic neurotransmission by increasing the number of available GABA receptors, possibly by displacing endogenous inhibitors of GABA binding. Etomidate produces clinical responses such as hypnosis, elevations in arterial carbon dioxide tension, reduced cortisol plasma levels, and a transient 20—30% decrease in cerebral blood flow. Its effects are at least partially due to depression of the brainstem reticular formation.

Indications:

Induction of general anesthesia.

Contraindications:

Use with caution in the elderly and in patients with hepatic disease because they are more likely to develop etomidate-related adverse reactions.

Precautions:

Use with caution during lactation.

Side Effects:

Skeletal muscle: Myoclonic skeletal muscle movements, tonic movements. *Respiratory:* Apnea of short duration, hyperventilation or hypoventilation, **laryngospasm**. *CV:* Either hypertension or hypotension; tachycardia or bradycardia; arrhythmias. *GI:* Postoperative N&V. *Miscellaneous:* Eye movements, averting movements, hiccoughs, snoring.

Interactions:

Etomidate potentiates the effects of CNS depressants such as ethanol, general anesthetics, local anesthetics, antidepressants, H₁-blockers, opiate agonists, skeletal muscle relaxants, phenothiazines, barbiturates, and benzodiazepines. Concurrent use of antihypertensive agents and etomidate can result in hypotension. This is particularly true if any of the following agents are used with etomidate: calcium-channel blockers, diazoxide, mecamylamine.

Furosemide

Class:

Diuretic

Description:

Furosemide is a potent diuretic that inhibits sodium and chloride reabsorption in the kidneys and causes venous dilation.

Mechanism of Action:

Furosemide is a loop diuretic that inhibits sodium and chloride reabsorption in the kidneys. Furosemide first causes venous dilation within 5 minutes of administration, reducing preload and decreasing cardiac work. Diuretic effects begin 5-15 minutes after administration.

Indications:

Congestive Heart Failure, Pulmonary Edema.

Contraindications:

Use in pregnancy should be limited to life threatening situations in which the benefits of administration outweigh the risks. It should not be administered to patients who are allergic to the sulfa class of medications.

Precautions:

Dehydration, electrolyte depletion, and hypotension can result from excessive doses. Blood pressure should be frequently monitored. Furosemide should be protected from light.

Side Effects:

Headache, dizziness, hypotension, volume depletion, potassium depletion, arrhythmias, diarrhea, nausea, vomiting.

Interactions:

Furosemide should not be administered in the same line as Amrinone, as a precipitate will form. Administration with other diuretics can lead to severe volume depletion and electrolyte imbalance.

Glucagon

Class:

Hormone and Anti-hypoglycemic

Description:

Glucagon is a hormone secreted by the alpha cells of the pancreas. It is used to increase the blood glucose level in cases of hypoglycemia in which an IV cannot immediately be placed.

Mechanism of Action:

Glucagon causes a breakdown of stored glycogen to glucose, and inhibits the synthesis of glycogen from glucose. A return to consciousness following the administration of Glucagon usually takes from 5-20 minutes. Glucagon is only effective if there are sufficient stores of glycogen in the liver. Glucagon exerts a positive inotropic action on the heart and decreases renal vascular resistance.

Indications:

Hypoglycemia, Beta-Blocker overdoses.

Contraindications:

Known hypersensitivity.

Precautions:

Glucagon is only effective if there are sufficient stores of glycogen in the liver. Glucagon should be administered with caution to patients with a history of cardiovascular or renal disease.

Side Effects:

Hypotension, dizziness, headache, nausea, vomiting.

Interactions:

There are few interactions reported in the emergency setting.

Ipratropium Bromide

Class:

Anticholinergic

Description:

Ipratropium is an anticholinergic that is chemically related to atropine.

Mechanism of Action:

Ipratropium is a parasympatholytic used in the treatment of respiratory emergencies. It causes bronchodilation and dries respiratory tract secretions. Ipratropium acts by blocking acetylcholine receptors, thus inhibiting parasympathetic stimulation.

Indications:

Bronchial asthma, reversible bronchospasm associated with chronic bronchitis and emphysema.

Contraindications:

Known hypersensitivity.

Precautions:

Use caution when administering this drug to elderly patients and those with cardiovascular disease or hypertension. If possible, peak flow rate should be measured before and after administration.

Side Effects:

Palpitations, anxiety, dizziness, headache, nervousness, tremor, hypertension, arrhythmias, chest pain, nausea, vomiting.

Interactions:

There are few interactions in the prehospital setting.

Labetalol

Class:

Non-Selective Beta Blocker

Description:

Labetalol is a non-selective beta-blocker and a selective alpha-1 blocker.

Mechanism of Action:

Labetalol is a nonselective beta-adrenergic antagonist. It also blocks alpha-1 adrenergic receptors, inhibiting peripheral vasoconstriction. It lowers blood pressure by decreasing cardiac output, and by causing peripheral vasodilation.

Indications:

Acute management of hypertensive crisis.

Contraindications:

Bronchial asthma, CHF, heart block, bradycardia, cardiogenic shock.

Precautions:

Prehospital personnel should be alert for signs of CHF, bradycardia, shock, heart block, or bronchospasm. Postural hypotension might occur and should be expected.

Side Effects:

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

Interactions:

Labetalol should not be administered to patients who have received intravenous verapamil. It should be administered with caution to patients taking antihypertensive agents.

Levalbuterol

Class:

Sympathetic Agonist

Description:

Levalbuterol is the (R)-isomer of the drug substance Racemic Albuterol and is a sympathomimetic that is selective for Beta-2 adrenergic receptors.

Mechanism of Action:

Albuterol is a selective Beta-2 agonist with a minimal number of side effects. It relaxes the smooth muscle of all airways, from the trachea to the terminal bronchioles and has a mean duration of effect of approximately 5 hours (Pediatric Dose), approximately 6 hours (Adult Dose) but may last up to 8 hours.

Indications:

Bronchial asthma, reversible bronchospasm associated with COPD and emphysema.

Contraindications:

Known hypersensitivity to the drug.

Precautions:

Use caution when administering this medication to patients with cardiovascular disease, cardiac arrhythmias, hypertension, convulsive disorders, hyperthyroidism, or diabetes mellitus and who may be unusually responsive to sympathomimetic amines. If possible, peak flow rate should be measured before and after administration.

Side Effects:

Palpitations, anxiety, dizziness, headache, nervousness, tremor, hypertension, arrhythmias, chest pain, nausea, vomiting, diarrhea.

Interactions:

The possibility of developing unpleasant side effects increases when administered with other sympathetic agonists. Beta blockers may blunt or block the effects of Levalbuterol. Levalbuterol should be used with caution in the presence of Diuretics, Digoxin, Monoamine Oxidase Inhibitors or Tricyclic Antidepressants.

Lidocaine

Class:

Antiarrhythmic

Description:

Lidocaine is an amide-type local anesthetic. It is frequently used to treat life-threatening dysrhythmias.

Mechanism of Action:

Lidocaine depresses depolarization and automaticity in the ventricles, and increases the ventricular fibrillation threshold by increasing phase IV repolarization.

Indications:

Ventricular tachycardia, ventricular fibrillation, malignant premature ventricular contractions.

Contraindications:

Second and third degree heart blocks, ventricular escape beats.

Precautions:

CNS depression may occur when the drug exceeds 300mg/hr. Exceedingly high doses can result in coma and death.

Side Effects:

Drowsiness, seizures, confusion, hypotension, bradycardia, heart blocks, nausea, vomiting, and respiratory and cardiac arrest.

Interactions:

Lidocaine should be used with caution when administered concomitantly with Procainamide, Phenytoin, Quinidine, and beta-blockers as drug toxicity may result.

Magnesium Sulfate

Class:

Antiarrhythmic, Mineral, Electrolyte

Description:

Magnesium Sulfate is a salt that dissociates into the Magnesium cation and the sulfate anion when administered. Magnesium is an essential element in numerous biochemical reactions that occur within the body.

Mechanism of Action:

Magnesium Sulfate acts as a physiological calcium channel blocker and blocks neuromuscular transmission. A decreased magnesium level is associated with cardiac arrhythmias, symptoms of cardiac insufficiency, and sudden death. Hypomagnesemia can cause refractory ventricular fibrillation. Magnesium Sulfate is also a central nervous system depressant effective in the management of seizures associated with eclampsia.

Indications:

Magnesium Sulfate is used in refractory ventricular fibrillation, pulseless ventricular tachycardia, post-myocardial infarction for prophylaxis of arrhythmias, and torsade de pointes or multiaxial ventricular tachycardia. It is also used in severe bronchospasm, and in eclampsia.

Contraindications:

Shock, persistent severe hypertension, third degree AV block, routine dialysis patients, known hypocalcemia.

Precautions:

Magnesium Sulfate should be administered slowly to minimize side effects. Use with caution in patients with known renal insufficiency. Hypermagnesemia can occur, Calcium Chloride should be available as an antidote if serious side effects occur.

Side Effects:

Flushing, sweating, bradycardia, decreased deep tendon reflexes, drowsiness, respiratory depression, arrhythmia, hypotension, hypothermia, itching, and rash.

Interactions:

Magnesium Sulfate can cause cardiac conduction abnormalities if administered in conjunction with digitalis.

Methylprednisolone

Class:

Corticosteroid and Anti-inflammatory

Description:

Methylprednisolone is a synthetic steroid with potent anti-inflammatory properties. It is related to the natural hormones secreted in the adrenal cortex.

Mechanism of Action:

The pharmacological effects of steroids are vast and complex. Effective as anti-inflammatory agents, they are used in the management of allergic reactions, asthma, and anaphylaxis. Methylprednisolone is considered an intermediate-acting steroid with a plasma half-life of 3 to 4 hours.

Indications:

Severe anaphylaxis, asthma, or COPD, urticaria, and spinal cord injury.

Contraindications:

There are no major contraindications in the use of Methylprednisolone in the emergency setting.

Precautions:

A single dose is all that should be given in the prehospital setting. Long-term steroid therapy can cause gastrointestinal bleeding, prolonged wound healing, and suppression of adrenocortical steroids.

Side Effects:

Fluid retention, congestive heart failure, hypertension, abdominal distention, vertigo, headache, nausea, malaise, and hiccups.

Interactions:

There are few interactions in the prehospital setting.

Midazolam

Class:

Sedative and Hypnotic

Description:

Midazolam is a benzodiazepine with strong hypnotic and amnestic properties.

Mechanism of Action:

Midazolam is a potent but short-acting benzodiazepine used as a sedative and hypnotic. It is three to four times more potent than Diazepam. Its onset of action is approximately 1.5 minutes when administered IV. Midazolam has impressive amnestic properties, and like other benzodiazepines, it has no effect on pain.

Indications:

Midazolam is used as a premedication before cardioversion and other painful procedures.

Contraindications:

Known hypersensitivity, narrow angle glaucoma, shock, depressed vital signs, and alcoholic coma.

Precautions:

Emergency resuscitative equipment must be available prior to the administration of Midazolam. Midazolam has more potential than the other benzodiazepines to cause respiratory depression and respiratory arrest.

Side Effects:

Laryngospasm, bronchospasm, dyspnea, respiratory depression and arrest, drowsiness, altered mental status, amnesia, bradycardia, tachycardia, premature ventricular contractions, and retching.

Interactions:

The effects of Midazolam can be accentuated by CNS depressants such as narcotics and alcohol.

Morphine Sulfate

Class:

Narcotic Analgesic

Description:

Morphine is a potent CNS depressant and analgesic.

Mechanism of Action:

Morphine acts on opiate receptors in the brain, providing analgesia and sedation. It increases peripheral venous capacitance and decreases venous return. Morphine also decreases myocardial oxygen demand.

Indications:

Severe pain associated with myocardial infarction, kidney stones, etc., and pulmonary edema.

Contraindications:

Volume depletion, severe hypotension, hypersensitivity, undiagnosed head injury or abdominal pain.

Precautions:

Morphine has a high tendency for addiction and abuse. Morphine can cause severe respiratory depression in high doses, especially in patients with respiratory impairment. Narcan should be available as an antagonist.

Side Effects:

Nausea, vomiting, abdominal cramps, blurred vision, constricted pupils, altered mental status, headache, respiratory depression.

Interactions:

CNS depression can be enhanced when administered with antihistamines, antiemetics, sedatives, hypnotics, barbiturates, and alcohol.

Naloxone

Class:

Narcotic Antagonist

Description:

Naloxone is an effective narcotic antagonist.

Mechanism of Action:

Naloxone is chemically similar to narcotics, however it has only antagonistic properties. Naloxone competes for opiate receptors in the brain, and displaces narcotic molecules from opiate receptors. It can reverse respiratory depression from narcotic overdose.

Indications:

Complete or partial reversal of depression caused by narcotics. Naloxone can also be used in the treatment of coma of unknown origin.

Contraindications:

Known hypersensitivity.

Precautions:

Naloxone should be administered cautiously to patients who are known or are suspected to be physically dependent on narcotics. Abrupt and complete reversal by Naloxone can cause withdrawal type effects.

Side Effects:

Hypotension, hypertension, ventricular arrhythmias, nausea, vomiting.

Interactions:

Naloxone may cause narcotic withdrawal in the narcotic dependent patient. Only enough of the drug should be given to reverse respiratory depression.

Phenylephrine 1% Nasal Spray

Class:

Alpha-adrenergic agent (sympathomimetic)

Description:

Phenylephrine is commonly used orally in combination with other drugs and intranasally to treat nasal congestion.

Mechanism of Action:

After intranasal administration, Phenylephrine stimulates alpha-adrenergic receptors on the nasal mucosa (direct effect) causing vasoconstriction of local vessels. The vasoconstrictive action decreases mucosal edema, thereby leading to a decongestant effect.

Indications:

Vasoconstriction of local vessels to facilitate nasotracheal intubation

Contraindications:

Severe hypertension, VT.

Precautions:

Use with extreme caution in geriatric clients, severe arteriosclerosis, bradycardia, partial heart block, myocardial disease, hyperthyroidism, and during pregnancy and lactation. Systemic absorption with nasal or ophthalmic use.

Side Effects:

CV: Reflex bradycardia, arrhythmias (rare). *CNS:* Headache, excitability, restlessness.

Ophthalmologic: Rebound miosis and decreased mydriatic response in geriatric clients, blurred vision.

Interactions:

Atropine blocks the vagal reflex bradycardia caused by Phenylephrine and increases its pressor effect. The concomitant use of Phenylephrine with diuretics can cause decreased arterial responsiveness to vasopressor agents. Phenylephrine can cause severe persistent hypertension if administered concurrently with Oxytocin.

Nitroglycerine

Class:

Nitrate

Description:

Nitroglycerine is a potent smooth muscle relaxant used in the treatment of angina pectoris.

Mechanism of Action:

Nitroglycerine is a rapid smooth muscle relaxant that reduces cardiac work and to a lesser degree dilates the coronary arteries. This results in increased coronary blood flow and improved perfusion of the myocardium. Pain relief following Nitroglycerine administration usually occurs within 1 to 2 minutes, with therapeutic effects up to 30 minutes later.

Indications:

Chest pain associated with angina pectoris, acute myocardial infarction, and acute pulmonary edema.

Contraindications:

Hypotension, increased intracranial pressure.

Precautions:

Patients taking Nitroglycerine may develop a tolerance to the drug necessitating a higher dose. Headache from vasodilation of the cerebral vessels is common. Nitroglycerine deteriorates rapidly once opened. Nitroglycerine should be protected from light.

Side Effects:

Headache, dizziness, weakness, tachycardia, hypotension, orthostasis, skin rash, dry mouth, nausea, vomiting.

Interactions:

Nitroglycerine can cause hypotension in patients who have recently ingested alcohol. It can cause orthostatic hypotension when used in conjunction with beta-blockers.

Nitrous Oxide

Class:

Analgesic and Anesthetic Gas

Description:

Nitronox is a blended mixture of 50 % Nitrous Oxide and 50% Oxygen that has potent analgesic effects.

Mechanism of Action:

Nitrous Oxide is a CNS depressant with analgesic properties. The effects dissipate within 2-5 minutes after cessation of administration. Nitronox must be self administered through a modified demand valve. It is effective in treating many varieties of pain, including those from trauma. The high concentration of oxygen delivered with nitrous oxide will increase the oxygen amount in the blood, thus reducing hypoxia.

Indications:

Pain of musculoskeletal origin, burns, suspected ischemic chest pain, states of severe anxiety including hyperventilation.

Contraindications:

Nitronox should not be used with any patient who cannot understand verbal instructions or who is intoxicated with alcohol or other drugs. It should not be administered to any patient with a head injury who exhibits altered mental status. Nitronox should not be administered to COPD patients, as it tends to diffuse into closed spaces more readily than carbon dioxide or oxygen, thereby causing blebs to swell, and possibly rupture. Nitronox should also not be administered to patients with pneumothorax or tension pneumothorax, as the gas will accumulate and increase the size of the injury.

Precautions:

Nitronox should be used only in well-ventilated areas. Nitrous oxide exists in a liquid state inside the gas cylinder. Heat will cause the gas to vaporize, making the cylinder and lines cool to the touch. In very cold environments (less than 21 degrees F) the liquid may be slow to vaporize, and administration impossible.

Side Effects:

Dizziness, lightheadedness, altered mental state, hallucinations, nausea, and vomiting.

Interactions:

Nitronox can potentiate the effects of other CNS depressants such as narcotics, sedatives, hypnotics, and alcohol.

Oxytocin

Class:

Hormone and Uterine Stimulant

Description:

Oxytocin is a naturally occurring hormone that is secreted by the posterior pituitary.

Mechanism of Action:

Oxytocin causes contraction of uterine smooth muscle and lactation. Oxytocin is used to induce labor in selected cases and is also effective in inducing uterine contractions following delivery, thereby controlling post-partum hemorrhage.

Indications:

Post-partum hemorrhage

Contraindications:

In the prehospital setting, Oxytocin should be administered only to patients suffering severe post partum bleeding. Before administration it is essential to verify that the baby and the placenta have been delivered and that there is not an additional fetus in the uterus.

Precautions:

Excess Oxytocin can cause over stimulation of the uterus and possible uterine rupture. Hypertension, cardiac arrhythmia and anaphylaxis have been reported.

Side Effects:

In the mother: Hypotension, arrhythmias, tachycardia, seizures, coma, nausea, vomiting.
In the fetus prior to delivery: hypoxia, asphyxia, arrhythmias, intracranial bleeding.

Interactions:

Oxytocin can cause hypertension when administered with vasoconstrictors.

Procainamide

Class:

Antiarrhythmic

Description:

Procainamide is an ester-type local anesthetic. It is frequently used to treat ventricular dysrhythmias refractory to Lidocaine.

Mechanism of Action:

Procainamide reduces the automaticity of the various pacemaker sites in the heart. Procainamide slows intraventricular conduction to a greater degree than does Lidocaine.

Indications:

Persistent cardiac arrest due to ventricular fibrillation, and refractory to Lidocaine, PVC's and ventricular tachycardia.

Contraindications:

Severe conduction system disturbances, especially second and third degree heart blocks, ventricular escape beats.

Precautions:

Hypotension is common.

Side Effects:

Drowsiness, seizures, confusion, hypotension, bradycardia, heart blocks, nausea, vomiting, and respiratory and cardiac arrest.

Interactions:

The hypotensive effects of Procainamide may be increased if administered with antihypertensive drugs. The chance of neurological toxicity by both Lidocaine and Procainamide increases when the medications are administered together.

Sodium Bicarbonate

Class:

Alkalinizing Agent

Description:

Sodium Bicarbonate is a salt that provides bicarbonate to buffer metabolic acidosis.

Mechanism of Action:

Sodium Bicarbonate increases pH by providing the bicarbonate buffer (a weak base). Making the urine more alkaline enhances Tricyclic Antidepressant excretion. Sodium Bicarbonate is used to increase the pH of the urine and thereby speed excretion from the body.

Indications:

Tricyclic antidepressant overdose, Phenobarbital overdose, severe acidosis refractory to hyperventilation, and known hyperkalemia.

Contraindications:

There are no absolute contraindications.

Precautions:

Sodium Bicarbonate can cause metabolic alkalosis when administered in large quantities. It is important to calculate the dosage based on weight and size.

Side Effects:

There are few side effects when used in the emergency setting.

Interactions:

Most catecholamines and vasopressors (e.g., Epinephrine and Dopamine) can be deactivated by alkaline solutions such as Sodium Bicarbonate. Calcium Chloride should not be administered in conjunction with Sodium Bicarbonate, as a precipitate will form.

Succinylcholine

Class:

Depolarizing Neuromuscular Blocker

Description:

Succinylcholine is a short acting, depolarizing skeletal muscle relaxant used to facilitate endotracheal intubation.

Mechanism of Action:

Like acetylcholine, Succinylcholine combines with cholinergic receptors in the motor nerves to cause depolarization. Neuromuscular transmission is thus inhibited, which renders the muscles unable to be stimulated by acetylcholine. Complete paralysis is obtained within 60 to 90 seconds, and persists for approximately 4 to 5 minutes. Effects then begin to fade, and a return to normal is seen within 6 minutes. Muscle relaxation begins in the eyelids and the jaw, and then progresses to the limbs, abdomen, diaphragm, and intercostals. *Succinylcholine has no effect on consciousness.*

Indications:

Succinylcholine is used to achieve temporary paralysis when endotracheal intubation is indicated, and muscle tone or seizure activity prevents it.

Contraindications:

Known hypersensitivity, penetrating eye injuries, and narrow-angle-glaucoma.

Precautions:

Succinylcholine should not be administered unless personnel skilled in endotracheal intubation are present and ready to perform the procedure. Oxygen and emergency resuscitative drugs should be readily available. Cardiac arrest and ventricular arrhythmias have been reported when Succinylcholine was administered to patients with severe burns and severe crush injuries.

Side Effects:

Succinylcholine can cause wheezing, respiratory depression, apnea, aspiration, arrhythmias, bradycardia, sinus arrest, hypertension, hypotension, increased intraocular pressure, increased intracranial pressure.

Interactions:

Lidocaine, Procainamide, beta-blockers, magnesium sulfate, and other neuromuscular blockers enhance the effects of Succinylcholine.

Terbutaline

Class:

Sympathetic Agonist and Tocolytic

Description:

Terbutaline is a synthetic sympathomimetic that is selective for Beta-2 adrenergic receptors.

Mechanism of Action:

Terbutaline causes immediate bronchodilation with minimal cardiac effects. Its onset of action is similar to that of Epinephrine. Terbutaline is also used to suppress pre-term labor.

Indications:

Bronchial asthma, reversible bronchospasm associated with chronic bronchitis and emphysema, preterm labor.

Contraindications:

Known hypersensitivity.

Precautions:

Use caution when administering this drug to elderly patients and those with cardiovascular disease or hypertension. If possible, peak flow rate should be measured before and after administration.

Side Effects:

Palpitations, anxiety, dizziness, headache, nervousness, tremor, hypertension, arrhythmias, chest pain, nausea, vomiting.

Interactions:

The possibility of developing unpleasant side effects increases when administered with other sympathetic agonists. Beta-blockers may blunt the effects of Terbutaline.

Tetracaine 1/2% Ophthalmic Drops

Class:

Ophthalmic Anesthetic

Description:

Tetracaine is an ester-type local anesthetic with an intermediate to long duration of action.

Mechanism of Action:

Tetracaine, like all local anesthetics, causes a reversible blockade of nerve conduction by decreasing nerve membrane permeability to sodium. This decreases the rate of membrane depolarization thereby increasing the threshold for electrical excitability.

Indications:

Ophthalmic anesthesia

Contraindications:

Use Tetracaine with caution in patients with known ester type anesthetic hypersensitivity.

Precautions:

After Tetracaine is applied to the eye, *do not rub or wipe the eye until the anesthetic has worn off and feeling in the eye returns*. To do so may cause injury or damage to the eye.

Side Effects:

Dizziness or drowsiness; increased sweating; irregular heartbeat; muscle twitching or trembling; nausea or vomiting; shortness of breath or troubled breathing; unusual excitement, nervousness, or restlessness; unusual tiredness or weakness, Burning, stinging, redness, or other irritation of eye.

Interactions:

The vagal effects and respiratory depression induced by opiate agonists may be increased by local anesthetics. Use of local anesthetics with rapid onset vasodilators, such as nitrates, may result in hypotension. Local anesthetics may enhance the effect of CNS depressive agents.

Thiamine

Class:

Vitamin

Description:

Thiamine is an important vitamin commonly referred to as vitamin B₁. It is required for the conversion of pyruvic acid to acetyl coenzyme A.

Mechanism of Action:

Thiamine is required for the conversion of pyruvic acid to acetyl coenzyme A. Without this step, a significant amount of the energy available in glucose cannot be obtained. Chronic alcohol intake interferes with the intake, absorption, and use of Thiamine. During extended periods of fasting, neurological symptoms of owing to Thiamine deficiency may occur. These symptoms include Wernicke's encephalopathy and Korsakoff's psychosis.

Indications:

Thiamine is used for coma of unknown origin, especially if alcohol may be involved, and delirium tremens.

Contraindications:

There are no contraindications to the administration of Thiamine in the emergency setting.

Precautions:

A few cases of hypersensitivity have been reported.

Side Effects:

Hypotension, dyspnea, and respiratory failure have been reported with its use.

Interactions:

There are no interactions in the emergency setting.

Vasopressin

Class:

Pituitary (antidiuretic) hormone

Description:

Causes vasoconstriction (pressor effect) of the splanchnic and portal vessels (and to a lesser extent of peripheral, cerebral, pulmonary, and coronary vessels).

Mechanism of Action:

Depending on the concentration, the hormone acts on both V₁ and V₂ receptors.

IV use of Vasopressin may result in severe vasoconstriction.

Indications:

Alternative pressor to epinephrine in the treatment of adult shock refractory VF, useful for hemodynamic support in vasodilatory shock.

Contraindications:

Vascular disease, especially when involving coronary arteries; angina pectoris.

Precautions:

Increased peripheral vascular resistance may provoke cardiac ischemia and angina, not recommended for responsive patients with coronary artery disease.

Side Effects:

GI: N&V, increased intestinal activity (e.g., belching, cramps, urge to defecate), abdominal cramps, flatus. *Miscellaneous:* Facial pallor, tremor, sweating, **allergic reactions** vertigo, skin blanching, **bronchoconstriction, anaphylaxis** "pounding" in head, water intoxication (drowsiness, headache, **coma, convulsions**).

Interactions:

High doses of epinephrine, heparin, or ethanol can also decrease the response to Vasopressin.

Vecuronium

Class:

Non-depolarizing Neuromuscular Blocker

Description:

Vecuronium is a derivative of Pancuronium and is used to provide muscle relaxation to facilitate endotracheal intubation.

Mechanism of Action:

Vecuronium is one-third more potent than Pancuronium with a shorter duration of effect. Vecuronium competes with acetylcholine for cholinergic receptor sites on the post junctional membrane. This competition results in paralysis of muscle fibers served by the occupied neuromuscular junction. It does not cause an initial depolarization wave, as does Succinylcholine. The onset is about 1 minute, with good to excellent intubation conditions within 2-3 minutes.

Indications:

Vecuronium is used to achieve temporary paralysis when endotracheal intubation is indicated, and muscle tone or seizure activity prevents it.

Contraindications:

Known hypersensitivity.

Precautions:

Vecuronium should not be administered unless personnel skilled in endotracheal intubation are present and ready to perform the procedure. Oxygen and emergency resuscitative drugs should be readily available.

Side Effects:

Vecuronium can cause wheezing, respiratory depression, apnea, aspiration, arrhythmias, bradycardia, sinus arrest, hypertension, hypotension, increased intraocular pressure, increased intracranial pressure.

Interactions:

Lidocaine, Procainamide, beta-blockers, magnesium sulfate, and other neuromuscular blockers enhance the effects of Vecuronium.

Verapamil

Class:

Calcium Channel Blocker

Description:

Verapamil is a calcium ion antagonist, causing a relaxing of vascular smooth muscle, and slower conduction through the AV node. Verapamil has a greater effect on conduction and a lesser effect on vascular smooth muscle than do other agents in the same class.

Mechanism of Action:

Verapamil inhibits arrhythmias caused by re-entry pathways, and decreases rapid ventricular response in atrial tachyarrhythmias. Verapamil reduces myocardial oxygen demand because of its negative inotropic effects, and causes coronary and peripheral vasodilation.

Indications:

PSVT refractory to Adenosine.

Contraindications:

Severe hypotension, cardiogenic shock, ventricular tachycardia, Wolff-Parkinson-White syndrome.

Precautions:

Verapamil can cause systemic hypotension. Calcium chloride can be used to prevent the hypotensive effects of calcium channel blockers and in the management of calcium channel blocker overdose.

Side Effects:

Nausea, vomiting, dizziness, headache, bradycardia, heart block, hypotension, asystole.

Interactions:

Verapamil should not be administered to patients receiving intravenous beta-blockers because of an increased risk of congestive heart failure, bradycardia, and asystole.

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