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 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 gm/kg	PO or NG	OLMC Required (except for acetaminophen or aspirin)
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Poisoning or overdose	1 gm/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.

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.

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 cc (or more).

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

**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 6 liters per minute. Patients with 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
Hyperkalemia	10 mg	Nebulized	OLMC Required
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

**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
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
V-fib/Pulseless V-tach	5 mg/kg	IV, IO	Repeat once with 2.5 mg/kg
V-tach with pulse	2.5 mg/kg	IV, IO	Mix with 2 mL/kg of NS in Buretrol and infuse over 10 minutes

Preparation:

Amiodarone is packaged 150 mg ampules containing 3 mL of amiodarone.

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

For ventricular tachycardia: 150 mg over 10 minutes.

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**
Asystole, PEA	1 mg IV	IV, IO	q 3-5 minutes to MAX of 3.0 mg IV/IO
Bradycardia	0.5 mg	IV, IO	q 3-5 minutes MAX 3 mg
Organophosphates	1-5 mg	IV, IO	Call OLMC for frequency
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Bradycardia	0.02 mg/kg	IV, IO	Minimum single dose is 0.1 mg Maximum single dose 0.5 mg Maximum total dose 1 mg
RSI	0.02 mg/kg	IV, IO	Minimum dose is 0.1 mg Required if pt. <2 years
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. Remember in cardiac arrest situations that atropine dilates pupils.

C. 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 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. 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.

Adult and Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Hyperkalemia* Calcium Channel Blocker OD	One 10 ml calcium gluconate vial 10%	IO, Slow IV (over 5-10 min) Use a proximal port	OLMC Contact Required in Calcium Channel Blocker OD only
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Hyperkalemia* Calcium Channel Blocker OD	0.5 ml of calcium gluconate 10% per kg (0.5 cc/kg) Maximum of 10 (1 calcium gluconate 10% vial)	IO, Slow IV (over 5-10 min) Use a proximal port	OLMC Contact Required in Calcium Channel Blocker OD only

NOTES:

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

Preparation:

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

**Dextrose 50%

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)	50 ccs	Slow IV	Can give orally
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Hypoglycemia (Altered Mental Status)	Patients over 10 kg, **1 cc/kg** MAX 50 ccs	Slow IV	May repeat once Can give orally
Hypoglycemia (Altered Mental Status)	Patients ≤ 10 kg, administer **2 cc/kg of D25%**	Slow IV	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% should be given whenever hypoglycemia is documented by blood glucose meters or colorimetric reagent strips.
2. If these objective findings are not available, the EMT should use judgment based on signs and history.

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

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

Side Effects/Special Notes

A. Diphenhydramine is **rarely** necessary in the field.
B. It is **not** the first-line drug for allergic reactions, but may be useful for long transports.

***Dopamine (Intropin®)

Class:

Adrenergic vasopressor

Actions:

Chemical precursor of norepinephrine that occurs naturally in individuals and which has both alpha and beta-receptor stimulating actions. Its actions differ with dosage given:

A. 1 to 2 micrograms/km/min — dilates renal and mesenteric blood vessels (no effect on heart rate or blood pressure).

B. 2 to 10 micrograms/km/min — beta effects on heart which usually increase cardiac output without increasing heart rate or blood pressure.

C. 10 to 20 micrograms/km/min — alpha peripheral effects cause peripheral vasoconstriction and increased blood pressure.

D. 20 to 40 micrograms/km/min — alpha effects reverse dilatation of renal and mesenteric vessels with resultant decreased flow.

Indications:

A. Primary indication is cardiogenic shock.

B. May be useful for other forms of shock, except hypovolemic.

Precautions:

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

B. High doses may cause extreme peripheral vasoconstriction. Conversely, low doses may cause a decreased blood pressure due to peripheral dilatation.

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

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

Side Effects/Special Notes:

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

1. Angina has been reported following treatment.

2. Tachycardia and arrhythmias are less likely than with other catecholamines.

B. Consider hypovolemia and treat this with appropriate fluids before administration of dopamine. Dopamine is contraindicated for hypovolemic shock.

C. Dopamine is best administered by an infusion pump to accurately regulate rate. **Monitor closely.**

***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.

Precautions:

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

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Patient Restraint	2.5 mg	IV, or IM	Monitor ECG Maximum dose 5 mg
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

(* 1:1,000 Subcutaneous Only) (1:10,000)**

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. Electromechanical dissociation

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.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Ventricular fibrillation, Asystole, PEA	1 mg IV/IO	IV, IO q 3-5 min	
Anaphylaxis, Asthma	0.3 mg 1:1000 SQ or IM **OR** 0.3 mg 1:10,000 IV	1:1000 SQ, IM 1:10,000 IV, IO	OLMC required for asthma if pt. > 40 y.o.
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Ventricular fibrillation, Asystole, PEA	IV/IO - 0.01 mg/kg (1:10,000) neonatal ET use 1:10,000 at 0.01 mg/kg	IV, IO, ET q 3-5 min	ET use is last resort in neonates
Anaphylaxis	0.01 mg/kg of 1:1000	IM, SQ	MAX single dose is 0.3 mg
	0.01 mg/kg of 1:1000 **or** 0.01 mg/kg 1:10,000	IV, IO	MAX single dose is 0.3 mg
Respiratory distress	5 cc of 1:1000	Nebulizer	For audible stridor at rest

Side Effects/Special Notes:

A. Anxiety, tremor, headache

B. Tachycardia, palpitations, PVCs

C. Angina, hypertension

***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:

Induction drug for use in rapid sequence intubation.

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

**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.

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 ≥ 40kg			
Indication	**Dose**	**Route(s)**	**Special**
Isolated extremity fractures, burns, chest pain	50 micrograms, repeat with 25-50 micrograms every 3-5 min as needed to a max of 200 micrograms	IV, IM, IO	Do not give if BP is <100 mmHg systolic
Pediatric <40kg			
Isolated extremity fractures, burns	1 microgram/kg, repeat with 0.5-1 microgram/kg every 3 -5 minutes as needed, maximum 4 microgram/kg	IV, IM, 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	20 mg - **OR** Amount equal to the patients largest individual daily dose	IV, IO	MAX dose is 100 mg
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
Beta Blocker OD	Call OLMC	Call OLMC	OLMC required
Pediatric			
Hypoglycemia	0.02 mg/kg to a max 1 mg	IM	
Beta Blocker OD	Call OLMC	Call OLMC	OLMC required

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 80 mg% in adults).

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 EMT 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 ABC's.

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.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Cyanide poisoning	5 g (both 2.5 g vials)	IV, IO over 15 minutes	Depending on the severity of the poisoning and the clinical response, a second dose of 5 g may be administered (after OLMC contact) up to a total dose of 10 g.
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 maximum total dose of 10 g.

Preparation:

Each 2.5 g vial of Hydroxycobolamin should be reconstituted with 100 ml of Normosol. Hydroxycobolamin 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.

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.

**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/COPD	0.5 mg	Nebulized	Combine with 2nd and 3rd doses of Albuterol®
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.

**Lidocaine (Xylocaine® HCL)

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.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
PVCs, Stable VT, Recurrent VF	**Bolus:** 1.5 mg/kg (3 mg/kg MAX) **Maintenance:** 0.75 mg/kg q 10 minutes (No MAX)	IV, IO	
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. Drug is metabolized in the liver and, therefore, patients with hepatic disease, shock or Congestive Heart Failure will have impaired metabolism. All doses after the initial dose must be decreased by one-half in patients over 70 years and those referred to above.

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.

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

***Methylprednisolone (Solu-Medrol®)

Class:

Corticosteroid

Actions:

Suppresses acute and chronic inflammation. In addition, it potentiates vascular smooth muscle relaxation by beta-adrenergic agonists and may alter airway hyperactivity.

Indications:

Asthma/COPD unresponsive to Albuterol.
Anaphylaxis

Contraindications:

Patient with known hypersensitivity to methylprednisolone.

Precautions:

May cause nausea, vomiting, headache, dizziness or hypertension.

Supplied:

125 mg/2 ml vial

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Asthma/COPD	125 mg	Slow IV/IO over 1-2 minutes	
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Asthma/wheezing	2 mg/kg	Slow IV/IO over 1-2 minutes	

***Midazolam (Versed®)

Class:

Benzodiazepine

Actions:

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

Indications:

Status Seizures: In the field this is any seizure activity that has lasted longer than 2 minutes or two consecutive seizures without regaining consciousness.

A. Do not give unless patient is actively seizing.

B. To relieve anxiety and produce amnesia during cardioversion, paralytic intubation or pacing.

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.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Seizures, pacing	2.5 mg IV/IO, or if no IV 2.5-5 mg IM (May repeat once. MAX 10 mg)	IV, IO, IM	For additional dose, call OLMC
RSI	0.1 mg/kg IV/IO MAX 2.5 mg after successful intubation	IV, IO	
Pediatric			
Seizures, pacing	0.1 mg/kg IV/IO (5 mg MAX) 0.2 mg/kg IM (5 mg MAX)	IV, IO, IM	May repeat once after 5 minutes. Call OLMC if more needed.
RSI	0.1 mg/kg IV/IO MAX 2.5 mg after successful intubation	IV, IO	
Cardioversion/ tachycardia	0.1 mg/kg IV/IO MAX 2.5 mg after successful intubation	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 2 to 3 minutes; peak effect occurs at 7 to 10 minutes and lasts 3 to 5 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	2-5 mg, repeat with 2-5 mg to a MAX of 20 mg	IV, IO	Do not give if BP is <100 mmHg systolic
Pediatric			
Isolated extremity fractures, burns	**< 20 kg: 0.1 mg/kg repeat p.r.n.**	IV, IO	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.

**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).

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Reversal of opioid effects, coma of unknown etiology	If no IV present, 2 mg IM If IV already established, 0.5 mg IV may be repeated q 2 minutes up to 2 mg	IV, IO, IM	In most instances, a total dose of 2 mg IM 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 or IV/IO every 3-5 minutes) up to a maximum 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 etioloy	**< 20 kg: 0.1 mg/kg no more than 2 mg/dose**	IV, IO, IM	Do not use in neonates

Side Effects/Special Notes:

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-B 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. If no effect, give no more than 3 doses	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
Precaution: NTG is contraindicated in patients who have recently taken Viagra® (sildenafil citrate) or Levitra® (vardenafil HCI) within 24 hours OR taken Cialis® (tadalafil) within 48 hours. Contact OLMC for direction.			

Contraindications:

A. Blood pressure less than 100 mm/Hg.

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

***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 in adults.

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®).

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Nausea and vomiting	4 mg slowly (over 2 minutes)	IV, IM, IO	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	OLMC <2 years of age

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	24
	2 L/min	28
	8 L/min	40
Face Mask	6 L/min	50 to 60
Oxygen reservoir (mask)	10 to 12 L/min	90
Mouth to mask	10 L/min	50
	15 L/min	80
	30 L/min	100
Bag/valve/mask	Room air	21
(Regulated to inflate bag	12 L/min	40
at proper rate.)	with Reservoir	90+

***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.

Adult			
Indication	**Dose**	**Route(s)**	**Special**
Cyclic Antidepressant OD	1 mEq/kg	IV, IO	OLMC required
Entrapment	Call for Dose	IV, IO	Trauma physician through OLMC for advice
V-Fib/pulseless VT Asystole	1 mEq/kg	IV, IO	
Hyperkalemia	50 mEq	IV, IO	OLMC required
Pediatric			
Indication	**Dose**	**Route(s)**	**Special**
Cyclic Antidepressant OD/hyperkalemia	**1 mEq/kg**	IV, IO	OLMC contact required

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 slow IV/IO (over 10-20 minutes)	IV, IO	Consider using Buretrol® or similar device. OLMC required
Pediatric - children less than 6 years			
Indication	**Dose**	**Route(s)**	**Special**
Cyanide Poisoning	1.65 ml/kg slow IV/IO (over 10-20 minutes)	IV, IO	Consider using Buretrol® or similar device. OLMC required

***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.

**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

Precautions:

A. Vasopressin should only be administered in patients with asystole.

B. 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®)

(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.

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	

***Xylocaine®, Viscous (Lidocaine Jelly)

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.