DRUGS

Drugs - Section 20.000

Acetaminophen

Class

Analgesic

Actions

Acetaminophen (paracetamol) targets the cyclooxygenase enzymes that produce prostaglandins responsible for pain and fever. It has little anti-inflammatory effect. It is metabolized into toxic and non-toxic products in the liver.

Indications

A. Mild to moderate pain (Example: 1-4 on pain scale)

Contraindications

A. Known liver disease.
B. Has taken acetaminophen in last four (4) hours

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Mild to moderate pain Example: 1-4 on pain scale (headache, muscle aches, arthritis, backache, toothaches)	325 to 1000 mg	PO Slow IV push (over 60 seconds)	Do not use if known allergy to acetaminophen
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Mild to moderate pain	**15 mg/kg PO to MAX of 1000 mg**	PO	Follow dose chart in Pediatric Guide

Activated Charcoal

Class

Absorbent

Actions

Absorbs toxic substances ingested, and inhibits gastrointestinal absorption by forming an effective barrier between remaining particulate material and the gastrointestinal mucosa.

Indications

Effective in the management of poisoning or overdose of many substances. Can be given without OLMC for isolated acetaminophen and/or aspirin ingestion.

Contraindications

None in acute, severe poisoning.

Precautions

A. OLMC must be contacted before administering activated charcoal, for ingestion other than acetaminophen or aspirin.

B. Activated charcoal should **Not** be given to patients who are unconscious or who may have a rapidly diminishing level of consciousness.

C. Activated charcoal may be ineffective in ingestions such as mineral acids, alkalis, petroleum products, or cyanide.

D. **Never** give activated charcoal simultaneously with ipecac as it will absorb the ipecac and prevent emesis.

E. Administration of activated charcoal can result in aspiration or significant particulate obstruction of the airway.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Poisoning or overdose	1 gram/kg (MAX 50 grams)	PO or NG	
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Poisoning or overdose	1 gram/kg (MAX 50 grams)	PO or NG	

Side Effects

Nausea, vomiting, constipation.

Adenosine (Adenocard®)

Class

Antiarrhythmic

Actions

Adenosine is a naturally occurring nucleoside that has the ability to slow conduction through the AV node. Since most cases of PSVT involve AV nodal re-entry, adenosine is capable of interrupting the AV nodal circuit and stopping the tachycardia, restoring normal sinus rhythm. It is eliminated from the circulation rapidly, having a half-life in the blood of less than 10 seconds. This allows for the use of repeated doses in rapid succession if needed.

Indications

Converts symptomatic PSVT to normal sinus rhythm, including PSVT associated with accessory bypass tracts (e.g., WPW).

Contraindications

A. Second or third degree heart block, sick sinus syndrome

B. Known hypersensitivity

C. Atrial fibrillation

Precautions

A. When doses larger than 12 mg are given by rapid IV injection/IO there may be a decrease in blood pressure secondary to a decrease in the vascular resistance.

B. The effects of adenosine are antagonized by the methylxanthines such as Theophylline and caffeine. Larger doses of adenosine may be required.

C. Adenosine effects are potentiated by dipyridamole (Persantine®), resulting in prolonged asystole.

D. In the presence of carbamazepine (Tegretol®), high degree heart block may occur.

E. Adenosine is not effective in converting atrial fibrillation, atrial flutter or ventricular tachycardia.

F. Adenosine may initiate atrioventricular nodal reentry tachycardia (AVNRT) with rapid ventricular response in patients with Wolff-Parkinson-White syndrome.

G. Adenosine should be used with caution in patients with asthma as it may cause a reactive airways response in some cases.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
PSVT	6 mg, 12 mg, 12 mg	Rapid IV, IO	Large proximal IV line with fluid bolus flush
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
PSVT	0.1 mg/kg 0.2 mg/kg x 2	Rapid IV, IO	Large proximal IV line with fluid bolus flush

Side Effects:

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

Administration Notes:

A. Adenosine is administered in less than 5 seconds via a rapid IV/IO bolus, preferably through a large bore IV in an antecubital vein OR proximal humerus IO.

B. The medication should be administered through an IV port as close to the patient as possible so it is not diluted in the tubing.

C. Each bolus should be followed immediately by rapid administration of a flush of 10 mL (or more).

D. If the patient becomes hemodynamically unstable at any point in time, cardioversion should be performed.

E. All doses of adenosine should be reduced by 1/2 (50%) in the following clinical settings:

1. History of cardiac transplantation.

2. Patients who are on carbamazepine (Tegretol®), dipyridamole (Persantine®).

3. Administration through any type of central line (Porta Cath, Broviac, Hickman etc).

Albuterol (Ventolin®)

Class

Sympathomimetic

Actions

Albuterol sulfate is a potent bronchodilator. The pharmacologic effects are at least in part attributable to stimulation through beta-adrenergic receptors of intracellular adenyl cyclase that catalyzes the conversion of ATP to cyclic-AMP. Increased cyclic-AMP levels are associated with relaxation of bronchial smooth muscle and inhibition of release of mediators of immediate hypersensitivity from cells, especially mast cells.

The onset of improvement in pulmonary function is within 2 to 15 minutes after the initiation of treatment and the duration of action is from 4 to 6 hours. As a $beta_2$ agonist, albuterol induces bronchial dilation, but has occasional $beta_1$ overlap with clinically significant cardiac effects. Clinically significant arrhythmias may occur especially in patients with underlying cardiovascular disorders such as coronary insufficiency and hypertension.

Indications

Treat bronchial asthma and reversible bronchial spasm that occur with chronic pulmonary disease.

Precautions

A. The patient's rhythm should be observed for arrhythmias.

B. Paradoxical bronchospasm may occur with excessive administration.

C. Skeletal muscle tremors are a side effect.

Technique

A. Nebulization should be accomplished using the supplied kit.

B. O_2 flow should be set at a minimum of 8 liters per minute. Patients COPD should be monitored carefully for CO_2 retention.

C. Patients should be instructed to breathe as follows:

1. Inhale slowly

2. Hold breath

3. Exhale passively through nose

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Bronchial asthma	2.5 mg repeat p.r.n.	Nebulized	Add Ipratropium with repeat dose
Anaphylaxis	2.5 mg	Nebulized	Use Nebulizer for ETT
Crush Injury	Per OLMC	Nebulized	OLMC Required
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
All	Same as adult	Nebulized	See above

Alprazolam (Xanax)

Class
Benzodiazepine

Indications
Anxiety Disorders

Initial
0.25 PO or ODT

Indications
A. To relieve anxiety.
B. Decrease adverse effects of suspected methamphetamine and/or cocaine use.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Anxiety	0.25 mg	PO or ODT	Use with caution in patients with suspected alcohol intoxicants, sedatives, and opiates.

Side Effects/Special Notes
A. Common side effects include drowsiness, dizziness, fatigue and ataxia, respiratory depression and hypotension.
B. Most likely to produce respiratory depression in patients who have taken other depressant drugs, especially opioids, alcohol and barbiturates.
C. Use with caution in patients who have severe COPD (especially in patients with CO_2 retention), hypoxia or elderly.

Amiodarone

Class

Antiarrhythmic

Actions

Amiodarone depresses automaticity of the sinoatrial node. It slows conduction and increases refractoriness of the AV node. Amiodarone increases atrial and ventricular refractoriness and prolongs the QT interval.

Amiodarone IV is rapidly distributed. No dosage adjustments are needed for patients with renal, liver, heart failure, or advanced age.

Indications

Ventricular Fibrillation
Sustained Ventricular Tachycardia
Pulseless Ventricular Tachycardia

Precautions

A. In perfusing patients
1. Hypotension
2. Prolonged QT
3. Proarrhythmic (Torsades de Pointes, VF)
4. Severe bradycardia & atrioventricular block

B. Other non-cardiac toxicities (usually seen with chronic administration)
1. Pulmonary infiltrates
2. Hepatitic dysfunction
3. Thyroid dysfunction
4. Peripheral neuropathy
5. (> 3 mg/mL) Amiodarone can cause phlebitis

C. Peripheral vein amiodarone IV infusion concentrations should not exceed 3 mg/mL.

D. IV amiodarone will precipitate if administered with sodium bicarbonate.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
V-fib/Pulseless V-tach	300 mg	IV, IO bolus	If conversion occurs or V-fib/Pulseless V-tach persists, repeat once @ 150 mg
V-tach with pulse	150 mg	IV, IO infusion	Mix with 100 mL of NS in Buretrol and administer over 10 minutes, or IV pump. May repeat once.
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
V-fib/Pulseless V-tach	5 mg/**kg**	IV, IO bolus	Repeat once with 2.5 mg/**kg**
V-tach with pulse	2.5 mg/**kg**	IV, IO infusion	Mix with 2 mL/**kg** of NS in Buretrol and infuse over 10 minutes, or IV pump. May repeat once.

Preparation:

A. Amiodarone is packaged 150 mg in 3 mL vials.

B. For ventricular fibrillation: 300 mg IV/IO push. If VF/VT persists, repeat with 150 mg IV/IO push.

C. For ventricular tachycardia with pulse: 150 mg over 10 minutes. May repeat once.

D. Call OLMC for rebolus instructions.

Aspirin

Class

Anti-inflammatory agent, platelet inhibitor.

Actions

Aspirin inhibits prostaglandin and disrupts platelet function. It is also a mild analgesic and anti-inflammatory agent.

Indications

In unstable angina and acute myocardial infarction, aspirin has been shown to lower mortality and is indicated in patients with ischemic chest pain.

Contraindications

A. Allergy to aspirin or aspirin induced asthma.

B. History of active bleeding disorder (i.e., hemophilia).

C. Current ulcer or GI bleeding.

D. Suspected aortic dissection.

Side Effects

A. High doses of aspirin can cause ringing in the ears.

B. Heartburn, nausea, vomiting.

Note: The exact dose of aspirin in acute myocardial infarction has not been determined, however this system has standardized the dose to be approximately 324 mg.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Acute Coronary Syndrome (AMI)	324 mg (4 x 81 mg tablets)	PO	Can be given even if patient has taken ASA that day
Pediatric - not indicated for pediatric patients			

Atropine Sulfate

Class

Parasympatholytic

Actions

Atropine is a muscarinic-cholinergic blocking agent. As such, it has the following effects:

A. Increases heart rate (by blocking vagal influences).

B. Increases conduction through AV node (i.e., increases ventricular sensitivity to atrial impulses).

C. Reduces motility and tone of GI tract.

D. Reduces action and tone of the urinary bladder (may cause urinary retention).

E. Dilates pupils.

Indications

A. To increase the heart rate in bradycardia or pacemaker failure.

B. To improve conduction in second and third degree heart block.

C. As an antidote for some insecticide exposures (anti-cholinesterases, e.g., organophosphates) and nerve gases.

D. To counteract excessive vagal influences responsible for some bradysystolic and asystolic arrests.

Precautions

A. Contraindicated in atrial fibrillation and flutter because increased conduction may speed ventricular rate excessively.

B. Bradycardia in the setting of an acute MI is common and probably beneficial.

1. Do not treat unless there are signs of poor perfusion (low blood pressure, mental confusion).

2. Chest pain could be due to a MI or to poor perfusion caused by the bradycardia itself.

3. Consult the OLMC physician.

4. When in doubt, watch your patient.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Bradycardia	1.0 mg	IV, IO	q 3-5 minutes MAX 3 mg
Organophosphates	2-5 mg IV/IO or 2 mg IM	IV, IO, IM	Call OLMC for frequency
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Bradycardia	0.02 mg/kg	IV, IO	MAX single dose 0.5 mg MAX total dose 1 mg
Organophosphates	0.015 mg/kg - 0.05 mg/kg	IV, IO	Call OLMC for frequency

Side Effects/Special Notes

A. Second and third degree block may be chronic and without symptoms.
  1. Symptoms occur mainly with acute change.
  2. **Treat the patient, not the dysrhythmia.**

B. This drug blocks cholinergic (vagal) influences already present. If there is little cholinergic stimulation present, effects will be minimal.

C. Atropine will have no effect if given to heart transplant patients.

Buprenorphine (Suboxone)

Class

Opioid partial agonist-antagonists.

Indications

A. pioid Withdrawal Symptoms with Clinical Opioid Withdrawal Scale (COWS) Score ≥7.

Contraindications

A. <18 years of age.
B. Methadone use within the past 72 hours.
C. Unable to consent (e.g. AMS).
D. Significant medical illness.
E. Known allergy to buprenorphine.
F. COWS <7.
G. No history of opioid use disorder (OUD).

Side Effects

A. Like all opioids, buprenorphine administered to a patient without a history of opioid use disorder may cause somnolence and respiratory depression.

Notes and Precautions

A. Buprenorphine can cause worsened opiate withdrawal symptoms if given to patients who are not in withdrawal. If opioid withdrawal symptoms are not improved or worsened with buprenorphine, additional buprenorphine and other medications are typically needed.

B. Buprenorphine rarely causes respiratory depression in patients who are not opioid naïve.

C. Buprenorphine is a schedule III controlled substance. Follow your agency's controlled substance policy for control and monitoring of use.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Opioid Withdrawal with COWS Score ≥7	16 mg	SL	May repeat after 10 minutes with additional 8 mg dose (32 mg MAX)
Pediatric			
Pediatric - not indicated for patients < 18 years old			

Calcium Gluconate

Class

Membrane stabilizer and antidote

Actions

Calcium is the most common cation in the human body and the majority of the body stores are located in bone. It is critical in many different cellular processes and is essential for the functional integrity of muscle (skeletal, smooth and cardiac) and nervous tissues.

Indications

A. As a membrane stabilizer in suspected hyperkalemia. Reverses ECG changes pending correction of the extracellular potassium concentration.

B. As an potential antidote in suspected calcium channel blocker overdoses, hydrofluoric acid poisoning and iatrogenic magnesium intoxication.

Precautions

A. Calcium gluconate can be administered IV/IO only.

B. In patients with a pulse, administer slowly (over 30-60 seconds) and stop if the patient complains of pain. Inject using a small needle in large vein and do not mix with bicarbonate.

C. Rapid IV administration can cause bradycardia, vasodilatation, hypotension, syncope and local burning.

D. Avoid use with patients who are on digoxin since calcium can augment the positive inotropic and negative chronotropic effects of digitalis preparations.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Hyperkalemia* with pulse Calcium Channel Blocker OD	One 10 mL vial calcium gluconate 10% May repeat x2 then contact OLMC	IO, Slow IV (over 30 – 60 seconds) Use a proximal port	One 10 mL vial = 1 gram
Hyperkalemia with Cardiac Arrest	Three 10 mL vials	IO, Slow IV push over 5-10 seconds	
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Hyperkalemia* Calcium Channel Blocker OD	0.5 mL/kg of calcium gluconate 10%, MAX 10 mL May repeat x2 then contact OLMC	IO, Slow IV (over 30 – 60 seconds) Use a proximal port	

NOTES:

*Wide Complex Arrhythmia with HX of Renal Failure (see Cardiac Dysrhythmias protocol)

Preparation

One vial of 10 mL calcium gluconate 10% contains 1 gram of calcium gluconate salt (= 93mg elemental calcium or 4.6 mEq calcium or 2.3 mmol calcium)

Dexamethasone (Decadron®)

Class

Corticosteroid

Actions

Dexamethasone is a synthetic steroid that suppresses acute and chronic inflammation. In addition, it potentiates vascular smooth muscle relaxation by beta-adrenergic agonists and may alter airway hyperactivity.

Indications

A. Moderate to severe asthma/COPD.

B. Severe allergic reaction.

C. Croup.

Contraindictions

Do not use in patients with known hypersensitivity to corticosteroids.

Precautions

May cause hypertension and hyperglycemia.

Side Effects and Notes

May cause nausea, vomiting, headache, or dizziness.

Adult ≥ 40 kg			
Indication	**Dose**	**Route(s)**	**Special**
Respiratory distress, severe allergic reactions	10 mg	IV, IO, IM, PO	May use flavoring, if available, for PO dosing
Pediatric < 40 kg			
Indication	**Dose**	**Route(s)**	**Special**
Respiratory distress, severe allergic reactions, croup	0.6 mg/kg up to 10 mg	IV, IO, IM, PO	May use flavoring, if available, for PO dosing

Dextrose 50% / 10%

Class

Carbohydrate

Actions

Glucose is the body's basic fuel. It produces most of the body's quick energy. Its use is regulated by insulin, which stimulates storage of excess glucose from the bloodstream and glucagon that mobilizes stored glucose into the bloodstream.

Indications

A. Hypoglycemic states usually associated with insulin shock in diabetes.

B. The unconscious patient, when a history is unobtainable.

C. In hypoglycemic patients with any focal or partial neurologic deficit or altered mental status.

Precautions:

A. Extravasation of dextrose 50% will cause necrosis of tissue.

B. IV should be secure and free return of blood into the syringe or tubing should be checked 2 to 3 times during administration.

C. Report extravasation of the drug to receiving hospital personnel and document on Prehospital Care Report.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Hypoglycemia (Altered Mental Status)	25 - 50 mL D50% or 125 - 250 mL D10%	Slow IV or IO	Can give orally
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Hypoglycemia (Altered Mental Status)	5 mL/kg D10% MAX 250 mL D10%	Slow IV or IO	May repeat once Can give orally

Side Effects/Special Notes:

A. Recent research suggests that hyperglycemia may complicate or worsen a number of medical conditions (i.e., myocardial infarction, stroke).

1. Dextrose 50% / 10% should be given whenever hypoglycemia is documented by blood glucose meters.

2. If these objective findings are not available, the EMS Provider should use judgment based on signs and history.

Side Effects/Special Notes

B. To obtain 50 mL D10. Using a D50 preload syringe, discard 40 mL of the D50 and replace it with 40 mL normal saline and you get 50 mL of D10.

To obtain 100 mL of D10: Using 100 mL bag of NS, remove and discard 20 mL of the NS and replace it with 20 mL of D50.

To obtain 250 mL of D10: Using a 250 mL bag of NS, remove and discard 50 mL of NS and replace it with 50 mL of D50.

C. D10 is preferred for intraosseous route.

Desired amount of D10	Initial solution	Amount of initial solution to be discarded	Amount of D50 replacement solution	Final Solution
50 mL	50 mL of D50	40 mL of D50	40 mL of NS	50 mL of D10
100 mL	100 mL of NS	20 mL of NS	20 mL of D50	100 mL of D10
250 mL	250 mL of NS	50 mL of NS	50 mL of D50	250 mL of D10

Diphenhydramine (Benadryl®)

Class

Antihistamine

Pharmacology and Actions

A. Blocks action of histamines released from cells during an allergic reaction.
B. CNS effects which may stimulate or depress the CNS depending on the individual's response.
C. Anticholinergic, anti-parkinsonian effect, which is used to treat acute dystonic reactions to anti-psychotic drugs (e.g., Haldol®, Thorazine®, Compazine®).
These reactions include:
1. Oculogyric (nystagmus) crisis.
2. Acute torticollis.
3. Facial grimacing.

Indications

A. Allergic reactions.
B. To counteract acute dystonic reactions to anti-psychotic drugs.
C. A second-line drug in anaphylaxis and severe allergic reactions (after epinephrine).

Precautions:

A. May have additive effect with alcohol or other CNS depressants.
B. Although useful in acute dystonic reactions it is not an antidote to phenothiazine toxicity or overdose.
C. May cause hypotension when given IV/IO.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Anaphylaxis	1 mg/kg to MAX of 50 mg	IV, IO or deep IM, or PO	Not first line for anaphylaxis
EPS	1 mg/kg to MAX of 50 mg	IV, IO or deep IM, or PO	
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Anaphylaxis	1 mg/kg to MAX of 40 mg	IV, IO or deep IM, or PO	Not first line for anaphylaxis
EPS	1 mg/kg to MAX of 40 mg	IV, IO or deep IM, or PO	

Side Effects/Special Notes:

A. It is **not** the first-line drug for severe allergic reactions, but may be useful for long transports.

Epinephrine

Class

Sympathetic agonist

Actions

A. Catecholamine with alpha and beta effects.

B. In general, the following cardiovascular responses can be expected:

1. Increased heart rate
2. Increased myocardial contractile force
3. Increased systemic vascular resistance
4. Increased arterial blood pressure
5. Increased myocardial O_2 consumption
6. Increased automaticity

C. Potent bronchodilator.

Indications

A. Ventricular fibrillation

B. Asystole

C. Pulseless Electrical Activity (PEA)

D. Systemic allergic reactions

E. Asthma

Precautions

A. Epinephrine increases cardiac work and can precipitate angina, MI, or major dysrhythmias in an individual with ischemic heart disease.

B. Wheezing in an elderly person is pulmonary edema or pulmonary embolus until proven otherwise.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Ventricular fibrillation, Asystole, PEA	1:10,000 1 mg IV/IO Repeat every 3-5 min.	IV, IO	
Anaphylaxis	0.3 - 0.5 mg 1:1,000 IM; may repeat once in 5-15 minutes **OR** 1:10,000 0.1 mg boluses IV/IO every 3-5 min titrated to effect. MAX dose 0.5 mg.	IM, IV, IO	
Asthma	0.3 - 0.5 mg 1:1,000 IM	IM	
Beta blocker OD	2 - 10 mcg/min via drip	IV, IO	
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Ventricular fibrillation, Asystole, PEA	1:10,000 0.01 mg/**kg** IV/IO.	IV, IO	
Anaphylaxis	0.01 mg/**kg** of 1:1,000 IM; may repeat once in 5-15 min to a MAX of 0.5 mg **OR** 1:10,000 0.01 mg/**kg** (MAX 0.1 mg) IV boluses every 3-5 min titrated to effect. MAX total dose 0.5 mg.	IM, IV, IO	
Asthma	0.01 mg/**kg** of 1:1,000 IM MAX dose 0.5 mg.	IM	Contact OLMC for additional dosing.
Respiratory distress	1 mL of 1:1,000 diluted in 4 mL normal saline -or- Racemic Epinephrine (see drug page).	Nebulizer	Audible stridor at rest: may repeat after 20 min. Bronchiolitis: may repeat every 10 min.; discontinue if heart rate is >200. Contact OLMC for additional dosing.

Side Effects/Special Notes:

A. Anxiety, tremor, headache

B. Tachycardia, palpitations, PVCs

C. Angina, hypertension

Push Dose Epinephrine

Introduction

Bolus dose pressors and inotropes have been used by the anesthesiologists for decades for treatment of short-lived hypotension, e.g. post-intubation or during sedation.

Indications

A. Severe shock (MAP < 50 mmHg or SBP < 60 mmHg) not responsive to fluids.
B. A bridge to drip pressors while they are being mixed.
C. Short-lived hypotension, e.g. post-intubation or during sedation.

Contraindictions

Cardiac arrest.

Onset

1 minute

Duration

5-10 minutes

Mixing Instructions:

A. 10 ml syringe with 9 ml of normal saline.
B. In this syringe, draw up 1 ml of epinephrine 1:10,000 (amp contains 100 mcg/ml epinephrine).
C. Result is 10 ml of epinephrine 10 mcg/ml (or 100 mcg per syringe).

Dose

Adult: 1 mL every 1-5 minutes (10 micrograms)
Pediatric: 1 microgram/kg every 1-5 minutes (10 micrograms MAX)

Precautions

Concentration is low enough that extravasation is not a concern.

Route

IV/IO

Racemic Epinephrine

Pharmacology and Actions

Racemic epinephrine is a mixture consisting of d-Epinephrine and l-Epinephrine enantiomers. Epinephrine causes smooth muscle relaxation on various tissues, including bronchial smooth muscles. It also results in vasoconstriction of airway soft tissues when nebulized.

Indications

A. Suspected croup in patients 6 months to 6 years who have audible stridor at rest.

Contraindictions

Life threatening cardiac arrhythmias (i.e. ventricular tachycardia, unstable SVT).

Precautions

A. Monitor efficacy to nebulization by clinical status, oxygen saturation and respiratory rate and work of breathing.

B. Monitor response to heart rate and blood pressure.

C. Administer via nebulization ONLY.

D. DO NOT administer IV/ IO/ IM/ IN.

Side Effects and Notes

A. Tachycardia, hypertension

B. Tremors, nervousness, seizures

Adult Dose

Not used for adults in the prehospital setting.

Pediatric Dose

11.25 mg (0.5 ml) diluted in 2.5 ml normal saline, nebulized. May repeat once. Contact OLMC for additional dosing.

Esmolol (Brevibloc®)

Class
Antiarrhythmic beta-blocker.

Actions
Esmolol increases atrioventricular refractory time, decreases oxygen demand of the myocardium, and decreases atrioventricular conduction. Esmolol is rapidly absorbed, the onset of action is within 60 seconds, and it maintains a steady-state within 5 minutes of initiation of infusion. Therapeutic half-life of esmolol is approximately 2-5 minutes.

Contraindictions
Life threatening cardiac arrhythmias (i.e. ventricular tachycardia, unstable SVT).

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Refractory VF Pulseless VT	500 mcg/kg (0.5 mg/kg)	IV, IO bolus	May repeat x1 if defibrillation following esmolol bolus is unsuccessful.
ROSC	100 mcg/kg/min	IV infusion	Administer esmolol at a dose of 100 mcg/kg/min IV infusion
Pediatric – not recommended for refractory VF/pulseless VT			

Preparation
A. Esmolol is packaged 100 mg in 10 mL vials. This is equal to 100,000 mcg in 10 mL.
B. For average 70 kg patient, this would equal 35 mg or 3.5 mL

Notes
A. Esmolol is not to be used until both doses of amiodarone.
B. Use in conjunction of Double Sequential External Defibrillation for patients > 40 kgs.
C. When administered with sodium bicarbonate, flush IV/IO line before and after administration of esmolol.

Esmolol bolus dosing (500 mcg/kg) Concentration 10 mg/ml			
Weight (kg)	Dose (mcg)	Dose (mg)	Volume (ml)
30	15,000	15	1.5
35	17,500	17.5	1.75
40	20,000	20	2.0
45	22,500	22.5	2.3
50	25,000	25	2.5
55	27,500	27.5	2.8
60	30,000	30	3.0
65	32,500	32.5	3.3
70	35,000	35	3.5
75	37,500	37.5	3.8
80	40,000	40	4.0
85	42,500	42.5	4.3
90	45,000	45	4.5
95	47,500	47.5	4.8
100	50,000	50	5.0
105	52,500	52.5	5.3
110	55,000	55	5.5
115	57,500	57.5	5.8
120	60,000	60	6.0
125	62,500	62.5	6.3
130	65,000	65	6.5
135	67,500	67.5	6.8
140	70,000	70	7.0
145	72,500	72.5	7.3
150	75,000	75	7.5

Etomidate (Amidate®)

Class

Hypnotic

Actions

A hypnotic drug without any analgesic activity. Intravenous injection of etomidate produces hypnosis characterized by a rapid onset of action, usually within one minute. Duration of hypnosis is dose-dependent but relatively brief, usually 3-5 minutes.

Indications

A. Induction drug for use in rapid sequence intubation.

B. For sedation prior to cardioversion.

Precautions

A. Overdose may occur from too rapid or repeated injections.

B. Excessively rapid injection may be followed by a fall in blood pressure.

Adverse Reactions

A. The most frequent adverse reactions are transient venous pain on injection, and transient skeletal muscle movements, including myoclonus.

B. Nausea and/or vomiting.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Induction agent for RSI	0.3 mg/kg injected over 10 seconds	IV/IO	None
Cardioversion Sedation for Cardioversion	0.15 mg/kg	IV/IO	
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Induction agent for RSI	0.3 mg/kg injected over 10 seconds	IV/IO	None
Cardioversion Sedation for Cardioversion	0.15 mg/kg	IV/IO	

Fentanyl (Sublimaze)

Class

Synthetic opioid analgesic

Actions

A. Fentanyl is a potent, synthetic opioid analgesic that produces analgesia and sedation. Fentanyl is about 50-100 times more potent then morphine on a weight basis. 100 micrograms (0.1 mg) is approximately equivalent in analgesic activity to 10 mg of morphine. Fentanyl produces remarkably few hemodynamic changes and hypotension is rarely observed.

B. Onset of action when given IV is 2 to 3 minutes; peak effect occurs at 3 to 5 minutes and lasts 15 to 45 minutes.

Indications

A. Pain due to burns or isolated extremity injuries.

B. Suspected ischemic chest pain unresponsive to nitroglycerin.

C. Sedation post intubation.

Contraindications

A. Known allergy to fentanyl.

B. A blood pressure less than 100 mm/Hg.

C. Respiratory rate less than 14 breaths per minute, O_2 saturation less than 90%, or significant respiratory depression. For pediatric patients, vital signs should be maintained within the normal age-appropriate range.

Precautions

A. Fentanyl can cause respiratory depression that is reversible with naloxone. This respiratory depression is exacerbated by underlying lung diseases and use of the other respiratory depressant drugs (benzodiazepines, alcohol, cyclic antidepressants, etc.).

B. Naloxone and respiratory support must be available when administering fentanyl.

C. Check and document vital signs and patient response after each dose.

D. If administered rapidly and in very large doses, fentanyl can cause muscle spasm and chest wall rigidity. The only reliable treatment for this is neuromuscular blockade.

E. The action of fentanyl is prolonged and its elimination slower in the elderly. Smaller maintenance doses are advisable.

F. Fentanyl must be used cautiously in patients that have already received morphine for prehospital analgesia.

Adult ≥ 40 kg			
Indication	**Dose**	**Route(s)**	**Special**
Isolated extremity fractures, burns, chest pain	25-100 micrograms IV/IO; may repeat every 3-5 min as needed to a MAX of 400 micrograms. OR 25-100 micrograms IM/IN; may repeat every 15 min to a MAX of 400 micrograms.	IV/IO IM/IN	Do not give if BP is <100 mmHg systolic
Post intubation	50 – 100 micrograms	IV/IO	
Pediatric <40 kg			
Indication	**Dose**	**Route(s)**	**Special**
Isolated extremity fractures, burns	1 microgram/kg IV/IO; repeat with 0.5-1 microgram/kg every 3-5 minutes as needed to a MAX total dose of 4 micrograms/kg. OR 2 micrograms/kg IM/IN; may repeat every 15 minutes to a MAX total dose of 4 micrograms/kg. Do not exceed adult dosing.	IV/IO IM/IN	
Post intubation	1 micrograms/kg	IV/IO	

Side Effects/Special Notes

A. If hypotension develops, it is usually responsive to naloxone administration and Trendelenburg position. If hypotension persists, follow the ***Shock*** protocol.

B. Follow your agency policy for control and monitoring of use.

C. The goal of fentanyl administration is patient comfort. (The goal is not total elimination of pain, but reduction in perception of pain by the patient.)

Furosemide (Lasix®)

Class

Diuretic

Actions

Potent diuretic with a rapid onset of action and short duration of effect. It acts primarily by inhibiting sodium reabsorption throughout the kidney. Increase in potassium excretion occurs along with the sodium excretion. As an IV bolus, causes immediate (3 to 4 min.) increase in venous capacitance. This decreases venous congestion and probably accounts for its immediate effect in pulmonary edema. Peak effect: 1/2 to 1 hour after IV administration, duration about 2 hours. (Duration 6 to 8 hours if given orally, with a peak in 1 to 2 hours.)

Indications

Acute pulmonary edema: To decrease extracellular volume and reduce venous pressure on the lungs in cardiac failure.

Precautions

A. Contraindicated in hypovolemia or hypotension.

B. Can lead to profound diuresis with resulting shock and electrolyte depletion. Therefore, do not use in hypovolemic states, and monitor closely, particularly after IV administration.

C. Call OLMC for use in patients 18 years of age or younger.

D. Should not be used in pregnant women.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Pulmonary Edema	If patient is not currently taking furosemide, give 20 mg IV/IO. If patient is taking furosemide, give 40 mg IV/IO.	IV, IO	
Pediatric - not indicated for pediatric patients. Contact OLMC.			

Side Effects/Special Notes

A. Hypovolemia, hypotension, hyponatremia, and hypokalemia are the main toxic effects.

1. Because of the potency and need for close monitoring, furosemide should only be given with specific indications.

2. Other toxic effects are usually not related to single-dose use.

B. Patients who are on digitalis, and are having arrhythmias consistent with digitalis toxicity may need lower doses of furosemide. Contact OLMC.

Glucagon

Class

Antihypoglycemic agent

Actions

Glucagon is a hormone that causes glucose mobilization in the body. It works opposite to insulin, which causes glucose storage, and it is present normally in the body. It is released at times of insult or injury when glucose is needed and mobilizes glucose from body glycogen stores. Return to consciousness should be within 20 minutes of an IM dose if patient is hypoglycemic.

Indications

Known hypoglycemia (preferably demonstrated by blood glucose determination) when patient is confused or comatose, and dextrose solution is not available, or an IV line cannot be started.

Precautions

IV glucose or dextrose is the treatment of choice for hypoglycemia. Use of glucagon is restricted to patients who are seizing, comatose, combative, or with collapsed veins and in whom an IV cannot be started.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Hypoglycemia	1 mg	IM	May not be effective in malnourished patients
Pediatric			
Hypoglycemia	0.02 mg/~~kg~~ to a MAX 1 mg	IM	

Side Effects/Special Notes

A. Nausea and vomiting may occur.

B. Persons with no liver glycogen stores (malnutrition, alcoholism) may not be able to mobilize any glucose in response to glucagon.

C. May be useful in treating life-threatening beta-blocker overdoses (call OLMC for IV/IO doses).

Glucose, Oral

Class

Carbohydrate

Actions

Glucose is the body's fuel. It produces most of the body's quick energy. Its use is regulated by insulin that stimulates storage of excess glucose from the bloodstream and glucagon that mobilizes stored glucose into the bloodstream.

Indications

The conscious patient where a suspicion of hypoglycemia exists or a blood glucose measurement indicates a low blood glucose level (equal to or less than 60 mg% or glucose less than 80 mg% in a symptomatic patient).

Precautions

To give solutions orally, patient must be continually assessed for the ability to protect his/her own airway.

Side Effects/Special Notes

A. Recent research suggests that hyperglycemia may complicate, or worsen, a number of medical conditions, i.e., myocardial infarction, stroke.

1. Oral glucose should be given to a conscious patient whenever hypoglycemia is documented by blood glucose meter or colorimetric reagent strips.

2. If these objective findings are not available, the EMS Provider should use judgment based on signs and history.

B. Effect is delayed in the elderly and people with poor circulation.

C. If patient is unconscious support ABCs.

D. May be more tolerable if administered with liquid between dosages.

E. Patient's condition may require repeated doses.

Haloperidol (Haldol®)

Class

Major tranquilizer

Actions

A. Is a potent neuroleptic agent that is available in either an intravenous or intramuscular injection.

B. Produces marked tranquilization and sedation; it allays apprehension and provides a state of mental detachment and indifference while maintaining a state of reflex alertness.

C. Potentiates other CNS depressants.

1. It produces mild alpha-adrenergic blockade, peripheral vascular dilation, reduction of the pressor effect of epinephrine, and has an anti-emetic effect.

2. It can produce hypotension and decreased peripheral vascular resistance.

D. The onset of action of a single IV dose is from 5 to 15 minutes following administration, and the peak effect may not be apparent for up to 30 minutes. Duration is generally from 2 to 6 hours.

Indications

A. Sedation of combative patients to facilitate restraint.

Contraindications

A. Known allergy to haloperidol.

Precautions

A. Hypotension may occur; IV fluids and other measures to manage hypotension should be readily available.

B. Use caution when administering haloperidol to patients who have taken other CNS depressant drugs (barbiturates, tranquilizers, alcohol).

C. Haloperidol may induce Torsades de Pointes. Monitor the patient's ECG Q-T interval following use.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Patient Restraint	5-10 mg	IV, IO, IM	Monitor ECG MAX dose 10 mg IV, IO, IM
Pediatric - contact OLMC			

Side Effects/Special Notes

A. Common side effects are hypotension and tachycardia; these effects usually subside without treatment. If hypotension is severe or persists, give fluids.

B. Extrapyramidal symptoms (acute dystonic reactions) have occurred following administration. These are not life threatening and generally do not require treatment. Diphenhydramine may be considered if treatment deemed necessary.

C. Use caution when administering haloperidol to patients who have taken other CNS depressant drugs (barbiturates, tranquilizers, alcohol). Haloperidol may have additive or potentiating effects, and the dosage should be reduced.

D. Haloperidol should be used with caution in patients with a seizure disorder or condition that causes seizures; other similar neuroleptics are known to lower the seizure threshold.

Hydroxocobalamin (Cyanokit®)

Class

Cyanide antidote

Actions

A. Hydroxocobalamin (Vitamin B12a) is an effective antidote in the treatment of cyanide poisoning based on its ability to bind cyanide ions. Each hydroxocobalamin molecule can bind one cyanide ion to form cyanocobalamin (vitamin B12), which is then excreted in the urine.

B. Cyanide is an extremely toxic poison. In the absence of rapid and adequate treatment, exposure to a high dose of cyanide can result in death within minutes due to inhibition of cytochrome oxidase resulting in arrest of cellular respiration.

Indications

Cyanide poisoning or smoke inhalation with suspected cyanide poisoning due to the presence of coma, persistent hypotension or cardiorespiratory arrest.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Cyanide poisoning	5 grams	IV, IO over 15 minutes	Depending on the severity of the poisoning and the clinical response, a second dose of 5 grams may be administered (after OLMC contact) up to a total dose of 10 grams.
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Cyanide poisoning	70 mg/kg	IV, IO over 15 minutes	Depending on the severity of the poisoning and the clinical response, a second dose of 70 mg/kg may be administered (after OLMC contact) to a MAX total dose of 10 grams.

Preparation

Reconstitute the 5 gram vial of hydroxocobalamin with 200 mL of IV fluid (Lactated Ringers or Normal Saline). Hydroxocobalamin has physical (particulate) and chemical incompatibilities with many medications and it is best to administer all other drugs or products (e.g., blood) through a separate intravenous line. **Hydroxocobalamin (Cyanokit®) and sodium thiosulfate may be administered to the same patient but NOT simultaneously.**

Side Effects/ Special Notes

A. The most frequently occurring side effects are chromaturia (red-colored urine) and erythema (skin redness) which occur in nearly all patients.

B. Other reported serious side effects include allergic reactions, temporary increases in blood pressure, nausea, headache and infusion site reactions.

C. Because of its deep red color, hydroxocobalamin has been found to interfere with certain laboratory tests based on light absorption including co-oximetric measurements of carboxyhemoglobin, methemoglobin and oxyhemoglobin.

D. If patient has suspected cyanide poisoning, consider obtaining SpCO, if available, before administration of Cyanokit® since the latter will interfere with the carboxyhemoglobin monitor.

Ibuprofen

Class

Nonsteroidal anti-inflammatory drug (NSAID)

Actions

Ibuprofen, from isobutylphenylpropanoic acid, is a nonsteroidal anti-inflammatory drug (NSAID) used for relieving pain, lowering fever and reducing inflammation. Like other NSAIDs, it works by inhibiting the synthesis of prostaglandins, involved in mediating inflammation (swelling), pain, and fever.

Indications

A Mild to moderate pain (Example: 1-4 on pain scale)

Contraindications

A. Aspirin allergy or any allergic reaction after taking aspirin or other NSAID.
B. Patients less than 6 months old.
C. Immediate post-CABG heart surgery.

Precautions

A. Ibuprofen may cause a severe allergic reaction, especially in people who are allergic to aspirin.
B. Use with caution in patients with renal insufficiency
C. May cause stomach bleeding especially in patients:
  1. Older than 60 years.
  2. Who have had stomach ulcers or bleeding problems.
  3. Take blood thinners.
  4. Take other medications containing NSAIDs.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Mild to moderate pain Example: 1-4 on pain scale (headache, muscle aches, arthritis, backache, toothaches)	600 mg	Oral	Do not use if known allergy to aspirin or NSAID's
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Mild to moderate pain	**10 mg/kg PO to MAX of 600 mg**	Oral	Do not administer to patients less than 6 months old Follow dose chart in Pediatric Guide

Ipratropium Bromide (Atrovent®)

Class

Atropine derivative used for inhalation.

Actions

A. It is a relatively weak bronchodilator.

B. It has no anti-inflammatory effects and does not decrease bronchial hyper-responsiveness.

C. Onset of action is slower than beta agonists.

Indications

A. Used as a supplement to beta agonists in patients with asthma and COPD.

B. It has been shown to be beneficial in children with moderate to severe asthma, is probably beneficial in adults and may be better tolerated than beta agonists in the elderly.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Asthma	0.5 mg	Nebulized	
COPD	0.5 mg	Nebulized	
Pediatric - same as adult. Do not dilute for pediatric patients.			

Side Effects/Special Notes

Ipratropium (meter dose inhaler, autohaler only) should not be administered to individuals allergic to soya lecithin or related food products, e.g., soya beans or peanuts. Current formulations of NEBULIZED ipratropium do not contain these agents and can be administered to individuals allergic to soya lecithin.

Ketamine (Ketamine Hydrochloride)

Trade Name: Ketalar

Class

Sedative, Analgesic

Actions

A. Phencyclidine derivative causes "dissociative anesthesia" characterized by profound analgesia and amnesia with retention of protective airway reflexes, spontaneous respirations and cardiopulmonary stability. Dissociative anesthesia results in a patient who does not appear to be anesthetized and can swallow and open eyes but does not process information or pain.

B. Keeps airway reflexes intact.

Indications

A. May be used for analgesia and sedation for painful procedures or painful conditions.

B. Preinduction agent for rapid sequence intubation.

Contraindications

A. Coronary artery disease.

B. Pregnancy.

C. Infants under 3 months.

D. Tracheal stenosis or tracheomalacia.

E. Acute globe injury or glaucoma.

F. Known or suspected schizophrenia.

Precautions

A. Administer one time dose of midazalam 2.5 mg IV/IO/IM in adults to prevent/treat negative emergence reaction.

B. Midazolam is not necessary in children.

C. Monitor closely for laryngospasm.

D. Administer ketamine by slow IV/IO push (over 60 seconds).

E. Ketamine should be dosed by ideal body weight and not actual body weight

F. Ketamine may be the preferred pre-induction agent for young patients (<35 years) with severe asthma due to its bronchodilator effects.

Indication	Dose	Routes	Special
	Adult		
Preinduction Rapid Sequence Intubation	1 mg/kg Ideal Body Weight	IV/IO	Requires midazolam after intubation.
Analgesia and sedation for painful procedures or conditions	15 mg	IV, IO, IM	Pain not relieved after MAX of 400 micrograms of fentanyl. May repeat once after 30 minute. Administer one time dose of midazolam 2.5 mg IV/IO/IM in adults to prevent/treat negative emergence reaction.
	Pediatric		
Preinduction Rapid Sequence Intubation	1 mg/kg Ideal Body Weight	IV/IO	Requires midazolam after intubation.
Analgesia and sedation for painful procedures or conditions	Not approved for pediatric pain control		Use in patients ≥ 15 years old

Side Effects

A. May include transient laryngospasm (0.1%), transient apnea or respiratory depression (0.8%), hypersalivation (rare), emesis (usually well into recovery 8.4%), recovery agitation (mild in 6.3%, clinically important in 1.4 %), muscular hypertonicity and random purposeless movements (common), clonus, hiccupping or short lived non- allergic rash of face and neck.

B. Emergence reaction can occur in 5-30% of patients.

C. May cause hypertension, increase cardiac output and myocardial oxygen consumption.

Administrative Notes

A. Administration of ondansetron 8 mg may reduce the incidence of vomiting.

B. The IV/IO route is preferred in adults.

C. Administered intravenously, the onset of action is rapid within 1-2 minutes (causing minimal pain at the injection site), and the duration of action is approximately 15-30 minutes.

D. A single dose of midazolam 2.5 mg MAX IV/IO/IM is required for analgesia and sedation for painful procedures or conditions.

E. Ketamine can be used as a first line agent for patients who are:

1. prescribed opiates for chronic pain.

2. use illicit opiates on a continued basis.

3. are prescribed methadone, buprenorphine (Suboxone, Zubsolv, Bunavail), naltrexone.

Ketorolac Tromethamine (Toradol®)

Class:

Antihypertensive, alpha and beta blocker

Actions

A. Ketorolac works by inhibiting cyclooxygenase-1 and -2 enzymes to block the synthesis of prostaglandins which reduces inflammation and pain.

Indications

A. Age 2-64 years old.
B. Musculoskeletal pain.
C. Flank pain from suspected kidney stone(s).
D. Back pain.

Contraindications

A. Patients entered into trauma system.
B. History of renal failure, renal insufficiency or kidney transplant
C. History of liver disease.
D. Allergies to aspirin or other NSAIDs.
E. Known pregnancy or lactating females.
F. Patient currently taking anticoagulants.
G. Actively bleeding or suspected internal hemorrhage.
  i. clotting disorder (e.g. hemophilia)
  ii. suspected intracranial hemorrhage
H. History of ulcer or GI bleed.
I. Suspected cardiac chest pain.

Side Effects/Special Notes

A. Burning or pain at injection site.
B. Nausea, vomiting, dizziness, headache.
C. Itching, flushing.
D. May prolong bleeding time; use caution in patients with coagulation disorders.
E. Use caution in known or suspected fractures due to risk of bleeding.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Pain management	15mg IV or 30 mg IM	IV, IM	Contraindications as noted above
Pediatric ≤ 40 kg			
Indication	**Dose**	**Route(s)**	**Special**
Pain management	0.5 mg/kg IV to MAX of 15 mg OR 1 mg/kg IM to MAX of 30 mg	IV, IM	Do not exceed adult dose Do not repeat

Labetalol (Normodyne)

Class:

Antihypertensive, alpha and beta blocker.

Actions

Labetalol possesses both selective, competitive alpha1-adrenergic blocking and nonselective, competitive beta-adrenergic blocking activity. These actions decrease blood pressure without reflex tachycardia and without a significant reduction in heart rate.

Dose

A. 10 mg slow IV/IO push over 1-2 minutes .
B. Labetalol may be repeated twice (up to 3 total doses) every 15 minutes (doubling doses if needed depending on effect of preceding dose; eg. 1st dose - 10mg, 2nd dose - 20mg, 3rd dose - 40mg).
C. Stop administration if HR <60 bpm or other adverse effects.
D. Maximum dose of labetalol is 70 mg.

Indications

A. Hypertension in pregnant or postpartum patients.

Contraindications

A. Known hypersensitivity.
B. 2nd or 3rd degree heart block.
C. Severe bradycardia.
D. Cardiogenic shock.
E. Severe bronchospasm.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Hypertension in pregnant or postpartum patients	10 mg over 1-2 minutes	IV, IO	May be repeated twice (up to 3 total doses) every 15 minutes

Side Effects/Special Notes

A. Peak effect from IV/IO route is within 5 minutes.
B. Potentiates hypotension with nitroglycerin.
C. Symptomatic postural hypotension, ventricular dysrhythmia, and rarely syncope, bradycardia, and heart block, dizziness, tingling of the scalp/skin, numbness, vertigo, wheezing, bronchospasm, nausea/vomiting.
D. Target systolic BP 140-150 mmHg and diastolic BP 90-100 mmHg.

Lidocaine (Xylocaine®)

Class

Antiarrhythmic agent

Actions

A. Depresses automaticity of Purkinje fibers; therefore, raises stimulation threshold in the ventricular muscle fibers (makes ventricles less likely to fibrillate).

B. Little antiarrhythmic effect at subtoxic levels on atrial muscle.

C. CNS stimulation: Tremor, restlessness and clonic convulsions followed by depression and respiratory failure at higher doses.

D. Cardiovascular effect: decreased conduction rate and force of contraction, mainly at toxic levels.

E. The effect of a single bolus on the heart disappears in 10 to 20 minutes due to redistribution in the body. Metabolic half-life is about 2 hours and, therefore, toxicity develops with repeated doses.

Indications

A. Recurrent ventricular tachycardia if clinical condition is not rapidly deteriorating.

B. Recurrent ventricular fibrillation.

C. Following successful defibrillation or cardioversion from ventricular tachycardia.

D. For anesthetic purposes after inserting an intraosseous needle in a conscious or semi-conscious patient.

Precautions

A. Use with extreme caution in presence of advanced AV block or heart rate less than 50 beats per minute.

B. In atrial fibrillation or flutter, quinidine-like effect may cause alarming ventricular acceleration.

C. Lidocaine is generally not recommended for treatment of supra-ventricular arrhythmias.

D. Midazolam should be available to treat convulsions if they occur.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Recurrent VF	**Bolus:** 1.5 mg/kg (3 mg/kg MAX) **Maintenance:** 0.75 mg/kg q 10 minutes (No MAX)	IV, IO	
IO needle insertion (conscious or semi-conscious)	0.5 mg/kg (MAX 50 mg)	IO	*Slowly* (over 120 seconds) Wait 30-60 seconds before "power" flush
Pediatric - same as adult. Do not dilute for pediatric patients.			

Side Effects/Special Notes

A. Side effects:
- **1.** CNS disturbances
  - **a.** Sleepiness
  - **b.** Dizziness
  - **c.** Disorientation
  - **d.** Confusion
  - **e.** Convulsions
- **2.** Hypotension:
  - **a.** Decreased myocardial contractility.
  - **b.** Increased AV block at toxic levels only.
- **3.** Rare instances of sudden cardiovascular collapse and death.

B. Lidocaine bolus therapy requires initial loading dose (1.5 mg/**kg**) followed by 1/2 of the initial loading dose (0.75 mg/**kg**) every 10 minutes in patients who do not have shock or impaired metabolism.
For patients with impaired metabolism (e.g., hepatic disease, shock, congestive heart failure, or age greater than 70 years) the initial loading dose is the same (1.5 mg/**kg**) followed by 1/4 of the initial loading dose (0.37 mg/**kg**) every 10 minutes.

C. Toxicity is more likely in elderly patients.

D. As many as 50% of patients who develop ventricular fibrillation in the setting of an acute myocardial infarction may have no warning arrhythmias.

E. Administration of lidocaine is not indicated in Cardiac Arrest unless VF/PVT was present during resuscitation.

Magnesium Sulfate

Class

Antiarrhythmic agent; Anticonvulsant

Actions

Magnesium is a cation that is present in human cells and intercellular fluid. It acts as an antiarrhythmic agent and may convert ventricular fibrillation and tachycardia.

Indications

A. Torsades de Pointes.

B. Magnesium sulfate is also used to treat and prevent seizures in women with pre-eclampsia.

C. In prolonged transport time with severe asthma, consider magnesium sulfate (usual dose is 2 grams over 20 minutes).

Precautions

In the non-arrest patient, magnesium may cause hypotension, bradycardia, or decreased reflexes.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Torsades de Pointes	2 grams over 1-2 minutes	IV, IO	
Eclampsia	**Contact OLMC**	IV, IO	
Asthma	2 grams over 20 minutes	IV, IO	
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Torsades de Pointes	25 mg/kg over 1-2 minutes	IV, IO	
Asthma	50 mg/kg slow over 20 minutes	IV, IO	

Midazolam (Versed®)

Class

Benzodiazepine

Actions

Midazolam acts as a CNS depressant, anticonvulsant, and given IV/IO or IM/IN may cause amnesia.

Indications

A. Seizures.

B. To relieve anxiety and produce amnesia.

C. Pharmacological restraint.

D. Shivering during induced hypothermia process.

E. After ketamine administration to prevent emergence reaction.

F. For myoclonus after sedation with etomidate only for cardioversion.

Side Effects

A. Common side effects include drowsiness, dizziness, fatigue and ataxia, respiratory depression and hypotension.

B. Most likely to produce respiratory depression in patients who have taken other depressant drugs, especially opioids, alcohol and barbiturates, or when given rapidly.

Precautions

Since midazolam can cause respiratory depression and or hypotension, the patient must be monitored closely. If discrepancy exists, follow Treatment or Procedures protocol recommendations.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Seizures	2.5 - 5 mg IV/IO, or if no IV 10 mg IM/IN for seizures.	IV, IO, IM, IN	Repeat every 3-5 min until seizure stops. No OLMC.
Combative Patients	5 - 10 mg IM/IN for combative patients	IM, IN	
Pacing, cardioversion, induced hypothermia shivering, post intubation agitation	2.5 - 5 mg IV/IO, or if no IV 5 mg IM/IN. May repeat once.	IV, IO, IM, IN	For additional dose, call OLMC.
RSI	2.5 - 5 mg IV/IO after successful intubation. May repeat every 15 min as needed to maintain sedation.	IV, IO	
Amnesia control after ketamine	2.5 mg one time dose.	IV, IO, IM	
Pediatric			
Seizures	0.1 mg/**kg** IV/IO (MAX of 10 mg) 0.3 mg/**kg** IM/IN (MAX of 10 mg)	IV, IO, IM, IN	Repeat every 3-5 min until seizure stops.
Combative Patients	0.1 mg/**kg** IV/IO (5 mg MAX) 0.2 mg/**kg** IM/IN (10 mg MAX)	IV, IO IM, IN	May repeat once after 5 min. Call OLMC if more needed.
RSI	0.1 mg/**kg** IV/IO MAX 2.5 mg after successful intubation. May repeat every 15 min as needed to maintain sedation.	IV, IO	
Cardioversion/tachycardia, pacing	0.1 mg/**kg** IV/IO MAX 5.0 mg	IV, IO	

Morphine Sulfate

Class

Opioid analgesic

Actions

A. Morphine (MS) is a potent opioid analgesic that induces drowsiness, mental clouding, and mood changes.

1. It also increases venous capacitance, decreases venous blood return (reduce preload), and reduces systemic vascular resistance at the arteriolar level (reduce afterload).

2. This may lead to decreases in myocardial oxygen demand.

B. Onset of action when given IV is 5 to 10 minutes; peak effect occurs at 15 to 30 minutes and lasts 3 to 4 hours.

Indications

A. Pain due to burns or extremity injuries.

B. Suspected ischemic chest pain unresponsive to nitroglycerin.

Contraindications

A. Known allergy to morphine or sulfates.

NOTE:

Sulfa drugs are not sulfates.

B. A blood pressure less than 100 mm/Hg.

C. Trauma or pain of the head or abdomen.

D. Respiratory rate less than 14 breaths per minute, O_2 saturation less than 90%, or significant respiratory depression. For pediatric patients, vital signs should be maintained within the normal age-appropriate range.

Precautions

A. Morphine causes respiratory depression that is reversible with naloxone. This respiratory depression is exacerbated by underlying lung disease (COPD, etc.) and other depressant drugs (Valium, alcohol, cyclic antidepressants, etc.).

B. Naloxone and respiratory support must be available when administering morphine.

C. Check and document vital signs and patient response after each dose.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Isolated extremity fractures, burns, chest pain	2-8 mg IV/IO every 3-5 min to a MAX of 20 mg. OR, 5-10 mg IM; may repeat 5 mg in 10-15 min to a MAX of 20 mg.	IV, IO, IM	Do not give if BP is <100 mmHg systolic
Pediatric			
Isolated extremity fractures, burns	**< 20 kg: 0.1 mg/kg.** **May repeat every 3-5 min p.r.n.** **Do not exceed adult dosing.**	IV, IO, IM	If >20 kg, follow adult dosing

Side Effects/Special Notes

A. If hypotension develops, it is usually responsive to naloxone administration and Trendelenburg position. If hypotension persists, follow the ***Shock*** protocol.

B. Follow your agency policy for control and monitoring of use.

C. The goal of morphine administration is patient comfort. (The goal is not total elimination of pain, but reduction in **perception** of pain by the patient.)

D. Morphine should be avoided in organophosphate poisonings.

E. Fentanyl is preferred drug: refer to ***Pain Management*** protocol.
Use morphine if fentanyl is not available or for patients already administered morphine (e.g., continuity of care, interfacility transfers).

Naloxone (Narcan®)

Class

Opioid antagonist

Actions

Naloxone is an opioid antagonist that competitively binds to opioid sites but which exhibits almost no pharmacologic activity of its own. Duration of action is 1 to 4 hours.

Indications

A. Reversal of opioid effects, particularly respiratory depression, due to opioid drugs either ingested, injected or administered in the course of treatment. Opioid drugs include Fentanyl, Demerol®, heroin, Dilaudid®, Percodan®, codeine, Lomotil®, methadone, propoxyphene (Darvon®), pentazocine (Talwin®).

B. Diagnostically in coma of unknown etiology to rule out (or reverse) opioid depression.

Precautions

A. In patients physically dependent on opioids, violent withdrawal symptoms may be precipitated.

B. Be prepared to restrain the patient.

C. Some opioid intoxications may require up to 8 mg of naloxone to reverse symptoms (e.g., methadone, designer drugs).

Side Effects/Special Notes:

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Reversal of opioid effects, coma of unknown etiology	If no IV present, 2 mg IM/IN. If IV already established, 0.5 mg IV may be repeated every 2 min up to 2 mg.	IV, IO, IM, IN	In most instances, a total dose of 2 mg IM/IN or IV/IO will be sufficient to reverse opioid intoxication. In some cases (methadone or designer drugs), larger doses of naloxone may be necessary. In these cases, additional doses of naloxone (2 mg IM/IN or IV/IO every 3-5 minutes) up to a MAX of 8 mg of naloxone may be administered to reverse opioid intoxication. If no reaction, consider other causes.
Pediatric			
Reversal of opioid effects, coma of unknown etiology	**< 20 kg: 0.1 mg/~~kg~~ no more than 2 mg/dose**	IV, IO, IM	Do not use in neonates

A. The duration of some opioids is longer than naloxone and the patient **must** be monitored closely.

1. Repeated doses of naloxone may be required.

2. Patients who have received this drug should be transported to the hospital because coma may reoccur when naloxone wears off.

B. May need large doses to reverse some opioid intoxications.

Nitroglycerin

NOTE:
An EMT may assist a patient with administration of nitroglycerin spray or tablets previously prescribed by that patient's physician, if the medication is in the possession of the patient.

Class

Antianginal agent

Actions

A. Cardiovascular effects include:
  1. Reduced venous tone - this causes pooling of blood in peripheral veins and decreased return of blood to the heart.
  2. Decreased peripheral resistance
  3. Dilatation of coronary arteries
B. General smooth muscle relaxation

Indications

A. Chest pain thought to be related to cardiac ischemia.
B. Pulmonary edema to increase venous pooling, lowering cardiac preload and afterload.

Precautions

A. May cause profound hypotension and reflex tachycardia and orthostatic hypotension.
B. Common side effects include:
  1. Throbbing headache
  2. Flushing
  3. Dizziness
C. Because nitroglycerin causes generalized smooth muscle relaxation, it may be effective in relieving chest pain caused by esophageal spasm.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Angina	0.4 mg q 5 minutes if SBP is > 100 mmHg and is effective.	SL	Use with caution with inferior MI. Consider IV prior to administration
Pulmonary edema	0.4 mg q 5 minutes if SBP is >100 mmHg	SL	See precaution below
Pulmonary edema with severe respiratory distress	1 mg IV bolus May repeat once in 5 minutes	IV/IO	See precaution below MAX dose 2 mg
Precaution: NTG is contraindicated in patients who have recently taken Viagra, Levitra, Stendra, Stayxn, Sildenafil, Avanafil, or Vardenafil within 24 hours OR taken Cialis (tadalafil) within 48 hours. Contact OLMC.			
Pediatric - Not generally used with pediatrics. Call OLMC if unsure.			

Contraindications

A. Blood pressure SBP < 100 mmHg (MAP < 70 mmHg).

B. If patient has taken Viagra® within past 24 hours, contact OLMC.

Special Notes

Take a manual blood pressure if NiBP appears inaccurate

Norepinephrine (Levophed®)

Class

Adrenergic vasopressor

Actions

Primary alpha adrenergic vasoconstrictor.

Indications

1. Primary indication is septic, cardiogenic, neurogenic, and obstructive shock.
2. Not useful for primary treatment of hypovolemic shock.

Precautions

A. Extravasation may occur with tissue necrosis.

B. May induce tachyarrhythmias, in which case infusion should be decreased or stopped.

C. Moderate doses may cause extreme peripheral vasoconstriction.

D. Certain antidepressants potentiate the effects of this drug. Norepinephrine can precipitate hypertensive crisis in patients on MAO inhibitors (Parnate®, Nardi®, Marplan®).

E. Should not be added to sodium bicarbonate or other alkaline solutions since norepinephrine will be inactivated in alkaline solutions.

Side Effects/Special Notes

A. The most common side effects include ectopic beats, nausea, and vomiting.

B. Consider hypovolemia and treat this with appropriate fluids before administration of norepinephrine.

C. Norepinephrine **must be administered by an infusion pump** to accurately regulate rate. **Monitor closely.**

Indication	Dose	Route(s)	Special
Adult			**MIXING/ ADMINISTRATION ADULT AND PEDIATRIC:** Add one 4 mg ampule to 1000 mL of NS or D5W. Administer via infusion pump ONLY.
Septic, cardiogenic, neurogenic, and obstructive shock.	Begin at 4 mcg/min. If no response, increase every 5 min. in 4 mcg/min. increments to MAX 24 mcg/min	IV/IO	
Pediatric			
Septic, cardiogenic, neurogenic, and obstructive shock.	Begin at 0.1 mcg/kg/min. If no response in 5 min. increase to 0.2 mcg/kg/min. If still no response after 5 more min., may increase to 0.4 mcg/kg/min. Increase all subsequent doses 0.2 mcg/kg/min every 5 min to MAX dose of 1.2 mcg/kg/min. Goal is age-appropriate systolic blood pressure (refer to "Vital Signs" in *Pediatric Guide*).	IV/IO	

Olanzapine (Zyprexa® ODT)

Class

Atypical Antipsychotic

Actions

A. Dopamine and serotonin (5-HT) antagonist, along with anticholinergic, antihistaminic, and anti-alpha adrenergic effects.
B. Has anxiolytic properties.

Indications

A. Agitated patient who is willing to take an oral agent.
B. To avoid the need for physical or pharmacological restraint.

Administration

Administer tablet (Orally Disintegrating Tablet) immediately once it is removed from the blister unit. Tablets disintegrate in the mouth and can be swallowed subsequently with saliva or with liquid. Onset of action is 15-30 minutes.

Contraindications

Known hypersensitivity. Pregnancy is considered a relative contraindication.

Precautions

A. For use in patients ≥ 8 - 65 years old.
B. May prolong QT but unlikely in single dose. Obtain EKG before administration if known history or suspicion for prolonged QT or cardiovascular disease.
C. Can cause orthostatic hypotension or bradycardia.
D. Use with caution in suspected drug overdose.
E. Low incidence of extrapyramidal effects.
F. Elderly patients with dementia-related psychosis are at increased risk of death with most deaths attributed to cardiovascular events including heart failure and sudden death.

Adult (age 18-65)			
Indication	**Dose**	**Route(s)**	**Special**
Mild agitation	10 mg	ODT	Patients who receive olanzapine may be transported to Unity Hospital.

Ondansetron (Zofran®)

Pharmacology and Actions

Ondansetron (Zofran®) is a $5HT_3$ type serotonin antagonist that has effects both centrally and peripherally.

Indications

Prevention and control of nausea and vomiting.

How Supplied

2mg/mL in 2 mL vial (total = 4 mg).

Precautions

A. Hypersensitivity reactions have been reported in patients who have exhibited hypersensitivity to other $5HT_3$ receptor antagonists (i.e., dolasetron (Anzemet®)) and granisetron (Kytril®).

B. May result in QT prolongation. Use with extreme caution in patients with prolonged QT-interval. If ondansetron is administered, cardiac monitor must be applied.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Nausea and vomiting	8 mg slowly (over 2 minutes) may repeat x 1 for total of 2 doses	IV, IM, IO, PO (one 8 mg tab)	Consider other treatable causes
Pediatric			
Nausea and vomiting	0.1 mg/kg slowly (over 2 minutes) to a MAX of 4 mg	IV, IM, IO, PO (one 4 mg tab)	OLMC <2 years of age (except for children in spinal immobilization or receiving chemotherapy)

Special Notes

A. Unlike other antiemetics, ondansetron does not typically cause sedation.

B. Peak plasma concentrations of the drug occur 10 mins after IV dose, and 40 minutes after IM injection. Both routes have the same mean elimination half-life of four hours.

Oxygen

Class

Medical Gas

Actions

Oxygen added to the inspired air raises the amount of oxygen in the blood and, therefore, the amount delivered to the tissues. Tissue hypoxia causes cell damage and death. Breathing in most persons is regulated by small changes in acid/base balance and CO_2 levels. It takes relatively large drops in blood oxygen concentration to stimulate respiration.

Indications

A. Suspected hypoxemia or respiratory distress from any cause.

B. Acute chest pain in which a myocardial infarction is suspected.

C. Shock (decreased oxygenation of tissues) from any cause.

D. Major trauma.

E. Carbon monoxide poisoning.

Precautions

A. If the patient is not breathing adequately, the treatment of choice is ventilation, not just supplemental O_2.

B. In a small percentage of patients with chronic lung disease, administration of O_2 will decrease respiratory drive.

1. Do not withhold oxygen because of this possibility.
2. **Be prepared to assist ventilation if needed.**
3. Initial O_2 flow should be no greater than 2 liters per minute in these patients.

Side Effects/Special Notes

A. Non-humidified O_2 is drying and irritating to mucous membranes.

B. Restlessness may be an important sign of hypoxia.

C. Oxygen toxicity is not a risk in acute administration.

D. Nasal cannulas work equally well on nose and mouth breathers.

Method	Flow Rate	O_2% Inspired Air (Approximate)
Room air		21
Nasal Cannula (prongs)	1 L/min 2 L/min 8 L/min	24 28 40
Face Mask	6 L/min	50 to 60
Oxygen reservoir (mask)	10 to 12 L/min	90
Mouth to mask	10 L/min 15 L/min 30 L/min	50 80 100
Bag/valve/mask (Regulated to inflate bag at proper rate.)	Room air 12 L/min with Reservoir	21 40 90+

Oxymetazoline Hydrochloride (Afrin®)

Class

Decongestant

Actions

Oxymetazoline hydrochloride is a selective alpha 1 adrenergic receptor agonist and alpha 2 adrenergic receptor partial agonist which provides direct vasoconstriction.

Indications

A. Epistaxis uncontrolled by direct pressure.

Contraindications

A. Allergy to oxymetazoline hydrochloride.

B. Monoamine Oxidase Inhibitor (MAO) use within the past 14 days.

C. Systolic blood pressure > 220 mmHg or diastolic blood pressure >110 mmHg.

Side Effects/Special Notes

A. Avoid administration into eyes which will dilate pupils.

B. Temporary burning, stinging, dryness in the nose, runny nose and sneezing may occur.

Adult Dose instructions
Spray twice into each affected nostril with patient inhaling through nose.
Pediatric Dose instructions
Follow adult dosing Oxymetazoline hydrochloride should be avoided if child cannot follow instructions to blow their nose or are unable to tolerate the administration of a nasal medication.

Oxytocin

Class

Oxytocic hormone

Actions

Synthetic pituitary hormone which stimulates uterine contractions to assist with control of postpartum bleeding or atony.

Dose

A. 10 units IM (preferred) or IV/IO slow over 5 minutes

Indications

A. Reduce risk of severe postpartum hemorrhage after delivery.

B. Confirmation of single fetus by prenatal ultrasound.

Contraindications

A. Unconfirmed single fetus (mother needs to confirm that only a single fetus by prenatal ultrasound is present).

B. Any evidence of fetal distress (e.g. slowing of fetal heart rate, abnormal fetal position, etc).

C. Incomplete delivery (infant not completely delivered).

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Postpartum hemorrhage	10 units IM; If IV/IO, over 5 minutes	IM or IV/IO	Mother confirms single pregnancy by prenatal ultrasound

Side Effects/Special Notes

A. Confirm with mother that pregnancy is a single fetus as confirmed on prenatal ultrasound.

B. When administered IV/IO, must be given slowly over 1 minute. Rapid infusion may lead to uterine rupture, hypotension and dysrhythmias.

C. Oxytocin may be administered before or after the cord is clamped.

D. Oxytocin may be administered before placenta is delivered but ONLY after fetus is completely delivered.

Pralidoxime (Protopam/2-PAM)

Class

Cholinesterase reactivator

Actions

A. The principal action of Pralidoxime is to reactivate cholinesterase which has been inactivated by an organophosphate pesticide or related compound.

B. The drug's most critical effect is in relieving paralysis of respiratory muscles.

C. Atropine is always required concurrently to block the effect of acetylcholine.

Indications

A. As an antidote in the treatment of poisoning due to organophosphate pesticides and similar chemicals (e.g., nerve agents, sarin, VX).

B. Control of overdose by anticholinesterase drugs (e.g., treatment of myasthenia gravis).

Contraindications

A. The Pralidoxime Chloride auto-injector is contraindicated in patients who are hypersensitive to any component of the product.

Precautions

A. Usual route of administration is intramuscular injection.

B. Rapid IV injection may cause tachycardia, laryngospasm, muscle rigidity and transient neuromuscular blockade. IV administration should be done slowly and preferably by infusion.

C. Pralidoxime is a relatively short acting drug, repeat dosing may be necessary.

Side Effects/Special Notes

A. Dizziness, blurred vision, diplopia, headache, drowsiness, nausea, tachycardia and muscle weakness have been reported following administration.

B. Refer to Special Operations Protocol – Organophosphate Poisoning for dosing.

Prochlorperazine (Compazine)

Class

Phenothiazine; anti-emetic

Actions

A. Blocks the action of acetylcholine (anticholinergic effect)

Indications

A. Reduces the incidence of nausea and vomiting.
B. Active and prophylactic treatment of motion sickness.

Contraindications

A. Known hypersensitivity to prochlorperazine (Compazine).

Precautions

A. Use with caution in asthmatics, impaired hepatic function, COPD, and seizures.
B. Administer slowly; rapid administration can cause vein irritation, phlebitis and sclerosis.
C. Use with caution in patients with CNS depression from alcohol, narcotics, barbiturates, or other CNS depressants.
D. Use lower dose (5 mg) in the elderly.
E. Do not administer to unconscious or unresponsive patients.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Nausea and vomiting	5 to 10 mg IV/IM	IV, IM	When administrating IV, use slow IV administration over 1-2 minutes.
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Nausea and vomiting	**2.5 mg IM ONLY**	IM	Only 2 years and older or greater than 10 kg (20 lbs) in weight.

Side Effects/Special Notes

A. IM injections are the ONLY route of administration in children.
B. Extrapyramidal reactions (primarily tardive dyskinesia or akinesia) may occur. If observed, administer diphenhydramine (25 mg in adults, 1 mg/**kg** in pediatrics.)
C. Sedation, changes in heart rate or blood pressure may occur. If hypotension occurs, administer fluid bolus.

Proparacaine

Class:
Local anaesthetic

Pharmacology and Actions:
Proparacaine hydrochloride is a short-acting local anaesthetic of the ester type with an onset of action within 30 seconds. Duration is up to 15 minutes.

Indications:
Superficial foreign bodies or chemical burns to the eye.

Precaution:
Systemic effects are rare with topical use.

Adult			
Indication	**Dose**	**Route(s)**	**Notes**
Foreign body or burn to eye	One drop in the affected eye. If effect is not felt within one minute, three additional drops, one drop at a time, may be given at one minute intervals. For transports longer than 15 minutes, if eye pain returns, 1-4 additional drops may be given.		
Pediatric			
Indication	**Dose**	**Route(s)**	**Notes**
Same as adult			

Side Effects:
Instillation of proparicaine in the recommended concentration and dosage produces little or no initial irritation, stinging or burning; these effects may occur several hours after use.

Specific Precautions:
Document blurring, double vision, perceived flashes of light or other visual changes. Contact lenses should be removed, if possible.

Rocuronium Bromide (Zemuron®)
(Advanced Airway Training Required)

Class

Non-depolarizing neuromuscular blocking agent

Actions

Rocuronium is a non-depolarizing neuromuscular blocking agent causing skeletal muscle relaxation. Rocuronium produces a pure reversible competition between antagonist molecules and acetylcholine (Ach) for occupancy at the Ach binding site. Neuromuscular blockade occurs within 2 to 3 minutes. Time to recovery is 30 to 45 minutes. Metabolism is 5 to 35% renal and the remainder by the liver.

Indications

A. Sustained neuromuscular blockade in the intubated patient.

B. Rapid Sequence Induction (RSI) in the patient in whom succinylcholine is contraindicated.

Precautions

A. Use of pulse oximetry is required with this drug.

B. Rocuronium exhibits minimal side effects and does not substantially affect heart rate or rhythm, systolic or diastolic blood pressure, mean arterial pressure, cardiac output, or systemic vascular resistance.

C. Rocuronium has no effect on consciousness and must be used with a sedative or induction agent in the awake patient.

D. Rocuronium should not be administered simultaneously with furosemide, methylprednisolone, or sodium bicarbonate.

E. Rocuronium and vecuronium should be avoided in patients suspected of having status epilepticus who require intubation.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
RSI and maintenance of post-intubation paralysis	1 mg/kg	IV, IO	10 mg/mL concentration
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
RSI and maintenance of post-intubation paralysis	1 mg/kg	IV, IO	10 mg/mL concentration

Sodium Bicarbonate

Class

Alkalinizing agent

Actions

Acids are increased when body tissues become hypoxic due to cardiac or respiratory arrest. Acidosis depresses cardiac contractility, depresses the cardiac response to catecholamines and makes the heart more likely to fibrillate and less likely to defibrillate. Sodium bicarbonate neutralizes acids found in the blood.

Indications

A. To reverse sodium channel blockade.

B. Suspected hyperkalemia.

Precautions

A. Addition of too much bicarbonate may result in alkalosis that is difficult to reverse and can cause as many problems in resuscitation as acidosis.

B. May increase **cerebral** acidosis, especially in diabetics who are ketotic.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Sodium Channel Blockade OD	1 mEq/kg	IV, IO	
V-Fib/pulseless VT Asystole	1 mEq/kg	IV, IO	
Hyperkalemia	50 mEq	IV, IO	
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Sodium Channel Blockade OD/hyperkalemia	1 mEq/kg	IV, IO	

Side Effects/Special Notes

Each amp of sodium bicarbonate contains 50 mEq of Na^{++}. This may increase intravascular volume and hyperosmolarity conditions which result in cerebral impairment.

Sodium Thiosulfate

Class

Antidote

Actions

Sodium Thiosulfate is used as an antidote for cyanide poisoning. The primary mechanism of cyanide detoxification involves the conversion of cyanide to the thiocyanate ion, which is relatively non-toxic. This reaction involves the enzyme rhodanese which is found in many body tissues but with the major activity in the liver. The body has the capability to detoxify cyanide, however, the rhodanese enzyme reaction can be accelerated by supplying an exogenous source of sulfur. This is commonly accomplished by administering sodium thiosulfate. Sodium thiosulfate may be used alone or in combination with nitrite compounds such as amyl nitrite or sodium nitrite.

Indications

A. Cyanide Poisoning

Precautions

A. Sodium thiosulfate is essentially non-toxic. However, some animal studies showed that a constant infusion of sodium thiosulfate led to hypovolemia which was considered due to an osmotic diuretic effect.

B. It is not known whether sodium thiosulfate can cause fetal harm when administered to a pregnant woman and as such should only be administered in this setting if clearly needed.

Side Effects/Special Notes

Sodium Thiosulfate is administered as a **slow push over 10 minutes.**

Adult and children 6 years or older			
Indication	**Dose**	**Route(s)**	**Special**
Cyanide Poisoning	50 mL of 25% solution slow IV/IO (over 10 minutes)	IV, IO	Consider using Buretrol® or similar device.
Pediatric - children less than 6 years			
Indication	**Dose**	**Route(s)**	**Special**
Cyanide Poisoning	1.65 mL/kg 25% solution slow IV/IO (over 10 minutes)	IV, IO	Consider using Buretrol® or similar device.

Succinylcholine (Advanced Airway Training Required)

Class

Depolarizing neuromuscular blocking agent

Actions

Succinylcholine is a short-acting, motor nerve depolarizing, skeletal muscle relaxant. Like acetylcholine, it combines with cholinergic receptors in the motor nerves to cause depolarization. Neuromuscular transmission is thus inhibited and remains so for 2 to 5 minutes. Following IV injection, complete paralysis is obtained within one (1) minute and persists for approximately 4 to 6 minutes. Effects then start to fade and a return to normal is seen within 6 minutes. Muscle relaxation begins in the eyelids and jaw, then progresses to the limbs, the abdomen, and finally the diaphragm and intercostal muscles. It has no effect on consciousness at all.

Metabolism

Succinylcholine is excreted by the kidneys (10%) and is hydrolyzed by plasma pseudocholinesterase.

Indications

To achieve temporary paralysis where muscle tone, or seizure activity, prevent intubation.

Contraindications

A. Succinylcholine is contraindicated in patients with a history of hypersensitivity to the drug.

B. Succinylcholine should be avoided in:

1. Major burns and crush injuries between 48 hours and 6 months old.

2. Stroke or spinal cord injury with profound residual deficits between 48 hours and 6 months old.

3. Neuromuscular disease (muscular dystrophy, multiple sclerosis, etc).

4. Suspected hyperkalemia such as end-stage renal disease patients who have missed dialysis.

Precautions

A. Succinylcholine shall not be administered unless personnel trained and authorized in this procedure are present, and ready to perform the procedure.

B. Oxygen therapy equipment and resuscitation drugs should be available.

C. Succinylcholine produces paralysis, but does not alter a person's level of consciousness.

1. Paralysis in the conscious patient is very frightening, therefore, sedation should be provided in any conscious or responsive patient.

2. Verbal explanations should be provided to the patient during the procedure, even if you do not think the patient can hear you.

Adult and children 6 years or older			
Indication	**Dose**	**Route(s)**	**Special**
Clenched jaw. Active gag reflex. Uncontrollable combative behavior. Clinical condition requiring airway protection.	1.5 mg/kg	IV, IO	If inadequate relaxation present after 1 minute, repeat the same dose.
Pediatric - children less than 6 years			
Indication	**Dose**	**Route(s)**	**Special**
Clenched jaw. Active gag reflex. Clinical condition requiring airway protection.	2 mg/kg	IV, IO push	If inadequate relaxation present after 1 minute, repeat the same dose.

Sufentanil (Sufenta)

Class

Opioid Analgesic

Actions

A. Sufentanil is a synthetic opioid analgesic drug approximately 5-10 times more potent than its parent drug, fentanyl, and 500 times as potent as morphine.

B. Sufentanil is highly lipophilic resulting in rapid cell membrane penetration and rapid entry into the central nervous system (CNS).

C. Appears to metabolize mainly in the liver and small intestine with relatively limited accumulation.

Indications

A. Severe pain.

B. May be used in conjunction with versed for sedation in intubated patients.

Contraindications

A. Known hypersensitivity to sufentanil.

B. A blood pressure less than 90 mmHg (MAP < 65 mmHg).

C. Respiratory rate less than 14 breaths per minute, O_2 saturation less than 90%, or significant respiratory depression. For pediatric patients, vital signs should be maintained within the normal age-appropriate range.

Precautions

A. Sufentanil can cause respiratory depression that is reversible with naloxone. This respiratory depression is exacerbated by underlying lung diseases and use of the other respiratory depressant drugs (benzodiazepines, alcohol, cyclic antidepressants, etc.).

B. Monitor and document vital signs and patient response after each dose.

C. If administered rapidly and in very large doses, sufentanil can cause muscle spasm and chest wall rigidity.

D. The action of sufentanil is prolonged and its elimination slower in the elderly. Smaller maintenance doses are advisable.

E. Sufentanil must be used cautiously in patients that have already received morphine for prehospital analgesia.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Severe pain	5 – 10 micrograms IV/IO, may repeat every 3-5 min as needed to a MAX of 40 micrograms. OR 5 – 10 micrograms IM/IN; may repeat every 15 min to a MAX of 40 micrograms.	IV, IO, IM, IN	Do not give if BP < 90 mmHg systolic or MAP < 65 mmHg
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Severe pain	0.1 microgram/~~kg~~ to MAX of 10 micrograms.	IV, IO, IM, IN	Do not give if BP < 90 mmHg systolic or MAP < 65 mmHg

Side Effects/Special Notes

A. If hypotension develops, it is usually responsive to naloxone administration and Trendelenburg position. If hypotension persists, follow the ***Shock*** protocol.

B. Chest and abdominal wall rigidity and/or muscle spasms have been rarely reported with sufentanil and fentanyl. The patient may present with any or all of the following symptoms:

1. Spasms of the extremities
2. Clenched jaw
3. Rigidity of the chest and abdominal wall with ineffective ventilation.

Risk factors are extremes of age, dose and rapidity of injection. Treatment for this condition is naloxone. If naloxone is ineffective, then neuromuscular blockade is indicated.

C. The goal of sufentanil administration is patient comfort. The goal is not total elimination of pain, but reduction in perception of pain by the patient.

Tranexamic Acid (TXA)

Class

Anti-fibrinolytic

Actions

Forms a reversible complex that displaces plasminogen from fibrin resulting in inhibition of fibrinolysis; it also inhibits the proteolytic activity of plasmin. Tranexamic acid blocks the action of plasmin on fibrin and thereby prevents the breakdown of fibrin. This leads to stabilization and preservation of fibrin in blood clots, and this helps reduce bleeding. Tranexamic Acid also has anti-inflammatory properties.

Indications

A. Traumatic injury:
- Adult ≥ 15 years old
- ≥ 50 kg if age unknown
- Blunt or penetrating injury
- ≤ 1 hour from of injury
- IV/IO established
- **Physiological criteria:**
  - GCS between 3 - 12 with a reactive pupil

    AND/OR

  - MAP < 55 mmHg (SBP < 70 mmHg)

B. Postpartum hemorrhage

Contraindications

A. Traumatic injury:
- GCS = 3 with no reactive pupil.
- >1 hour from time of injury or time unknown.
- Seizures, MI, Stroke, or Dialysis (head injury only)
- Drowning
- Hanging

Dose

2 grams slow IV/IO push administered as soon as feasible.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Moderate to severe head trauma (GCS 3-12 with reactive pupil) Blunt or penetrating trauma with severe hemorrhagic shock (MAP < 55 mmHg or SBP < 70 mmHg) Postpartum Hemorrhage	2 grams slow IV/IO push administered as soon as feasible. Currently, TXA is 1 gram (1,000 mg) per 10 mL solution	IV, IO	Time of injury ≤ 1 hours Not for cardiac or traumatic arrest
Pediatric			
	Not currently indicated < 15 years old		

Vecuronium Bromide (Norcuron®)

(Advanced Airway Training Required)

Class

Non-depolarizing neuromuscular blocking agent

Actions

Vecuronium is a non-depolarizing neuromuscular blocking agent causing skeletal muscle relaxation. Vecuronium produces a pure reversible competition between antagonist molecules and acetylcholine (Ach) for occupancy at the Ach binding site. Neuromuscular blockade occurs within 2 to 3 minutes. Time to recovery is 30 to 45 minutes. Metabolism is 5 to 35% renal and the remainder by the liver.

Indications

A. Rapid Sequence Induction (RSI) in the patient in whom succinylcholine in contraindicated.
B. Sustained neuromuscular blockade in the intubated patient.

Precautions

A. Use of pulse oximetry is required with this drug.
B. Vecuronium exhibits minimal side effects, and does not substantially affect heart rate, or rhythm; systolic or diastolic blood pressure; mean arterial pressure; cardiac output; systemic vascular resistance.
C. Vecuronium has no effect on consciousness and must be used with a sedative or induction agent in the awake patient.
D. Vecuronium and rocuronium should be avoided in patients suspected of having status epilepticus who require intubation.
E. Vecuronium should be dosed by ideal body weight and not actual body weight.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
RSI and maintenance of post-intubation paralysis	0.1 mg/kg	IV, IO	
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
RSI and maintenance of post-intubation paralysis	0.1 mg/kg	IV, IO	

Whole Blood (LTOWB+)

Class

Blood component

Actions

Whole blood provides red and white cells, platelets, and clotting factors which make it potentially beneficial in rapidly hemorrhaging patients due to trauma.

Indications

A. Blunt or penetrating trauma patient -AND-
B. Suspected hemorrhagic shock (ADULT) as defined by:
  1. MAP < 55 mmHg (SBP < 70 mmHg) regardless of heart rate -OR-
  2. MAP < 65 mmHg (SBP < 90 mmHg) with heart rate > 110/minute -OR-
  3. Witnessed traumatic arrest during transport to trauma hospital.
C. Suspected hemorrhagic shock (PEDIATRIC) as defined by:
  1. See Pediatric Guidebook for age appropriate vital signs.
  2. Witnessed traumatic arrest during transport to trauma hospital.

Contraindications

A. Patients < 2 years old.
B. Any objection (e.g. personal or religious belief) to receiving blood products.
C. Unable to establish vascular access.

Side Effects

A. Monitor patient for transfusion reactions.

	Symptoms	Timing	Interventions
Anaphylactic (Allergic)	Urticarial, bronchospasm, anaphylaxis, hypotension	10 - 15 min	Stop transfusion; Treat per ***Anaphylactic & Allergic Reaction*** protocol
Febrile Non-hemolytic	Fever, headache, flushing	1 - 6 hours	Stop transfusion; supportive treatment including Tylenol for fever
Hemolytic	Flank pain, jaundice, hemoglobinuria	1 hour	Stop transfusion; consider fluid bolus
Lung Injury	Respiratory collapse, pulmonary edema	1 - 6 hours	Stop transfusion; respiratory support

Notes and Precautions

A. Do not administer blood product simultaneously in same line as Lactated Ringers.
B. Give medications (e.g. TXA) through second IV line, if feasible.
C. Do not administer medications through same line while blood is being transfused.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Blunt or penetrating trauma	1 unit	IV, IO	Do not administer blood simultaneously with Lactated Ringers
Pediatric ≥ 2 years old			
Indication	**Dose**	**Route(s)**	**Special**
Blunt or penetrating trauma	15 mg/kg	IV, IO	Do not administer blood simultaneously with Lactated Ringers

Xylocaine, Viscous (Lidocaine®, topical)

Class

Topical anesthetic

Actions

Xylocaine, Viscous (Lidocaine jelly) stabilizes the neuronal membrane by inhibiting the ionic flux required for the initiation and conduction of impulses, thereby effectively creating local anesthetic action.

Lidocaine ointment or jelly produces local topical anesthesia on mucous membranes. The onset of action is within 3 to 5 minutes. It is ineffective when applied to the intact skin. Local anesthesia appears within 1 to 2 minutes after application of Lidocaine liquid and persists for 15 to 20 minutes in soft tissue.

Indications

Lidocaine ointment, solution, and jelly are indicated for production of topical anesthesia and as a lubricant for intubation.

Precautions

A. Lidocaine HCl may be absorbed following topical administration to mucous membranes. Its rate and extent of absorption depends upon the site of application, duration of exposure, concentration and total dosage.

B. In general, the rate of absorption of local anesthetics following application occurs most rapidly after endotracheal administration.

C. Use with caution in patient already taking Lidocaine preparations. The dosing may be additive.

Side Effects/Special Notes

A. The systemic side effects are identical to parenteral Lidocaine administration.

B. Excessive blood levels may cause changes in cardiac output, total peripheral resistance, and mean arterial pressure.

1. These changes may be attributed to a direct depressant effect of the local anesthetic agent on various components of the cardiovascular system.

2. The net effect is normally a modest hypotension when the recommended dosages are not exceeded.

Ziprasidone (Geodon)

Class

A. Major tranquilizer (antipsychotic)

Pharmacology and Actions

A. The mechanism of action of ziprasidone is unknown. However, it is thought to be through blocking of dopamine (D2) and serotonin (5HT2) receptors producing sedation and tranquilization.

B. Onset of action of a single IM dose is 15 to 30 minutes following administration; the peak serum concentration is approximately 60 minutes. Duration of action is 2 to 5 hours.

Indications

A. Sedation of combative patients

Contraindictions

A. Known allergy

Precautions

A. Hypotension may occur; treat per ***Shock*** protocol when feasible.

B. Use caution when administering ziprasidone to patients who have taken other CNS depressant drugs (e.g. sedative-hypnotics, alcohol). Consider a reduced dose in these cases.

C. May induce Torsades de Pointes. Monitor the patient's ECG Q-T interval following use if feasible.

D. Extrapyramidal symptoms have been reported. If severe, treat per protocol with diphenhydramine.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Patient Restraint	10-20 mg IM	IM ONLY	Monitor ECG MAX dose 20 mg IM
Pediatric - contact OLMC			

Side Effects/Special Notes

A. Do not use in patients with known history of QT prolongation, recent acute MI, decompensated heart failure.

B. Somnolence, dizziness, headache, nausea have occurred following administration. These are not life threatening and generally do not require treatment.

C. Reconstitute with Sterile Water ONLY.