DRUGS
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.

<table>
<thead>
<tr>
<th>Adult</th>
<th>Poisoning or overdose</th>
<th>1 gram/kg</th>
<th>PO or NG</th>
<th>OLMC Required (except for acetaminophen or aspirin)</th>
</tr>
</thead>
</table>

| Pediatric | Poisoning or overdose | 1 gram/kg | PO or NG | OLMC Required (except for acetaminophen or aspirin) |

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 atrial fibrillation 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.
### Adenosine (Adenocard®)

#### 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.

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).

<table>
<thead>
<tr>
<th>Adult</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indication</strong></td>
<td><strong>Dose</strong></td>
<td><strong>Route(s)</strong></td>
<td><strong>Special</strong></td>
</tr>
<tr>
<td>PSVT</td>
<td>6 mg, 12 mg, 12 mg</td>
<td>Rapid IV, IO</td>
<td>Large proximal IV line with fluid bolus flush</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pediatric</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indication</strong></td>
<td><strong>Dose</strong></td>
<td><strong>Route(s)</strong></td>
<td><strong>Special</strong></td>
</tr>
<tr>
<td>PSVT</td>
<td>0.1 mg/kg, 0.2 mg/kg x 2</td>
<td>Rapid IV, IO</td>
<td>Large proximal IV line with fluid bolus flush</td>
</tr>
</tbody>
</table>
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 beta₂ agonist, albuterol induces bronchial dilation, but has occasional beta₁ 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. O₂ flow should be set at a minimum of 6 liters per minute. Patients with COPD should be monitored carefully for CO₂ retention.
C. Patients should be instructed to breathe as follows:
   1. Inhale slowly
   2. Hold breath
   3. Exhale passively through nose
<table>
<thead>
<tr>
<th><strong>Indication</strong></th>
<th><strong>Dose</strong></th>
<th><strong>Route(s)</strong></th>
<th><strong>Special</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronchial asthma</td>
<td>2.5 mg repeat p.r.n.</td>
<td>Nebulized</td>
<td>Add Ipratropium with repeat dose</td>
</tr>
<tr>
<td>Hyperkalemia</td>
<td>10 mg</td>
<td>Nebulized</td>
<td>OLMC Required</td>
</tr>
<tr>
<td>Anaphylaxis</td>
<td>2.5 mg</td>
<td>Nebulized</td>
<td>Use Nebulizer for ETT</td>
</tr>
<tr>
<td>Crush Injury</td>
<td>Per OLMC</td>
<td>Nebulized</td>
<td>OLMC Required</td>
</tr>
</tbody>
</table>

**Pediatric**

<table>
<thead>
<tr>
<th><strong>Indication</strong></th>
<th><strong>Dose</strong></th>
<th><strong>Route(s)</strong></th>
<th><strong>Special</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Same as adult</td>
<td>Nebulized</td>
<td>See above</td>
</tr>
</tbody>
</table>
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. Hepatic 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

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-fib/Pulseless</td>
<td>300 mg</td>
<td>IV, IO bolus</td>
<td>If conversion occurs or V-fib/Pulseless V-tach persists, repeat once @ 150 mg</td>
</tr>
<tr>
<td>V-tach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V-tach with pulse</td>
<td>150 mg</td>
<td>IV, IO infusion</td>
<td>Mix with 100 mL of NS in Buretrol and administer over 10 minutes, or IV pump</td>
</tr>
</tbody>
</table>

### Pediatric

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose (kg)</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-fib/Pulseless</td>
<td>5 mg/kg</td>
<td>IV, IO bolus</td>
<td>Repeat once with 2.5 mg/kg</td>
</tr>
<tr>
<td>V-tach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V-tach with pulse</td>
<td>2.5 mg/kg</td>
<td>IV, IO infusion</td>
<td>Mix with 2 mL/kg of NS in Buretrol and infuse over 10 minutes, or IV pump</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Coronary Syndrome (AMI)</td>
<td>324 mg (4 x 81 mg tablets)</td>
<td>PO</td>
<td>Can be given even if patient has taken ASA that day</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradycardia</td>
<td>0.5 mg</td>
<td>IV, IO</td>
<td>q 3-5 minutes MAX 3 mg</td>
</tr>
<tr>
<td>Organophosphates</td>
<td>1-5 mg</td>
<td>IV, IO</td>
<td>Call OLMC for frequency</td>
</tr>
</tbody>
</table>

### Pediatric

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradycardia</td>
<td>0.02 mg/kg</td>
<td>IV, IO</td>
<td>Minimum single dose is 0.1 mg Maximum single dose 0.5 mg Maximum total dose 1 mg</td>
</tr>
<tr>
<td>RSI</td>
<td>0.02 mg/kg</td>
<td>IV, IO</td>
<td>Minimum dose is 0.1 mg Required if pt. &lt;2 years</td>
</tr>
<tr>
<td>Organophosphates</td>
<td>0.015 mg/kg - 0.05 mg/kg</td>
<td>IV, IO</td>
<td>Call OLMC for frequency</td>
</tr>
</tbody>
</table>

### 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.
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 a 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. Administer slowly (no faster than 2 mL/min) 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.

<table>
<thead>
<tr>
<th>Adult</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indication</strong></td>
<td><strong>Dose</strong></td>
</tr>
<tr>
<td>Hyperkalemia* Calcium Channel Blocker OD</td>
<td>One 10 mL vial calcium gluconate 10%</td>
</tr>
<tr>
<td><strong>Indication</strong></td>
<td><strong>Dose</strong></td>
</tr>
<tr>
<td>Hyperkalemia* Calcium Channel Blocker OD</td>
<td>0.5 mL/kg of calcium gluconate 10%, MAX 10 mL</td>
</tr>
</tbody>
</table>

**Pediatric**

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.

Contraindications
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.

### Adult

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoglycemia (Altered Mental Status)</td>
<td>25 - 50 mL D50% or 125 - 250 mL D10%</td>
<td>Slow IV</td>
<td>Can give orally</td>
</tr>
</tbody>
</table>

### Pediatric

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoglycemia (Altered Mental Status)</td>
<td>5 mL/kg D10% MAX 250 mL D10%</td>
<td>Slow IV</td>
<td>May repeat once Can give orally</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Desired amount of D10</th>
<th>Initial solution</th>
<th>Amount of initial solution to be discarded</th>
<th>Amount of D50 replacement solution</th>
<th>Final Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mL</td>
<td>50 mL of D50</td>
<td>40 mL of D50</td>
<td>40 mL of NS</td>
<td>50 mL of D10</td>
</tr>
<tr>
<td>100 mL</td>
<td>100 mL of NS</td>
<td>20 mL of NS</td>
<td>20 mL of D50</td>
<td>100 mL of D10</td>
</tr>
<tr>
<td>250 mL</td>
<td>250 mL of NS</td>
<td>50 mL of NS</td>
<td>50 mL of D50</td>
<td>250 mL of D10</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Adult</th>
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<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Anaphylaxis</td>
<td>1 mg/kg to MAX of 50 mg</td>
<td>IV, IO or deep IM</td>
<td>Not first line for anaphylaxis</td>
</tr>
<tr>
<td></td>
<td>EPS</td>
<td>1 mg/kg to MAX of 50 mg</td>
<td>IV, IO or deep IM</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pediatric</th>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Anaphylaxis</td>
<td>1 mg/kg to MAX of 50 mg</td>
<td>IV, IO or deep IM</td>
<td>Not first line for anaphylaxis</td>
</tr>
<tr>
<td></td>
<td>EPS</td>
<td>1 mg/kg to MAX of 50 mg</td>
<td>IV, IO or deep IM</td>
<td></td>
</tr>
</tbody>
</table>

Side Effects/Special Notes:
A. It is not the first-line drug for severe allergic reactions, but may be useful for long transports.
Droperidol (Inapsine®)

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 3 to 10 minutes following administration, and the peak effect may not be apparent for up to 30 minutes. Duration is generally from 2 to 4 hours.

Indications
A. Sedation of combative patients to facilitate restraint.

Contraindications
A. Known allergy to droperidol.

Precautions:
1. Hypotension may occur; IV fluids and other measures to manage hypotension should be readily available.
2. Use caution when administering droperidol to patients who have taken other CNS depressant drugs (barbiturates, tranquilizers, alcohol).
3. Droperidol may induce Torsades de Pointes. Monitor the patient’s ECG Q-T interval following use.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Restraint</td>
<td>2.5 mg IV or 5 mg IM</td>
<td>IV, IM</td>
<td>Monitor ECG Maximum dose 5 mg IV or 10 mg IM</td>
</tr>
</tbody>
</table>

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 droperidol to patients who have taken other CNS depressant drugs (barbiturates, tranquilizers, alcohol). Droperidol may have additive or potentiating effects, and the dosage should be reduced.

D. Droperidol 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.
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\textsubscript{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 in patients under 40 years of age

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.
## Epinephrine

### Adult

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventricular fibrillation, Asystole, PEA</td>
<td>1:10,000</td>
<td>IV, IO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 mg IV/IO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repeat every 3-5 min.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaphylaxis</td>
<td>0.3 - 0.5 mg 1:1000 IM</td>
<td>IM, IV, IO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1:10,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.1 mg boluses IV/IO every 3-5 min titrated to effect. MAX dose 0.5 mg.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asthma</td>
<td>0.3 - 0.5 mg 1:1000 IM</td>
<td>IM</td>
<td>OLMC required for asthma if pt &gt; 40 y.o.</td>
</tr>
</tbody>
</table>

### Pediatric

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventricular fibrillation, Asystole, PEA</td>
<td>1:10,000</td>
<td>IV, IO</td>
<td>EZ-IO indicated only &gt; 3 kg Repeat every 3-5 min.</td>
</tr>
<tr>
<td></td>
<td>0.01 mg/kg IV/IO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaphylaxis</td>
<td>0.01 mg/kg of 1:1000 IM</td>
<td>IM, IV, IO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1:10,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.01 mg/kg (max 0.1 mg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IV boluses every 3-5 min titrated to effect. MAX total dose 0.5 mg.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asthma</td>
<td>0.01 mg/kg of 1:1000 IM</td>
<td>IM</td>
<td>Contact OLMC for additional dosing.</td>
</tr>
<tr>
<td></td>
<td>MAX dose 0.5 mg.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory distress</td>
<td>5 mL of 1:1000</td>
<td>Nebulizer</td>
<td>Audible stridor at rest: may repeat after 20 min. Bronchiolitis: may repeat every 10 min.; discontinue if heart rate is &gt;200. Contact OLMC for additional dosing.</td>
</tr>
</tbody>
</table>

### 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 or while a central line is being placed.
C. Short-lived hypotension, e.g. post-intubation or during sedation.

Contraindications
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:
1 ml every 1-5 minutes (10 mcg).

Precautions:
Concentration is low enough that extravasation is not a concern.
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.

**Preparation**
Supplied in a pre-load syringe containing 40 mg in 20 mL (2 mg per mL).

| 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 than 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.

Contraindications
A. Known allergy to fentanyl.
B. A blood pressure less than 100 mm/Hg.
C. Respiratory rate less than 14 breaths per minute, O₂ 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.
**Indication** | **Dose** | **Route(s)** | **Special**
--- | --- | --- | ---
Isolated extremity fractures, burns, chest pain | 25-100 micrograms IV/IO/IN; may repeat every 3-5 min as needed to a MAX of 400 micrograms. OR, 25-100 micrograms IM; may repeat every 15 min to a MAX of 400 micrograms. | IV, IM, IO, IN | Do not give if BP is <100 mmHg systolic

**Pediatric <40 kg**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated extremity fractures, burns</td>
<td>1 microgram/kg IV, IO, or IN; repeat with 0.5-1 microgram/kg every 3-5 minutes as needed to a MAX total dose of 4 micrograms/kg. OR, 1-2 micrograms/kg IM; may repeat every 15 minutes to a MAX total dose of 4 micrograms/kg. Do not exceed adult dosing.</td>
<td>IV, IM, IO, IN</td>
<td></td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary Edema, Crush injury</td>
<td>If patient is not currently taking</td>
<td>IV, IO</td>
<td>Special</td>
</tr>
<tr>
<td>(if Mannitol not available)</td>
<td>furosemide, give 20 mg IV/IO.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If patient is taking furosemide, give</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40 mg IV/IO.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Adult</th>
<th>Pediatric</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indication</strong></td>
<td><strong>Dose</strong></td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>1 mg</td>
</tr>
<tr>
<td>Beta Blocker OD</td>
<td>Call OLMC</td>
</tr>
</tbody>
</table>

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 100 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.
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.

<table>
<thead>
<tr>
<th>Adult</th>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cyanide poisoning</td>
<td>5 grams</td>
<td>IV, IO over 15 min</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pediatric</th>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cyanide poisoning</td>
<td>70 mg/kg</td>
<td>IV, IO over 15 min</td>
<td>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 maximum total dose of 10 grams.</td>
</tr>
</tbody>
</table>

Preparation
Reconstitute the 5 gram vial of hydroxocobalamin with 200 mL of diluent. Preferred diluent is 0.9% Sodium Chloride. 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.
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.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
<td>0.5 mg</td>
<td>Nebulized</td>
<td>Combine with 2nd and 3rd doses of Albuterol®</td>
</tr>
<tr>
<td>COPD</td>
<td>0.5 mg</td>
<td>Nebulized</td>
<td>Combine with only 2nd dose of Albuterol®</td>
</tr>
</tbody>
</table>

**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.
C. Releases endogenous catecholamines.
D. Maintains blood pressure and heart rate.
E. Dilates bronchial smooth muscles.
F. Stimulates beta receptors in the lungs.

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 with midazolam 2.5 mg IV/IO in adults to prevent/treat negative emergence reaction.
B. Midazolam is not necessary in children.
C. Monitor closely for laryngospasm.
**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.

D. May transiently increase intracranial pressure (ICP) and cardiac perfusion pressure (CPP).

**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.

---

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Routes</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preinduction Rapid Sequence Intubation</td>
<td>2 mg/kg</td>
<td>IV/IO</td>
<td>Requires midazolam after intubation.</td>
</tr>
<tr>
<td>Analgesia and sedation for painful procedures or conditions</td>
<td>15 mg</td>
<td>IV, IO, IM</td>
<td>Pain not relieved after max of 400 micrograms of fentanyl. May repeat once after 30 minute. Administer with midazolam 2.5 mg IV/IO in adults to prevent/treat negative emergence reaction.</td>
</tr>
<tr>
<td>Preinduction Rapid Sequence Intubation</td>
<td>2 mg/kg</td>
<td>IV/IO</td>
<td>Requires midazolam after intubation.</td>
</tr>
<tr>
<td>Analgesia and sedation for painful procedures or conditions</td>
<td>Not approved for pediatric pain control</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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. PVCs in suspected ischemic event.
B. Stable ventricular tachycardia or recurrent ventricular tachycardia if clinical condition is not rapidly deteriorating.
C. Recurrent ventricular fibrillation.
D. Following successful defibrillation or cardioversion from ventricular tachycardia.

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.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVCs, Stable VT, Recurrent VF</td>
<td><strong>Bolus</strong>: 1.5 mg/kg (3 mg/kg MAX)</td>
<td>IV, IO</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Maintenance</strong>: 0.75 mg/kg q 10 minutes (No MAX)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
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. In cardiac arrest, after defibrillation, epinephrine, lidocaine and amiodarone, in the treatment of pulseless ventricular fibrillation and ventricular tachycardia.
B. Magnesium sulfate is also used to treat and prevent seizures in women with pre-eclampsia.
C. In prolonged transport time with severe asthma, OLMC may 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.

<table>
<thead>
<tr>
<th>Adult</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-Fib/Torsades/Pulseless VT</td>
<td>2 gram over 1-2 minutes</td>
<td>IV, IO</td>
<td></td>
</tr>
<tr>
<td>Eclampsia</td>
<td>Contact OLMC</td>
<td>IV, IO</td>
<td></td>
</tr>
<tr>
<td>Asthma</td>
<td>Contact OLMC</td>
<td>IV, IO</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pediatric</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torsades de Pointes</td>
<td>25 mg/kg over 1-2 minutes</td>
<td>IV, IO</td>
<td></td>
</tr>
<tr>
<td>Asthma</td>
<td>Contact OLMC</td>
<td>IV, IO</td>
<td></td>
</tr>
</tbody>
</table>
### 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. Chemical restraint.
- D. Shivering during induced hypothermia process.
- E. After ketamine administration to prevent emergence reaction.

**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.

<table>
<thead>
<tr>
<th>Adult</th>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seizures</td>
<td>2.5 - 5 mg IV/IO, or if no IV 5 mg IM/IN for seizures. 5 - 10 mg IM/IN for combative patients.</td>
<td>IV, IO, IM, IN</td>
<td>Repeat every 5 min until seizure stops. No OLMC.</td>
<td></td>
</tr>
<tr>
<td>Pacing, cardioversion, induced hypothermia shivering, post intubation agitation</td>
<td>2.5 - 5 mg IV/IO, or if no IV 5 mg IM/IN. May repeat once.</td>
<td>IV, IO, IM, IN</td>
<td>For additional dose, call OLMC.</td>
<td></td>
</tr>
<tr>
<td>RSI</td>
<td>2.5 - 5 mg IV/IO after successful intubation. May repeat every 15 min as needed to maintain sedation.</td>
<td>IV, IO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pediatric</th>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seizures</td>
<td>0.1 mg/kg IV/IO 0.3 mg/kg IM/IN</td>
<td>IV, IO, IM, IN</td>
<td>Repeat every 5 min until seizure stops.</td>
<td></td>
</tr>
<tr>
<td>Combative Patients</td>
<td>0.1 mg/kg IV/IO (5 mg MAX) 0.2 mg/kg IM/IN (10 mg MAX)</td>
<td>IV, IO IM, IN</td>
<td>May repeat once after 5 min. Call OLMC if more needed.</td>
<td></td>
</tr>
<tr>
<td>RSI</td>
<td>0.1 mg/kg IV/IO MAX 2.5 mg after successful intubation. May repeat every 15 min as needed to maintain sedation.</td>
<td>IV, IO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardioversion/tachycardia, pacing</td>
<td>0.1 mg/kg IV/IO MAX 2.5 mg</td>
<td>IV, IO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated extremity fractures, burns, chest pain</td>
<td>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.</td>
<td>IV, IO, IM</td>
<td>Do not give if BP is &lt;100 mmHg systolic</td>
</tr>
</tbody>
</table>

### Pediatric

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated extremity fractures, burns</td>
<td>&lt; 20 kg: 0.1 mg/kg. May repeat every 3-5 min p.r.n. Do not exceed adult dosing.</td>
<td>IV, IO, IM</td>
<td>If &gt;20 kg, follow adult dosing</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Adult</th>
<th>Pediatric</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indication</strong></td>
<td>Reversal of opioid effects, coma of unknown etiology</td>
</tr>
<tr>
<td><strong>Dose</strong></td>
<td>If no IV present, 2 mg IM/IN.</td>
</tr>
<tr>
<td></td>
<td>If IV already established, 0.5 mg IV may be repeated every 2 min up to 2 mg.</td>
</tr>
<tr>
<td><strong>Route(s)</strong></td>
<td>IV, IO, IM, IN</td>
</tr>
<tr>
<td><strong>Special</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>
Naloxone (Narcan®)

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.
## Nitroglycerin

### Adult

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angina</td>
<td>0.4 mg q 5 minutes if SBP is &gt; 100 mmHg and is effective.</td>
<td>SL</td>
<td>Use with caution with inferior MI. Consider IV prior to administration</td>
</tr>
<tr>
<td>Pulmonary edema</td>
<td>0.4 mg q 5 minutes if SBP is &gt; 100 mmHg</td>
<td>SL</td>
<td>See precaution below</td>
</tr>
</tbody>
</table>

**Precaution:** NTG is contraindicated in patients who have recently taken Viagra® (sildenafil citrate) or Levitra® (vardenafil HCl) within 24 hours OR taken Cialis® (tadalafil) within 48 hours. Contact OLMC for direction.

**Pediatric - Not generally used with pediatrics. Call OLMC if unsure.**

### Contraindications

A. Blood pressure less than 100 mm/Hg.

B. If patient has taken Viagra® within past 24 hours, contact OLMC.
Norepinephrine (Levophed®)

**Class**
Adrenergic vasopressor

**Actions**
Primary alpha adrenergic vasoconstrictor.

**Indications**
1. Primary indication is septic, cardiogenic, neurogenic, and obstructive 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.**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adult</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Septic, cardiogenic, neurogenic, and obstructive shock.</td>
<td>Begin at 4 mcg/min. If no response, increase every 5 min. in 4 mcg/min. increments to MAX 12 mcg/min</td>
<td>IV/IO</td>
<td></td>
</tr>
<tr>
<td><strong>Pediatric</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Septic, cardiogenic, neurogenic, and obstructive shock.</td>
<td>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 2 mcg/kg/min. Goal is age-appropriate systolic blood pressure (refer to “Vital Signs” in Pediatric Guide).</td>
<td>IV/IO</td>
<td></td>
</tr>
</tbody>
</table>
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. Anxious and/or mildly agitated patient who is willing to take an oral agent to help relieve stress of transport.
B. To avoid the need for physical or chemical 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 between 18-65 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.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild agitation or anxiety</td>
<td>10 mg</td>
<td>ODT</td>
<td>Patients who receive olanzapine may be transported to Unity Hospital.</td>
</tr>
</tbody>
</table>
**Ondansetron (Zofran®)**

**Pharmacology and Actions**

Ondansetron (Zofran®) is a 5HT₃ 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 5HT₃ receptor antagonists (i.e., dolasetron (Anzemet®)) and granisetron (Kytril®).

B. May result in QT prolongation.

<table>
<thead>
<tr>
<th>Adult</th>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nausea and vomiting</td>
<td>8 mg slowly (over 2 minutes)</td>
<td>IV, IM, IO, PO</td>
<td>Consider other treatable causes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>may repeat x 2 for total of 3 doses</td>
<td>(one 8 mg tab)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pediatric</th>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nausea and vomiting</td>
<td>0.1 mg/kg slowly (over 2 minutes) to a max of 4 mg</td>
<td>IV, IM, IO, PO</td>
<td>OLMC &lt;2 years of age (except for children in spinal immobilization or receiving chemotherapy)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(one 4 mg tab)</td>
<td></td>
</tr>
</tbody>
</table>

**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 CO₂ 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 O₂.
B. In a small percentage of patients with chronic lung disease, administration of O₂ will decrease respiratory drive.
   1. Do not withhold oxygen because of this possibility.
   2. **Be prepared to assist ventilation if needed.**
   3. Initial O₂ flow should be no greater than 2 liters per minute in these patients.

Side Effects/Special Notes
A. Non-humidified O₂ 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.
<table>
<thead>
<tr>
<th>Method</th>
<th>Flow Rate</th>
<th>O₂% Inspired Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Approximate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room air</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>Nasal Cannula (prongs)</td>
<td>1 L/min</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>2 L/min</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>8 L/min</td>
<td>40</td>
</tr>
<tr>
<td>Face Mask</td>
<td>6 L/min</td>
<td>50 to 60</td>
</tr>
<tr>
<td>Oxygen reservoir (mask)</td>
<td>10 to 12 L/min</td>
<td>90</td>
</tr>
<tr>
<td>Mouth to mask</td>
<td>10 L/min</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>15 L/min</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>30 L/min</td>
<td>100</td>
</tr>
<tr>
<td>Bag/valve/mask</td>
<td>Room air</td>
<td>21</td>
</tr>
<tr>
<td>(Regulated to inflate bag at proper rate.)</td>
<td>12 L/min</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>with Reservoir</td>
<td>90+</td>
</tr>
</tbody>
</table>
**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.

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.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSI and maintenance of post-intubation paralysis</td>
<td>0.5 mg/kg</td>
<td>IV, IO</td>
<td>10 mg/mL concentration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSI and maintenance of post-intubation paralysis</td>
<td>0.5 mg/kg</td>
<td>IV, IO</td>
<td>10 mg/mL concentration</td>
</tr>
</tbody>
</table>
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 control arrhythmias in cyclic antidepressant overdose.
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.

<table>
<thead>
<tr>
<th>Adult</th>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cyclic Antidepressant OD</td>
<td>1 mEq/kg</td>
<td>IV, IO</td>
<td>OLMC required</td>
</tr>
<tr>
<td></td>
<td>Entrapment</td>
<td>Call for Dose</td>
<td>IV, IO</td>
<td>Trauma physician through OLMC for advice</td>
</tr>
<tr>
<td></td>
<td>V-Fib/pulseless VT Asystole</td>
<td>1 mEq/kg</td>
<td>IV, IO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hyperkalemia</td>
<td>50 mEq</td>
<td>IV, IO</td>
<td>OLMC required</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pediatric</th>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cyclic Antidepressant OD/hyperkalemia</td>
<td>1 mEq/kg</td>
<td>IV, IO</td>
<td>OLMC contact required</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanide Poisoning</td>
<td>50 mL slow IV/IO (over 10-20 minutes)</td>
<td>IV, IO</td>
<td>Consider using Buretrol® or similar device.</td>
</tr>
<tr>
<td><strong>Adult and children 6 years or older</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyanide Poisoning</td>
<td>1.65 mL/kg slow IV/IO (over 10-20 minutes)</td>
<td>IV, IO</td>
<td>Consider using Buretrol® or similar device.</td>
</tr>
<tr>
<td><strong>Pediatric - children less than 6 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clenched jaw.</td>
<td>1.5 mg/kg</td>
<td>IV, IO</td>
<td>If inadequate relaxation present after 1 minute, repeat the same dose.</td>
</tr>
<tr>
<td>Active gag reflex.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncontrollable combative behavior.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical condition requiring airway protection.</td>
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</tbody>
</table>

### Pediatric - children less than 6 years

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clenched jaw.</td>
<td>2 mg/kg</td>
<td>IV, IO push</td>
<td>If inadequate relaxation present after 1 minute, repeat the same dose.</td>
</tr>
<tr>
<td>Active gag reflex.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical condition requiring airway protection.</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
**Vasopressin**

**Class**
Vasopressor

**Actions**
Vasopressin is a non-peptide hormone made in the posterior pituitary. Its primary role is water regulation with secondary role of vasoconstriction. It increases GI and uterine motility, platelet aggregation, and results in secretion of ACTH, aldosterone, factor VIII.

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

**Indications**
Asystole, PEA, V-Fib, Pulseless VT

**Contraindications**
Absolute contraindications include hypersensitivity to the medication.

| Adult |  |
| --- | --- | --- | --- |
| **Indication** | **Dose** | **Route(s)** | **Special** |
| Asystole/PEA/V-Fib/Pulseless VT | 40 units | IV, IO |  |

**Pediatric** - Not indicated for pediatrics

**Preparation**
Concentration of vasopressin is 20 U/mL.
Vecuronium Bromide (Norcuron®)

(Class 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 is 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.

<table>
<thead>
<tr>
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<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSI and maintenance of post-intubation paralysis</td>
<td>0.1 mg/kg</td>
<td>IV, IO</td>
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</tr>
</tbody>
</table>

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<tr>
<th>Pediatric</th>
<th>Indication</th>
<th>Dose</th>
<th>Route(s)</th>
<th>Special</th>
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<tbody>
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</tr>
</tbody>
</table>
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

Contraindications
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.

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Indication</strong></td>
</tr>
<tr>
<td>Patient Restraint</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
| *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.