Medications

Acetaminophen – 20.005

OLMC REQUIRED: No

SUPPLIED:
160 mg/5 mL liquid; 325 mg and 500 mg tablets, capsules, gel, suppositories; 10 mg/ml, 100 ml vial; 10 mg/ml, 100 ml pre-mixed bag

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

- Glucuronidation (45 - 55%)
- Sulfate conjugation (20 - 30%)
- N-hydroxylation and dehydration, then GSH conjugation (less than 15%)

All three pathways yield final products that are non-toxic. In the third pathway, however, the intermediate product NAPQI is toxic. At usual doses, NAPQI is quickly detoxified by conjugation with glutathione. In overdose, glutathione is used up and the toxic metabolite can cause potentially fatal liver damage. It is metabolized by the liver and is hepatotoxic. Toxicity is multiplied when combined with alcoholic drinks, and very likely in chronic alcoholics or patients with liver damage.

INIDCATIONS:

A. Mild to moderate pain.
B. Fever.

CONTRAINDICATIONS

A. Known liver disease.
B. Current alcohol abuse.
C. Acute intoxication.
D. Has taken acetaminophen in last 4 hours.

ADULT DOSING:

Pain and Fever-

650 - 1000 mg PO **or** 1000 mg IV slowly over 5 minutes. If given by infusion pump, can be administered over 10 -20 minutes.

PEDIATRIC DOSING:

Pain and Fever-

15 mg/kg PO liquid only to a maximum of 1000 mg

Approximate dosing using 160 mg/5 mL liquid.

Weight	Dose	Volume
11 lbs./5kg	80 mg	2.5 mL
22 lbs./10 kg	160 mg	5 mL
44 lbs./20 kg	320 mg	10 mL
66 lbs./30 kg	480 mg	15 mL
88 lbs./40 kg	640 mg	20 mL

Activated Charcoal – 20.010

OLMC REQUIRED:

A. Aspirin and acetaminophen with time of ingestion > 2 hours.
B. All other poisons or ingestions regardless of time from ingestion.

SUPPLIED: 25 grams / 120 ml bottle.

PHARMACOLOGY AND ACTIONS:

Activated charcoal adsorbs toxic substances ingested and inhibits GI adsorption by forming an effective barrier between the particulate material and the gastrointestinal mucosa. The effect is greatest if used within one hour of ingestion.

INDICATIONS:

Management of poisoning or overdose of many substances.

CONTRAINDICATIONS:

A. Patients with altered mental status or the inability to maintain their own airway.
B. Patients who have aspirated or with a potential for aspiration.

PRECAUTIONS:

A. Activated charcoal may be ineffective in some ingestions.
B. Milk, ice cream and other dairy products will decrease the adsorption capacity substantially.

SIDE EFFECTS AND NOTES:

May cause nausea, vomiting, and constipation.

ADULT DOSING:

Poisoning & overdose -

1 gram / kg PO or OG to a max of 50 grams.

PEDIATRIC DOSING:

Same as adult.

Adenosine (Adenocard®) – 20.020

OLMC REQUIRED: No

SUPPLIED: 6 mg / 2 ml and 12 mg / 4 ml pre-filled syringes

PHARMACOLOGY AND 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 and has a half-life in the blood of less than ten seconds.

INDICATIONS:
To convert PSVT to a normal sinus rhythm, including PSVT that is associated with accessory bypass tracts (e.g. Wolff-Parkinson-White Syndrome).

CONTRAINDICATIONS:

A. Second- or third-degree heart block.
B. Sick Sinus Syndrome.
C. Known hypersensitivity.
D. Atrial fibrillation.

PRECAUTIONS:

A. When doses larger than 12 mg are given by injection, there may be a decrease in blood pressure secondary to a decrease in vascular resistance.
B. The effects of adenosine are antagonized by 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. All doses of adenosine should be reduced to one-half (50%) in the following clinical settings:
    1. History of cardiac transplantation.
    2. Patients who are on carbamazepine (Tegretol) and dipyridamole (Persantine).
    3. Administration through any central line.
G. Adenosine should be used with caution in patients with asthma as it may cause a reactive airway response in some cases.

SIDE EFFECTS AND NOTES:
May cause facial flushing, shortness of breath, chest pressure, nausea, headache, and lightheadedness.

ADULT DOSING:
6 mg rapid IV. May repeat with 12 mg IV x 2 if patient fails to convert after 6 mg dose. Use a large proximal IV site with fluid bolus flush.

PEDIATRIC DOSING:
0.1 mg/kg rapid IV. May repeat with 0.2 mg/kg once if patient fails to convert after first dose. Use a large proximal IV site with fluid bolus flush.

Albuterol (Ventolin®) – 20.030

OLMC REQUIRED: None

SUPPLIED: 2.5 mg / 3 ml vial individually or 3 mg packaged with 0.5 mg ipratropium (Duo-Neb).

PHARMACOLOGY AND ACTIONS:
Albuterol is a potent, relatively selective beta-2 adrenergic bronchodilator and is associated with relaxation of bronchial smooth muscle and inhibition of release of mediators of immediate sensitivity from cells, especially MAST cells. The onset of improvement in pulmonary function is within 2 - 15 minutes after the initiation of treatment and the duration of action is from 4 - 6 hours. Albuterol has occasional beta-1 overlap with clinically significant cardiac effects.

INDICATIONS:
A. To treat bronchial asthma and reversible bronchial spasm that occurs with chronic obstructive pulmonary disease.
B. To treat hyperkalemia.
C. Chlorine Inhalation.

CONTRAINDICATIONS:
None in the prehospital setting.

PRECAUTIONS:
A. The patient's rhythm should be observed for arrhythmias. Stop treatment if frequent PVC's develop or any tachyarrhythmias other than sinus tachycardia appears or if heart rate increases by more than 20 beats/minute.
B. Paradoxical bronchospasm may occur with excessive administration.

SIDE EFFECTS AND NOTES:
Clinically significant arrhythmias may occur, especially in patients with underlying cardiovascular disorders such as coronary insufficiency and hypertension.

ADULT DOSING:
Respiratory distress -
3.0 ml DuoNeb (3.0 mg albuterol/0.5 mg ipratropium) via nebulizer. Repeat DuoNeb as needed X 2. Do not administer more than three total treatments.
If no response to DuoNeb, continue with Albuterol only at 2.5 mg via nebulizer. May repeat as needed.
Hyperkalemia (including secondary to crush injury) -
10 mg via nebulizer.
Chlorine Inhalation-
2.5 mg via nebulizer.

PEDIATRIC DOSING:
Same as adult except in hyperkalemia.

Hyperkalemia-
< 25 kg, 2.5 mg via nebulizer.
25 - 50 kg, 5.0 mg via nebulizer.
> 50 kg, 10 mg via nebulizer.

Amiodarone (Cordarone®) – 20.040

OLMC REQUIRED: See contraindications.

SUPPLIED: 150 mg / 3 ml pre-filled syringe or vial or 450 mg / 9 ml multiuse vial

PHARMACOLOGY AND ACTIONS:
Amiodarone depresses automaticity of the SA node. It slows conduction and increases refractoriness of the AV node. Amiodarone increases atrial and ventricular refractory period and prolongs the QTc interval. When given IV it is rapidly distributed. No dosage adjustments are needed for patients with renal, liver, heart failure, or advanced age.

INDICATIONS:
A. Ventricular fibrillation.
B. Ventricular tachycardia with pulses.
C. Post resuscitation anti-dysrhythmic.
D. PVCs in the setting of an acute ischemic event.

CONTRAINDICATIONS:
A. None in cardiac arrest.
B. Do not use in perfusing patients in the following situations without OLMC approval:
1. Systolic BP is less than 90 mmHg.
2. Heart rate is less than 50 beats per minute.
3. Periods of sinus arrest are present.
4. Second or third-degree heart blocks are present.

PRECAUTIONS:
A. In high concentrations (> 3 mg/ml), amiodarone can cause phlebitis. Infusion concentrations should not exceed 2 mg/ml.
B. Amiodarone will precipitate if administered in the same IV line as sodium bicarbonate or heparin.

SIDE EFFECTS AND NOTES:
A. In perfusing patients, amiodarone may cause hypotension, prolonged QTc interval, pro-arrhythmic effects (Torsades and ventricular fibrillation), severe bradycardia, and atrioventricular block.
B. Non-cardiac toxicities are usually related to chronic administration and include pulmonary infiltrates, hepatic and/or thyroid dysfunction, and peripheral neuropathy.

ADULT DOSING:
V Fib, pulseless V Tach - 300 mg IV/IO. May repeat once with 150 mg.
Unstable V Tach with a pulse (After unsuccessful cardioversion X 2) - 150 mg IV/IO slow IV push over 3 minutes.
Stable V Tach with a pulse - 150 mg IV/IO. Mix with 100 ml of NS (in Buretrol or 100 ml bag) and infuse over 10 minutes via drip or pump. May repeat once if no conversion.
Post resuscitation from VF/pVT - 150 mg IV/IO. Mix with 100 ml of NS (in Buretrol or 100 ml bag) and infuse over 10 minutes via drip or pump. (If amiodarone was last anti-dysrhythmic given prior to ROSC, wait 30 minutes after ROSC to re-dose). Max total arrest/post-ROSC dose is 450 mg.
PVCs (In the setting of an acute ischemic event) – 150 mg IV/IO over 10 minutes.

Amiodarone (Cordarone®) – 20.040

PEDIATRIC DOSING:

V Fib, pulseless V Tach - 5 mg/kg IV/IO. May repeat once with 2.5 mg/kg.

Unstable V Tach with a pulse (After unsuccessful cardioversion X 2) - 2.5 mg/kg IV/IO slow IV push over 3 minutes.

Aspirin – 20.050

OLMC REQUIRED: No

SUPPLIED: 81 mg chewable tablets (Children's aspirin)

PHARMACOLOGY AND ACTIONS:
Aspirin inhibits prostaglandins and disrupts platelet function for the life of the platelet. 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 suspected ischemic chest pain.

CONTRAINDICATIONS:

A. Allergy to aspirin or aspirin induced asthma.
B. History of bleeding disorder (i.e. hemophilia).
C. Current ulcer or GI bleeding.
D. Suspected aortic dissection.

SIDE EFFECTS AND NOTES:

A. High doses of aspirin can cause ringing in the ears.
B. May cause heartburn, nausea, and vomiting.

ADULT DOSING:

Chest pain (acute myocardial infarction) -
324 mg orally.

PEDIATRIC DOSING:

Not indicated for pediatric patients

Atropine Sulfate – 20.060

OLMC REQUIRED: No

SUPPLIED: 1 mg / 10 ml pre-filled syringe, 2 mg / 0.7 ml autoinjector, 8 mg / 20 ml vial

PHARMACOLOGY AND 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 the AV node.
C. Reduces motility and tone of the 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 (e.g. anti-cholinesterase, organophosphates) and nerve gases.
D. To counteract excessive vagal influences causing some brady-systolic and asystole arrests.
E. For bradycardia not due to hypoxia when using succinylcholine.

CONTRAINDICATIONS:

A. Atrial fibrillation and atrial flutter because increased conduction may speed ventricular rate excessively.
B. Not used in neonatal resuscitation.

PRECAUTIONS:
Bradycardia in the setting of an acute myocardial infarction is common and probably beneficial. Do not treat unless there are signs of poor perfusion (low blood pressure, mental confusion).

SIDE EFFECTS AND NOTES:

A. Atropine blocks cholinergic (vagal) influences already present. If there is little cholinergic stimulation present, effects will be minimal.
B. Remember in cardiac arrest situations, atropine dilates pupils.

ADULT DOSING:

Bradycardia (cardiac) -
1.0 mg IV/IO. May repeat every 3 - 5 minutes to max of 3 mg.

Bradycardia secondary to RSI/DSI -
0.5 mg IV/IO.

Organophosphate poisoning -
For mild to moderate poisoning (Headache, mild bronchorrhea, nausea, vomiting, diarrhea but normal mentation): 1 - 2 mg IV/IO/IM every 3 - 5 minutes until symptoms improve (e.g., decreased secretions).
For severe poisoning with unconsciousness (Altered mental status, unconsciousness, seizures): 3 - 5 mg IV/IO/IM every 3 - 5 minutes until symptoms improve (e.g., decreased secretions, ease of ventilation).

Atropine Sulfate – 20.060

PEDIATRIC DOSING:

Bradycardia secondary to RSI/DSI -

0.02 mg/kg IV/IO. Minimum dose 0.1 mg. Do not exceed adult dose.

Organophosphate poisoning -

0.05 mg/kg IV/IO/IM. Contact OLMC for frequency of dosing.

Buprenorphine (Suboxone®) – 20.065

OLMC REQUIRED: Yes – Contact Oregon Poison Center Buprenorphine Physician

SUPPLIED: 8 mg/2 mg Buprenorphine/Naloxone sublingual film or sublingual tab

PHARMACOLCOGY AND ACTIONS: Buprenorphine is a partial agonist and antagonist at the opioid receptor. It is used in the acute and chronic setting to treat opioid withdrawal symptoms, including GI symptoms, restlessness/anxiety/irritability, aches, sweating, tachycardia. It blocks effects of other opioids including fentanyl, morphine, oxycodone, hydromorphone, heroin. Onset of action 10 - 15 minutes, peak effect is at 1 - 4 hours, and effects can last for 24 - 36 hours.

INDICATIONS:
Opioid Withdrawal Symptoms with Clinical Opioid Withdrawal Scale (COWS) Score ≥ 7.

CONTRAINDICATIONS

A. Known allergy to buprenorphine.
B. COWS score < 7.
C. Any methadone in the last 7 days.
D. Altered mental status or unable to consent.
E. Concurrent severe medical illness (sepsis, respiratory distress, etc.).
F. Currently pregnant.
G. No history of Opioid Use Disorder.
H. Patients less than 18 years old.

PRECAUTIONS:

A. Buprenorphine can cause worsened opiate withdrawal symptoms if given to patients who are not in withdrawal. If opioid withdrawal symptoms are not improved or worsened with buprenorphine, additional buprenorphine and other medications are typically needed.
B. Buprenorphine rarely causes respiratory depression in patients who are not opioid naïve.
C. Buprenorphine is a schedule III-controlled substance. Follow your agency's controlled substance policy for control and monitoring of use.

SIDE-EFFECTS AND NOTES:
Like all opioids, buprenorphine administered to a patient without a history of opioid use disorder may cause somnolence and respiratory depression.

ADULT DOSING:

Opioid Withdrawal with COWS Score ≥ 7

Give a small amount of water to moisten mucous membranes.
Administer 16 mg buprenorphine sublingual.
May repeat after 10 minutes with additional 8 mg dose (24 mg max)

PEDIATRIC DOSING:

Not indicated in patients < 18 years old

Calcium Gluconate – 20.070

OLMC REQUIRED: None

SUPPLIED: 1 gram / 10 ml vial or 5 gram / 50 ml vial (vial size and concentration may vary depending on availability).

PHARMACOLOGY AND ACTIONS:
Calcium is the most common cation in the human body. The majority of the body stores of calcium are located in bone. It plays an important role in many physiologic functions and is essential for proper nerve and muscle function.

INDICATIONS:
A. Suspected calcium channel blocker overdose.
B. Hyperkalemia.
C. Cardiac arrest from suspected hyperkalemia.
D. Dermal hydrofluoric acid burn.

CONTRAINDICATIONS:
A. Hypercalcemia and hypercalciuria (hyperthyroidism, Vitamin D overdose, bone metastases).
B. Patients on digoxin.

PRECAUTIONS:
A. Extravasation of calcium salts will cause necrosis of tissue. The IV should be secured and free blood return into the syringe should be checked 2 - 3 times during administration. If extravasation does occur, immediately stop administration.
B. Administer slowly (no faster than 2 ml/min) and stop if patient complains of distress. Inject using a small needle in a large vein.
C. Calcium gluconate will precipitate if mixed with sodium bicarbonate. Flush catheter completely before administering one medication after another.

SIDE EFFECTS AND NOTES:
A. Rapid injection of calcium gluconate may cause vasodilatation, decreased blood pressure, bradycardia, cardiac arrhythmias, syncope, and cardiac arrest.
B. One 10 ml vial of calcium gluconate 10% contains 1 gram of calcium gluconate salt (= 93 mg elemental calcium or 4.65 mEq calcium or 2.3 mmol calcium).

ADULT DOSING:
Hyperkalemia -
1 - 3 grams slow IV/IO over 5 - 10 minutes. Use a proximal port.
Calcium channel blocker overdose (symptomatic) -
1 - 3 grams slow IV/IO over 5 - 10 minutes. Use a proximal port.
Cardiac arrest from suspected hyperkalemia (e.g., dialysis patient) -
3 gram IV/IO push.
Dermal hydrofluoric acid burn -
3 grams mixed with 5 oz. water soluble lubricant applied directly to burn.

PEDIATRIC DOSING:
Hyperkalemia, calcium channel blocker overdose -
0.6 ml/kg slow IV/IO over 5 - 10 minutes. Use a proximal port. Max dose 10 ml.

Dexamethasone (Decadron®) – 20.075

OLMC REQUIRED: No

SUPPLIED: 10 mg / 1 ml vial

PHARMACOLOGY AND 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.
D. Chlorine Inhalation.

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 DOSING:
Respiratory distress, severe allergic reaction, anaphylaxis -
10 mg IV/IO/IM/PO. Flavoring may be used if available for oral dosing.
Chlorine Inhalation-
10 mg IV/IO/IM/PO.

PEDIATRIC DOSING:
Respiratory distress, severe allergic reaction, anaphylaxis, croup -
0.6 mg/kg IV/IO/IM/PO to a max of 10 mg. Flavoring may be used if available for oral dosing.

Dextrose - 20.080

OLMC REQUIRED: No

SUPPLIED: 25 grams/50 ml pre-filled syringe 50%. 25 grams/250 ml bag 10%

PHARMACOLOGY AND 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 outside the bloodstream, and glucagon, which mobilizes stored glucose into the bloodstream.

INDICATIONS:
A. Hypoglycemia.
B. Unconscious patient when history is unobtainable.

CONTRAINDICATIONS:
None

PRECAUTIONS:
A. Extravasation of dextrose may cause necrosis of tissue and the patency of the IV should be secured during administration. If extravasation does occur, immediately stop administration.
B. Report any extravasation to receiving hospital personnel and document on the Prehospital Care Report.

SIDE EFFECTS AND NOTES:
Hyperglycemia may complicate or worsen a number of medical conditions (e.g., myocardial infarction and stroke). Dextrose should be given whenever hypoglycemia is documented by blood glucose meters. If these findings are not available, the EMT should use judgement based on signs and history.

ADULT DOSING:
Hypoglycemia/Altered mental status -
10 **-** 25 grams slow IV/IO.

PEDIATRIC DOSING –
For infants < 10 kg (birth to 1 year) with CBG < 40 mg% and children 10 kg - 35 kg with CBG < 60 mg% give:

Dextrose 10% - 5 ml/kg IV by infusion to a maximum dose of 250 ml.

Dextrose 12.5% - 4 ml/kg by infusion to a maximum dose of 200 ml.
(if diluting D50)

Diltiazem– 20.095

OLMC REQUIRED: No

SUPPLIED: 5 mg / ml in 5 ml vial

PHARMACOLOGY AND ACTIONS:
Diltiazem is a calcium channel blocker. It slows conduction through the sinoatrial and AV node; thus, slows ventricular response to the stimuli of rapid atrial fibrillation and atrial flutter. IV diltiazem is used primarily for ventricular rate control in atrial fibrillation and atrial flutter. Conversion to normal sinus rhythm often occurs.

INDICATIONS:
As a secondary medication to adenosine in the setting of SVT if the patient has a contraindication to adenosine use, or the patient wishes not to receive adenosine based on past experience.

CONTRAINDICATIONS:

A. Hypotension (systolic BP < 120)
B. Wide complex tachycardia of uncertain origin
C. WPW
D. Left ventricular dysfunction/heart failure
E. Sick Sinus Syndrome
F. AV block without pacemaker
G. Patient already taking a beta blocker

PRECAUTIONS:

A. Slow administration is required to avoid hypotension.
B. Dosing should be reduced by one half in setting of impaired hepatic or renal functions, the elderly and debilitated patients.
C. Monitor for cardiac dysrhythmias.
D. Monitor for hyperthermia.
E. Be prepared to treat seizures.

SIDE EFFECTS AND NOTES:
May produce hypotension, bradycardia, and decreased left ventricular activity

ADULT DOSING:
2.5 mg slow IV push over 1 min. May repeat up to 25 mg in 1-minute increments
Or
2.5 mg/min IV infusion to a max of 25 mg

PEDIATRIC DOSING:
Not indicated for pediatric patients

Diphenhydramine (Benadryl ®) – 20.097

OLMC REQUIRED: No

SUPPLIED: 50 mg/ml vial

PHARMACOLOGY AND ACTIONS:
Diphenhydramine is an antihistamine which blocks the action of histamines released from cells during an allergic reaction. It has direct CNS effects, which may be a stimulant, or more commonly a depressant, depending on individual variation. Diphenhydramine also has an anticholinergic and antiparkinsonian effect which is used to treat acute dystonic reactions to antipsychotic and anti-nausea medications (e.g., Haldol®, Thorazine®, Compazine®, Inapsine®, Reglan®). These reactions include oculogyric crisis, acute torticollis, and facial grimacing.

INDICATIONS:
A. The second-line drug in anaphylaxis and severe allergic reactions (after epinephrine).
B. To counteract acute dystonic and dysphoric reactions to anti-psychotic and anti-emetic medications.
C. Pharmacological sedation for patients ≤ 12 years old.

CONTRAINDICATIONS:
None

PRECAUTIONS:
A. May have an additive effect with alcohol or other CNS depressants.
B. Although useful in acute dystonic reactions, it is not an antidote for anti-psychotic toxicity or overdose.
C. May cause hypotension when given IV.

SIDE EFFECTS AND NOTES:
Diphenhydramine is not the first-line drug for allergic reactions but may be useful for longer transports.

ADULT DOSING:
Anaphylaxis, extrapyramidal symptoms -
1 mg/kg IV/IM to a max of 50 mg.

PEDIATRIC DOSING:
Anaphylaxis, extrapyramidal symptoms -
1 mg/kg IV/IM to a max of 50 mg.

Pharmacological Sedation (For patients ≤ 12 years) -
1 mg/kg IV/IM, not to exceed 25 mg.

Dopamine (Intropin®) – 20.100

OLMC REQUIRED: No
SUPPLIED: 800 mg / 10 ml vial or 400 mg / 10 ml vial

PHARMACOLOGY AND ACTIONS:
Dopamine is the chemical precursor of norepinephrine which occurs naturally in humans and which has both alpha and beta receptor stimulating actions. Its actions differ with the dosage given:

- 1 - 2 mcg/kg/min – Dilates renal and mesenteric blood vessels. No effect on heart rate or blood pressure.
- 2 - 10 mcg/kg/min – Beta effects on the heart, which usually increases cardiac output without increasing heart rate or blood pressure.
- 10 - 20 mcg/kg/min – Alpha peripheral effects cause peripheral vasoconstriction and increased blood pressure.

INDICATIONS:

A. Primary indication is cardiogenic shock.
B. May be useful in other forms of shock, except hypovolemic.

CONTRAINDICATIONS:
Hypovolemic shock.

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

SIDE EFFECTS AND NOTES:

A. The most common side effects include ectopic beats, nausea, and vomiting.
B. Angina has been reported following treatment.
C. Tachycardia and arrhythmias are less likely than with other catecholamines.
D. Can precipitate hypertensive crisis in susceptible individuals (i.e. patients on MAO inhibitors such as Parnate, Nardil, or Marplan).
E. Consider hypovolemia and treat this with appropriate fluids before administration of dopamine.
F. Dopamine is best administered by infusion pump if available. Monitor closely.

ADULT DOSING:

Bradycardia -

Begin at 2 mcg/kg/min and increase as needed to a maximum of 10 mcg/kg/min titrating to desired effect.

Cardiogenic shock -

5 mcg/kg/min IV drip. Increase by 5 mcg/kg/min every 5 minutes to max of 20 mcg/kg/min or until MAP is ≥ 65 mmHg (≥ 90 mmHg systolic) and signs of shock have been alleviated.

PEDIATRIC DOSING:
Same as adult.

Droperidol (Inapsine®) – 20.102

OLMC REQUIRED: Patients < 14 years old

SUPPLIED: 5 mg / 2 ml vial and ampule

PHARMACOLOGY AND ACTIONS:
Droperidol is an antipsychotic that may be used for pharmacological sedation. It also provides a state of mental detachment and indifference while maintaining a state of reflex alertness. Droperidol may potentiate the effects of other CNS depressants. It also causes mild alpha-adrenergic blockade which can lead to peripheral vasodilatation and hypotension, as well as a reduction of the pressor effect of catecholamines. It is also a very effective anti-emetic. Onset of action is from 3 - 10 minutes following administration and peak effect may not be apparent for up to 30 minutes. Duration is generally 2 - 4 hours.

INDICATIONS:
A. Pharmacological sedation of agitated and combative patients.
B. Nausea and vomiting refractory to ondansetron.

CONTRAINDICATIONS:
Unless directed by OLMC, do not administer droperidol in the following situations:
A. Systolic BP < 90.
B. Known allergy or prior reaction to droperidol.
C. Pregnancy.
D. Known Parkinson's disease or use of dopamine agonists medications like carbidopa-levodopa (Sinemet), Pramipexole (Mirapex), or ropinirole (Requip).

PRECAUTIONS:
A. Use caution when administering droperidol to patients who have taken other CNS depressant drugs (barbiturates, benzodiazepines, alcohol)
B. Droperidol can prolong the QT interval leading to Torsade De Pointes. Continuously monitor the patient's ECG Q-T interval following use.
C. Use with caution in patients with a seizure disorder or a condition that causes seizures; droperidol and haloperidol are known to lower the seizure threshold. Consider use of midazolam or lorazepam instead.

SIDE EFFECTS AND NOTES:
A. The most common side effects are hypotension and tachycardia which usually respond to a fluid bolus.
B. Akathisia (restlessness) and dystonic reactions have been reported following administration. These symptoms can be treated with the administration of diphenhydramine.

ADULT DOSING:
Nausea & vomiting unresponsive to ondansetron -
0.625 mg IV. (0.625 mg = 0.25 ml based on a 5 mg/ 2 ml package)

Pharmacological sedation -

2.5 mg IV/IO or 5 mg IM. May repeat once in 10 minutes.
For immediate threat (RASS +3 or +4, see Agitated Patient protocol 10.015):
2.5 - 5 mg IV/IO or 5 - 10 mg IM in addition to midazolam or lorazepam.
For patients > 65 years of age: 2.5 mg IV, IO. May repeat in 5 - 10 minutes.
OR 2.5 mg - 5 mg IM. May repeat in 10 - 15 minutes.

PEDIATRIC DOSING:

Nausea & vomiting unresponsive to ondansetron –
Contact OLMC for patients < 14 years old.

Pharmacological sedation -
0.1 mg /kg IV/IM, max 5 mg. **Age > 12 only.** See Pediatric Pharmacological Sedation Flow Chart in Agitated Patient protocol.

Epinephrine – 20.110

OLMC REQUIRED: No

SUPPLIED: 1:10,000 – 1 mg / 10 ml pre-filled syringe; 1:1000 – 30 mg / 30 ml vial or 1 mg/ml vials; racepinephrine 11.25 mg / 0.5 ml

PHARMACOLOGY AND ACTIONS:
Epinephrine is a catecholamine with both alpha and beta effects. In general, the following cardiovascular responses can be expected: Increased heart rate, increased myocardial contractile force, increased systemic vascular resistance, increased arterial blood pressure, increased myocardial oxygen consumption, and increased automaticity. Epinephrine is also a potent bronchodilator.

INDICATIONS:
Epinephrine is indicated in the following situations: Ventricular fibrillation, asystole, pulseless electrical activity, symptomatic bradycardia, anaphylaxis, severe asthma, and nebulized in suspected croup (audible stridor at rest in children 6 months to 6 years).

CONTRAINDICATIONS:
None

PRECAUTIONS:

A. Epinephrine increases cardiac workload and can precipitate angina, MI, or major dysrhythmias in individuals with ischemic heart disease.
B. Wheezing in an elderly person is pulmonary edema or pulmonary embolus until proved otherwise.

SIDE EFFECTS AND NOTES:

A. May cause anxiety, tremor, or headache.
B. Cardiac side effects include tachycardia, PVC's, angina, and hypertension.

ADULT DOSING:

V Fib, Pulseless V-Tach, asystole, PEA -
1 mg 1:10,000 IV/IO every 3 - 5 minutes.

Asthma -
0.3 mg - 0.5 mg 1:1000 IM. May repeat once if patient is still in extremis. (Consider using lower doses (0.1 - 0.3 mg) for patients > 40 years old or known coronary artery disease).

Anaphylaxis -

- 1:1000, 0.3 - 0.5 mg IM. Repeat once in 5 - 15 minutes if patient is still in extremis. **Or, if IV established**,
- 1:10,000, 0.1 mg boluses IV/IO every 5 min titrated to effect. Max dose 0.5 mg. **OR,**
- Infusion IV at 2 mcg/min (2 mcg/ml) titrated to effect. (See drip preparation below)

Symptomatic Bradycardia -
Infusion at 2 mcg/min and increase as needed to a maximum of 10 mcg/min titrating to effect. (See drip preparation below)

Push Dose Epinephrine

INDICATIONS

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

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 with 10 mcg/ml (or 100mcg per syringe).

DOSE:

Adult Dosing: 10 mcg (1 ml) IV/IO every 1 - 5 minutes.
Pediatric Dosing: 1 mcg/kg every 1 - 5 minutes up to 10 mcg.

Epinephrine Drip Preparation

Mix 1 mg of 1:1000 epinephrine in 500 ml of NS or LR (2 mcg/ml), deliver by micro-drip or infusion pump.

PEDIATRIC DOSING:

V Fib, Pulseless V-Tach, asystole, PEA -
0.01 mg/kg 1:10,000 IV/IO.

Symptomatic Bradycardia (cardiac) -
0.01 mg/kg 1:10,000 IV/IO. Repeat every 3 - 5 minutes.

Asthma -
0.01mg/kg 1:1000 IM (max dose 0.5 mg). Contact OLMC for additional doses.

Anaphylaxis -

- Epinephrine 1:1000, 0.01 mg/kg IM to a max of 0.5 mg. Repeat once in 5 - 15 minutes if patient is still in extremis. **OR, if IV established**,
- Epinephrine 1:10,000, 0.01 mg/kg (max 0.1 mg) IV/IO boluses every 3 - 5 min titrated to effect. Max dose 0.5 mg. **OR**
- Epinephrine infusion IV at 0.01 mcg/kg/min (2 mcg/ml) titrated to effect.

Respiratory Distress with suspected croup (audible stridor at rest in patients 6 months to 6 years old)-

- **See Racepinephrine dosing box below**

Racepinephrine (Racemic Epinephrine) - Pediatric use only in suspected croup.

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

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

PRECAUTIONS:
A. Monitor efficacy to nebulization by clinical status, oxygen saturation, respiratory rate, and work of breathing.
B. Monitor response to heart rate and blood pressure.
C. Administer via nebulization ONLY.
D. DO NOT administer IV/ IO/ IM/ IN.

PEDIATRIC DOSE:
Respiratory distress with audible stridor at rest (pts 6 months to 6 years old) - 0.5 ml (11.25 mg) of racepinephrine diluted with 2.5 ml of normal saline via nebulizer. May repeat once in 10 minutes if necessary. Contact OLMC for additional doses.
In the absence of Racepinephrine, you may substitute 5 ml (5 mg) of Epi 1:1000 via nebulizer.

Esmolol (Brevibloc®) – 20.112

OLMC REQUIRED: No

SUPPLIED: 100 mg / 10 ml vial

PHARMACOLOGY AND ACTIONS:
Esmolol is a short-acting intravenous cardio-selective beta-blocking agent. Esmolol is able to mitigate the depression of the VF threshold produced by high doses of epinephrine used during cardiac arrest due to its ability to dampen the sympathetic tone. Due to its quick onset and offset, it is ideal for these patients, without having the excessive/prolonged effects of the drug during and after resuscitation.

INDICATIONS:
Refractory ventricular fibrillation/pulseless ventricular tachycardia following 2 doses of an anti-dysrhythmic medication.

CONTRAINDICATIONS:
None in the setting of cardiac arrest

PRECAUTIONS:
Ensure the patency of the IV/IO to prevent extravasation.

SIDE EFFECTS AND NOTES:

A. Esmolol is not to be used until both doses of an anti-dysrhythmic medication is administered, whether that is two dose of amiodarone or two doses of lidocaine.
B. Esmolol is not compatible with sodium bicarbonate. Flush IV/IO line before and after when used with bicarbonate.

ADULT DOSING:

Refractory VF/pVT

0.5 mg/kg IV/IO. If refractory VF/pulseless VT persists, repeat with another 0.5 mg/kg bolus in 5 minutes.

PEDIATRIC DOSING:

Not indicated for pediatric patients in refractory VF/pulseless VT.

Esmolol bolus dosing 0.5 mg/kg
Concentration 10 mg/ml

Weight (kg)	Dose (mg)	Volume (ml)*
30	15	1.5
35	17.5	2.0
40	20	2.0
45	22.5	2.5
50	25.0	2.5
55	27.5	3.0
60	30	3.0
65	32.5	3.5
70	35	3.5
75	37.5	4.0
80	40	4.0
85	42.5	4.5
90	45	4.5
95	47.5	5.0
100	50	5.0
105	52.5	5.5
110	55	5.5
115	57.5	6.0
120	60	6.0
125	62.5	6.5
130	65	6.5
135	67.5	7.0
140	70	7.0
145	72.5	7.5
150	75	7.5

*Dose volumes have been rounded for ease of administration

Etomidate (Amidate®) – 20.115

OLMC REQUIRED: No

SUPPLIED: 40 mg / 20 ml pre-filled syringe or 2 mg/ml in 40 mg vial

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

INDICATIONS:
A. As an induction agent for Drug Assisted Airway Management (DAAM).
B. As a sedation agent prior to synchronized cardioversion of unstable tachycardia.

CONTRAINDICATIONS:
Etomidate is contraindicated in patients who have a known hypersensitivity to the drug.

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SIDE EFFECTS AND NOTES:
A. The most frequent adverse reactions are transient injection site pain and transient skeletal muscle movements (myoclonus).
B. Etomidate may also cause nausea and/or vomiting.

ADULT DOSING:

Induction agent for DAAM -
0.3 mg / kg IV/IO slow push.

Synchronized cardioversion for unstable tachycardia -
0.15 mg / kg IV /IO push to a max of 10 mg. Wait 45 - 60 seconds for signs of sedation such as patient becoming verbally unresponsive or no longer following commands.

PEDIATRIC DOSING:

Same as adult

Fentanyl (Sublimaze®) – 20.117

OLMC REQUIRED: No

SUPPLIED: 100 micrograms / 2 ml vial

PHARMACOLOGY AND ACTIONS:
Fentanyl is a potent synthetic opioid analgesic that produces analgesia and sedation. It is about 50 - 100 times more potent than morphine on a weight basis. Onset of action when given is 2 - 3 minutes. Peak effect occurs at 3 - 5 minutes and lasts 15 - 45 minutes.

INDICATIONS:
A. Pain due to musculoskeletal injury or burns.
B. Suspected ischemic chest pain.
C. Post-intubation analgesia.
D. CPR Induced Consciousness.

CONTRAINDICATIONS:
A. Known allergy to fentanyl.
B. Moderate to severe respiratory depression.

PRECAUTIONS:
A. Fentanyl can cause respiratory depression that is reversible with naloxone. Respiratory depression can also be exacerbated by underlying lung disease and the use of other respiratory depressant drugs (benzodiazepines, alcohol, cyclic antidepressants). Have naloxone and respiratory support available when administering fentanyl.
B. 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.
C. The action of fentanyl is prolonged, and its elimination is slower in the elderly. Smaller maintenance doses are advisable.
D. Fentanyl must be used cautiously in patients who have already received morphine for prehospital analgesia.

SIDE EFFECTS AND NOTES:
A. If hypotension develops, it is usually responsive to naloxone administration and Trendelenburg position. If hypotension continues, follow Shock protocol.
B. Check and document vital signs and patient response after each dose.
C. The goal of fentanyl administration is patient comfort, not the total elimination of pain but the reduction in the perception of pain by the patient.

ADULT DOSING:
Pain Management -
IV/IN – 50 - 100 mcg. May repeat 25 - 50 mcg every 10 - 15 minutes as needed to a maximum of 500 mcg. IM – 50 - 100 mcg. May repeat every 10 - 15 minutes as needed to a maximum of 500 mcg. <u>If BP < 100 mmHg and/or patient has minor altered mental status or respiratory depression - first dose fentanyl is 25 mcg, may repeat 25 - 50 mcg every 10 - 15 minutes to a maximum of 500 mcg. Monitor closely.</u>

Post-Intubation analgesia -

After successful airway placement, administer fentanyl 50 - 100 mcg IV/IO if systolic BP ≥ 100 mmHg (MAP is >65 mmHg). Repeat every 10 - 15 minutes as necessary to maintain analgesia.

CPR Induced Consciousness-

50 mcg IV/IO used in conjunction with midazolam or lorazepam. May repeat every 5 - 10 minutes as needed.

PEDIATRIC DOSING:

Pain Management -

1 mcg/kg IV. May repeat with 0.5 - 1 mcg/kg every 10 - 15 minutes as needed to a maximum of 4 mcg/kg. Or, 2 mcg/kg IN repeated with 1 mcg/kg every 10 - 15 minutes as needed to a maximum of 4 mcg/kg. If no IV/IN, may give fentanyl 1 - 2 mcg/kg IM. May repeat every 10 - 15 minutes to a max of 4 mcg/kg. Do not exceed adult dosing. IN is preferred if no IV.

Post-Intubation analgesia -

After successful airway placement, administer fentanyl 1 mcg/kg IV/IO, not to exceed the adult dose, with repeat doses at 0.5 - 1 mcg/kg every 10 - 15 minutes.

Furosemide (Lasix®) – 20.120

OLMC REQUIRED: No

SUPPLIED: 40 mg / 4 ml pre-filled syringe or 40 mg / 4 ml vial

PHARMACOLOGY AND ACTIONS:
Furosemide is a potent diuretic with a rapid onset of action and short duration of effect. It acts primarily by inhibiting sodium reabsorption in the kidney. Increase in potassium excretion occurs along with the sodium excretion. Peak effect is 30 - 60 minutes after IV administration with a duration of about 2 hours. (Duration if taken orally is 6 - 8 hours with peak effect in 1 - 2 hours).

INDICATIONS:
In congestive heart failure to decrease the extracellular volume and reduce pressure on the lungs in cardiac failure.

CONTRAINDICATIONS:
A. Hypovolemia or hypotension.
B. Pregnancy.

PRECAUTIONS:
A. May lead to profound diuresis with resultant shock and electrolyte depletion. Monitor patient closely after administration.
B. Hypovolemia, hypotension, hyponatremia, and hypokalemia are the main toxic effects. Other toxic effects are usually not related to single-dose use.
C. Patients who are on digitalis and are having arrhythmias consistent with digitalis toxicity (atrial tachycardia with conduction block, non-paroxysmal junctional tachycardia, sinus arrest, etc.) may need lower doses of furosemide. Contact OLMC.
D. Because of the potency and need for close monitoring, furosemide should only be given with specific indications.
E. Patients with Sympathetic Crashing Acute Pulmonary Edema (SCAPE) usually present with a sudden onset of extreme respiratory distress, diaphoresis, markedly elevated systolic blood pressure > 160, tachycardia, and decreased oxygen saturation. Most of these patients are euvolemic and respond better to preload/afterload reduction (Nitroglycerin SL every 5 minutes) in conjunction with CPAP/BiPAP. Furosemide is not helpful in SCAPE.

ADULT DOSING:
Respiratory distress from suspected congestive heart failure and evidence of volume overload and systolic BP > 100 mmHg –
A. If patient is <u>not</u> currently taking furosemide, give 20 mg IV.
B. If the patient is taking furosemide, give 40 mg IV.

PEDIATRIC DOSING:
Not indicated for pediatric patients. Contact OLMC

Glucagon – 20.130

OLMC REQUIRED: No

SUPPLIED: 1 mg vial of powder / 1 ml vial of diluent

PHARMACOLOGY AND ACTIONS:
Glucagon is a hormone that causes glucose mobilization in the body. It works opposite to insulin, which causes glucose storage. 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:
A. Known hypoglycemia (preferably demonstrated by blood glucose determination) when patient is confused or comatose and dextrose is not available or an IV cannot be started.
B. Anaphylaxis in patients with beta-blockade when epinephrine is ineffective.

CONTRAINDICATIONS:
None

PRECAUTIONS:
IV Dextrose is the treatment of choice for hypoglycemia in the patient who cannot tolerate oral glucose. The use of glucagon is restricted to patients who are seizing, comatose, combative, or with collapsed veins and in whom an IV cannot be started.

SIDE EFFECTS AND NOTES:
A. Nausea and vomiting may occur with administration.
B. Persons with no liver glycogen stores (malnutrition, alcoholism) may not be able to mobilize any glucose in response to glucagon.

ADULT DOSING:
Hypoglycemia -
1 mg IM.
Anaphylaxis (If epinephrine is ineffective in treating anaphylaxis in patients with beta-blockade)-
1 mg IM/IV.

PEDIATRIC DOSING:
Hypoglycemia -
0.02 mg/kg IM to a maximum of 1 mg.

Glucose (Oral) – 20.140

OLMC REQUIRED: No

SUPPLIED: 15 - 24 grams glucose in gel tubes

PHARMACOLOGY AND ACTIONS:
Glucose is the body's basic fuel and 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:
Oral glucose is indicated in the conscious patient where a suspicion of hypoglycemia exists, or a blood glucose measurement indicates a low blood glucose level.

CONTRAINDICATIONS:
Do not give to patients who cannot adequately protect their own airway.

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

SIDE EFFECTS AND NOTES:
A. Research suggests that hyperglycemia may complicate, or worsen, a number of medical conditions (e.g., myocardial infarction, stroke). Oral glucose should be given to a conscious patient whenever hypoglycemia is documented by blood glucose meter. If these objective findings are not available, the EMT should use judgment based on signs and history.
B. Effects will be delayed in the elderly and people with poor circulation.
C. May be more tolerable if administered with liquid between dosages.
D. Patient's condition may require more than one dose of oral glucose.

ADULT DOSING:
Hypoglycemia -
One tube or equivalent. Repeat as needed.

PEDIATRIC DOSING:
Same as adult

Haloperidol (Haldol®) – 20.142

OLMC REQUIRED: No

SUPPLIED: 5 mg / 1 ml vial

PHARMACOLOGY AND ACTIONS:
Haloperidol is an antipsychotic that may be used for pharmacological sedation by producing marked sedation and allaying apprehension. It also provides a state of mental detachment and indifference while maintaining a state of reflex alertness. Haloperidol may potentiate the effects of other CNS depressants. It also causes mild alpha-adrenergic blockade which can lead to peripheral vasodilatation and hypotension, as well as a reduction of the pressor effect of catecholamines. It is also a very effective anti-emetic. The onset of action of a single IV dose is from 5 - 15 minutes following administration, and the peak effect may not be apparent for up to 30 minutes. Duration is generally from 2 - 6 hours.

INDICATIONS:
A. Sedation of combative patients to facilitate restraint.
B. Nausea and vomiting

CONTRAINDICATIONS:
A. Known allergy to haloperidol
B. Known Parkinson's disease or use of dopamine agonists medications like carbidopa-levodopa (Sinemet), Pramipexole (Mirapex), or ropinirole (Requip).

PRECAUTIONS:
A. Hypotension may occur; IV fluids and other measures to manage hypotension should be readily available.
B. Use caution when administering haloperidol to patients who have taken other CNS depressant drugs (e.g., barbiturates, benzodiazepines, alcohol).
C. Haloperidol may induce Torsade de Pointes. Monitor the patient's ECG Q-T interval following use.

SIDE EFFECTS AND NOTES:
A. The most common side effects are hypotension and tachycardia, which usually responds to a fluid bolus.
B. Dysphoric (restlessness) and dystonic reactions have been reported following administration. These symptoms can be treated with the administration of diphenhydramine.
C. Haloperidol should be used with caution in patients with a seizure disorder or condition that causes seizures; other similar neuroleptics are known to lower the seizure threshold.

Haloperidol (Haldol®) – 20.142

ADULT DOSING:

Pharmacological sedation -

5 - 10 mg IV, IO, IM. May repeat to a maximum of 20 mg (**For patients > 65:** 2 mg IV/IO. May repeat after 15 mins. **or** 2.5 mg IM. May repeat after 15 - 20 mins.)

Nausea and vomiting

1.25 mg IV/IM

PEDIATRIC DOSING:

Haloperidol is not recommended for children**.**

Hydromorphone (Dilaudid®) – 20.144

OLMC REQUIRED: No

SUPPLIED: 2 mg / 1 ml vial. Concentration and packaging may vary based on availability.

PHARMACOLOGY AND ACTIONS:
Hydromorphone is an opioid agonist that binds to several opioid receptors. Its analgesic characteristics are through its effect on the mu-opioid receptors. Hydromorphone has been shown to be 5 - 7 times more potent than morphine with a shorter duration of analgesia. Onset of action when given IV is 5 minutes and peak effect occurs at 8 - 20 minutes. Duration is 3 - 4 hours.

INDICATIONS:
A. Pain due to burns or musculoskeletal injury.
B. Suspected ischemic chest pain unresponsive to nitroglycerin.
C. Post-intubation analgesia.

CONTRAINDICATIONS:
A. Known allergy to hydromorphone.
B. Blood pressure less than 100 mmHg systolic for pain management and post-intubation analgesia.
C. Respiratory rate less than 14 breaths per minute or oxygen saturation less than 90%. For pediatric patients, vital signs should be maintained within the normal age-appropriate range.
D. Patients < 12 months.

PRECAUTIONS:
A. Hydromorphone 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 anti-depressants). Naloxone and respiratory support must be available when using hydromorphone.
B. If hypotension develops, it is usually responsive to naloxone administration and Trendelenburg position. If hypotension persists, follow Shock protocol.
C. The goal of hydromorphone administration is patient comfort (not the total elimination of pain but reduction in perception of pain by the patient).
D. Use a 1 ml syringe for administration due to small volume.

SIDE EFFECTS AND NOTES:
A. Common side effects include flushing, pruritus, diaphoresis, dry mouth, nausea and vomiting, asthenia, dizziness, headache, and somnolence.
B. Serious adverse effects include hypotension, syncope, coma, increased intracranial pressure, seizures, respiratory depression, and apnea.

ADULT DOSING:
Pain Management -
0.25 - 0.5 mg IV. Repeat every 15 - 20 minutes up to a maximum of 2 mg. If no IV, give 0.5 - 1.0 mg IM. May repeat IM every 15 - 20 minutes to a maximum of 2 mg.

Hydromorphone (Dilaudid®) – 20.144

PEDIATRIC DOSING:

Pain - Musculoskeletal injuries–

For patients ≥ 12 months**:** 0.01 mg/kg IV/IM not to exceed the adult dose. May repeat every 15 - 20 minutes to a maximum of 2 mg.

NOTE: Hydromorphone is not preferred in young infants and toddlers if fentanyl or morphine is available.

Hydroxocobalamin (CYANOKIT®) – 20.145

OLMC REQUIRED: Repeat dose for pediatric patients.

SUPPLIED: 5 grams powder in vial for reconstitution with 200 ml NS. Kit has one vial.

PHARMACOLOGY AND ACTIONS:
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. Cyanide is an extremely potent 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.

CONTRAINDICATIONS:
Do not administer hydroxocobalamin and sodium thiosulfate to the same patient.

PRECAUTIONS:
Hydroxocobalamin has physical (particulate) and chemical incompatibilities with many medications, and it is best to administer other drugs or products (e.g. blood) through a separate intravenous line.

SIDE EFFECTS AND 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 also been found to interfere with certain laboratory tests based on light absorption including co-oximetric measurements or carboxyhemoglobin, methemoglobin, and oxyhemoglobin.

ADULT DOSING:

Cyanide poisoning or smoke inhalation with suspected cyanide poisoning -
5 grams IV or IO over 15 minutes. Repeat once if needed. For cardiac arrest, hydroxocobalamin should be administered as a rapid fluid bolus.

PEDIATRIC DOSING:

Cyanide poisoning or smoke inhalation with suspected cyanide poisoning -
70 mg/kg IV or IO to a max of 5 g over 15 minutes. For cardiac arrest, hydroxocobalamin should be administered as a rapid fluid bolus. Contact OLMC regarding second dose.

Ibuprofen – 20.147

OLMC REQUIRED: No

SUPPLIED: Liquid - 100 mg / 5 mL (Children's); 50 mg / 1.25 mL (Infant's);
200 mg tablets, capsules

PHARMACOLCOGY AND ACTIONS:
Ibuprofen, from isobutyl phenyl propionic acid, is a nonsteroidal anti-inflammatory drug (NSAID) used for relieving pain, lowering fever, and reducing inflammation. Like other NSAIDs, it works by inhibiting the synthesis of prostaglandins, involved in mediating inflammation (swelling), pain, and fever. It achieves this effect on prostaglandin synthesis by inhibiting cyclooxygenase, an enzyme that is present in various tissues of the body.

INDICATIONS:

A. Mild to moderate pain.
B. Fever.

CONTRAINDICATIONS

A. Known hypersensitivity to ibuprofen.
B. Previous asthma, urticarial, or allergic reaction after taking aspirin or other NSAID.
C. Recent heart surgery.
D. Has taken ibuprofen in last 6 hours.
E. Unable to take oral medication.
F. Any signs of dehydration in pediatric patients.
G. Patients less than 6 months old.

PRECAUTIONS:
Ibuprofen may cause a severe allergic reaction, especially in people who are allergic to aspirin. May cause stomach bleeding especially in patients:

- Older than 60 years.
- Who have had stomach ulcers or bleeding problems.
- Take blood thinners.
- Take other medications containing NSAIDs.

ADULT DOSING:

Fever and Pain Management –
200 - 600 mg PO.

PEDIATRIC DOSING:

Fever and Pain Management –
10 mg/kg PO liquid only to maximum of 600 mg (refer to dosing chart below)

Ibuprofen – 20.147

Pediatric dosing using 100 mg/5 mL (Children's liquid)

Weight	Dose	Volume
17 lbs. / 7.5 kg	75 mg	3.75 mL
22 lbs. / 10 kg	100 mg	5 mL
33 lbs. / 15 kg	150 mg	7.5 mL
44 lbs. / 20 kg	200 mg	10 mL
55 lbs. / 25 kg	250 mg	12.5 mL
66 lbs. / 30 kg	300 mg	15 mL
77 lbs. / 35 kg	350 mg	17.5 mL
88 lbs. / 40 kg	400 mg	20 mL

Ipratropium Bromide – 20.150

OLMC REQUIRED: No

SUPPLIED: 0.5 mg / 2.5 ml vial individually or 0.5 mg packaged with 3 mg albuterol (Duo-Neb).

PHARMACOLOGY AND ACTIONS:
Ipratropium is an atropine derivative used for inhalation therapy. For severe asthma, ipratropium taken in addition to a short acting beta agonist (such as albuterol) can provide greater bronchodilation and clinical benefit than the beta agonist alone. It has no anti-inflammatory effects and does not decrease bronchial hyper-responsiveness.

INDICATIONS:
As a supplement to albuterol in patients with asthma and COPD.

CONTRAINDICATIONS:
Do not use in patients with severe glaucoma.

PRECAUTIONS:
Ipratropium in the meter dose inhaler and auto-inhaler formulations should not be administered to individuals allergic to soy lecithin or related food products (e.g. soybeans, peanuts). The nebulized formulation may be administered to these patients.

SIDE EFFECTS AND NOTES:

A. Dry mouth.
B. Pharyngeal irritation.
C. Increased intra-ocular pressure in glaucoma patients.

ADULT DOSING:

Asthma/ COPD -

3.0 ml DuoNeb (3.0 mg albuterol/0.5 mg ipratropium) via nebulizer. Repeat as needed X 2. Do not administer more than three total treatments.

PEDIATRIC DOSING:

Same as adult dosing

Ketamine Hydrochloride - 20.155

OLMC REQUIRED: No

SUPPLIED: 500 mg/10 ml vial.

PHARMACOLOGY AND ACTIONS:
Ketamine is a NDMA receptor antagonist, that is structurally similar to phencyclidine (PCP), that acts as a dissociative anesthetic agent by interrupting the connection between the thalamo-neocortical tracts and the limbic system in the brain, producing anesthesia. In addition, it has analgesic effects and can be used at lower doses for pain control – without causing anesthesia. It also stimulates catecholamine release from the adrenal glands causing an increase in heart rate, blood pressure, and cardiac output. Ketamine is also a bronchodilator and is a useful induction agent when intubating patients with severe bronchospasm.

INDICATIONS:
A. As an induction agent for Drug Assisted Airway Management (DAAM).
B. Post intubation sedation.
C. Pain management.

CONTRAINDICATIONS:
A. Known pregnancy.
B. Non-traumatic chest pain.
C. Patients with a history of schizophrenia or history of psychosis.

SIDE EFFECTS AND NOTES:
A. Increased blood pressure due to catecholamine release.
B. Emergence reaction can occur in 5 - 30% of patients. Duration of action is 10 - 20 minutes IV and continued sedation must be provided before the induction agent wears off.

ADULT DOSING:

Pain management -
A. 12.5 - 25 mg IV/IO **slow push over 5 minutes,** or by IV infusion over 15 minutes**,** or 25 - 50 mg IM. May repeat once after 30 min unless patient develops nystagmus, hallucinations, or dysphoric symptoms.
B. **Ketamine must be diluted prior to IV or IO administration for pain management. Either dilute 12.5 mg in 9.75 ml or 25 mg in 9.5 ml of Normal Saline for slow IVP or dilute 12.5 - 25 mg in 100 ml of Normal Saline and infuse over 15 minutes.***

Induction agent for DAAM -
1 - 2 mg/kg IV/IO slow push over 1 minute. Dilute Ketamine with normal saline to a minimum of 10 ml total volume for a slower administration.

Post intubation sedation –
Initial dose is 1 mg/kg slow IV/IO push if not used for induction. If used for induction, initial dose is 0.5 mg/kg slow IV/IO push. May repeat 0.5 mg/kg every 15 minutes as necessary to maintain analgesia and sedation. **Ketamine should not be used for sedation following ROSC in cardiac arrest patients.**

***Ketamine should not be mixed with lactated ringers for dilution purposes due to compatibility concerns.**

Ketamine Hydrochloride - 20.155

PEDIATRIC DOSING:

Pain management -
Ketamine is not approved for use in pain control in pediatric patients < 15 years of age. For children ≥ 15, dose is 0.3 mg/kg IV slow push over 5 minutes, up to a max of 25 mg. Dose must be diluted in normal saline prior to administration.

Induction agent for DAAM - Same as adult

Ketorolac Tromethamine (Toradol®) – 20.157

OLMC REQUIRED: No

SUPPLIED: 30 mg /1 ml vial

PHARMACOLOGY AND ACTIONS:
Ketorolac works by inhibiting cyclooxygenase-1 and 2 enzymes to block the synthesis of prostaglandins and reduces inflammation and pain.

INDICATIONS:
A. Musculoskeletal pain.
B. Flank pain from suspected kidney stone.

CONTRAINDICATIONS:
A. Age < 2 or > 64.
B. Multisystem trauma
C. History of renal disease or kidney transplant.
D. History of liver disease.
E. Allergies to aspirin or other NSAIDs.
F. Pregnancy, or lactating females.
G. On anticoagulant, such as vitamin K antagonists (e.g. warfarin) or directing agents such as rivoraxaban, apixaban, edoxaban, lovenox, and dabigatran.
H. Bleeding or clotting disorder or history of ulcer.
I. Suspected cardiac chest pain.

SIDE EFFECTS AND NOTES:
A. Burning or pain at the injection site
B. Nausea and vomiting
C. Dizziness
D. Headache
E. Itching
F. Flushing

ADULT DOSING:
Pain management -
30 mg IM or 15 mg IV. **Single dose only**

PEDIATRIC DOSING (age 2-16 years):
Pain management -
1 mg/kg IM to a max of 30 mg or 0.5 mg/kg IV to a max of 15 mg.

Labetalol – 20.158

OLMC REQUIRED: No

SUPPLIED: 100 mg / 20 ml vial

PHARMACOLOGY AND ACTIONS:

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

INDICATIONS:

The treatment of uncontrolled, and sustained, hypertension in pregnant and postpartum women.

CONTRAINDICATIONS:

A. Bronchial Asthma.
B. Overt cardiac failure.
C. Greater than first degree heart block.
D. Cardiogenic shock.
E. Severe bradycardia.

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SIDE EFFECTS AND NOTES:

A. Cardiovascular: Symptomatic postural hypotension, ventricular dysrhythmia, syncope, bradycardia, and heart block.
B. CNS: Dizziness, tingling of the scalp/skin, numbness, vertigo.
C. Respiratory: Wheezing, bronchospasm.
D. GI: Nausea and vomiting.

ADULT DOSING:

For sustained elevation in BP > 160 mmHg systolic and/or ≥ 110 mmHg diastolic (either one or both) that persists for at least 15 minutes or more in pregnant or post-partum women.

10 mg slow IV push over 1 - 2 minutes. May be repeated twice (3 doses total) every 15 minutes if BP is not within target range. Depending on effect of preceding dose, double remaining doses (e.g. 1st dose 10 mg, 2nd dose 20 mg, 3rd dose 40 mg. Maximum total dose 70 mg.) Target systolic BP 140 - 150 mmHg and diastolic BP 90 - 100 mmHg. Stop administration if HR < 60 bpm or other adverse effects.

PEDIATRIC DOSING:

Not indicated for pediatric patients

Lidocaine – 20.160

OLMC REQUIRED: See Contraindications.

SUPPLIED: 100 mg / 5 ml of 2% solution in pre-filled syringe

PHARMACOLOGY AND ACTIONS:
Lidocaine depresses the automaticity of Purkinje fibers, raising stimulation threshold in the ventricular muscle fibers which makes the ventricles less likely to fibrillate. It has little antiarrhythmic effect on the atrial muscle in normal doses. The effect of a single bolus on the heart disappears in 10 - 20 minutes due to redistribution in the body. The metabolic half-life of lidocaine is about 2 hours.

INDICATIONS:
A. Recurrent ventricular fibrillation or pulseless ventricular tachycardia.
B. Following successful defibrillation from ventricular fibrillation or pulseless ventricular tachycardia.
C. Pain management following IO placement.

CONTRAINDICATIONS:
Do not use in perfusing pts in the following situations without OLMC approval:
A. Systolic BP is less than 90 mmHg.
B. Heart rate is less than 50 beats per minute.
C. Periods of sinus arrest are present.
D. Second or third-degree heart block are present.

PRECAUTIONS:
A. Lidocaine is not recommended in the treatment of supra-ventricular arrhythmias.
B. If administering maintenance dosing and the patient begins seizing, stop the lidocaine dosing and treat per Seizure protocol.

SIDE EFFECTS AND NOTES:
A. Side effects include drowsiness, dizziness, disorientation, confusion, and seizures.
B. Hypotension.
C. Lidocaine is metabolized in the liver and, therefore, patients with hepatic disease, shock, or congestive heart failure will have decreased metabolism. All doses after the initial dose must be decreased to one-quarter of the initial dose in these patients.
D. Toxicity is more likely in elderly patients.

ADULT DOSING:
V-Fib/Pulseless VT -
Bolus dose - 1.5 mg/kg IV/IO. Repeat to a max of 3 mg/kg if needed.
ROSC (from V-Fib/Pulseless VT arrest) -
- If no antidysrhythmic given prior to ROSC - 1.5 mg/kg bolus repeated with 0.75 mg/kg every 10 minutes to a max total dose of 3 mg/kg.
- If Lidocaine was the last anti-dysrhythmic given - 0.75 mg/kg every 10 minutes. Max total arrest/post-ROSC dose is 3 mg/kg.

Pain management for IO placement -
40 mg IO (**2**cc's of **2**% Lidocaine slowly over **2** minutes).

PEDIATRIC DOSING:
Same as adult for V-Fib/Pulseless VT, and ROSC.
Pain management for IO placement- 0.5 mg/kg IO slowly, not to exceed 40 mg.

Lorazepam – 20.165

OLMC REQUIRED: None

SUPPLIED: 2 mg / 1 ml vial or 4 mg / 1 ml vial

PHARMACOLOGY AND ACTIONS:
Long-acting benzodiazepine with central nervous system depressant, anticonvulsant, muscle relaxant, and anxiolytic effects. It enhances the inhibitory effects of GABA in the brain but has no analgesic properties.

INDICATIONS:
A. Patients actively seizing upon EMS arrival or having repetitive seizures without regaining consciousness.
B. To relieve anxiety and produce amnesia during cardioversion, pacing, or following drug assisted airway management (DAAM).
C. To facilitate restraint in patients whose cause of agitation is likely drug ingestion (especially stimulants), withdrawal, or from a postictal state.
D. CPR Induced Consciousness.
E. To relieve anxiety and agitation in hospice and palliative care patients.

CONTRAINDICATIONS:
A. Prior anaphylactic reaction to lorazepam, any component of the formulation, or other benzodiazepines (cross-sensitivity with other benzodiazepines may exist).
B. Acute narrow-angle glaucoma.
C. Neonates and premature infants.

PRECAUTIONS:
Must be used with caution in patients with COPD, chronic hepatic or renal failure, CHF, acute alcohol intoxication, and the elderly due to increased risk of respiratory depression.

SIDE EFFECTS AND NOTES:
Like most benzodiazepines, adverse reactions to lorazepam include CNS and respiratory depression, which are dose-dependent. More severe effects occur with high doses. Concomitant use of other sedative-hypnotics, opioids, and alcohol can worsen adverse reactions caused by lorazepam.

ADULT DOSING:
Seizures –
2 mg IV/IO or 4 mg IM. Repeat IV/IO dose every 5 minutes until seizure stops to a max of 8 mg. May repeat IM dose once in 10 minutes to a max of 8 mg.
Pharmacological sedation –
2 mg IV/IO or 4 mg IM. May repeat once in 10 minutes. Max total dose of 4 mg IV/IO or 8 mg IM. (***For immediate threat, RASS +3 or + 4, may repeat IV/IO dose once in 5 minutes***).
Sedation after intubation & for induced hypothermia shivering –
1 - 2 mg IV/IO if systolic BP is ≥ 100 mmHg. May repeat every 5 - 10 minutes as needed to a max total dose of 4 mg.
Sedation before cardioversion (with no IV) –
2 mg IM.

Sedation for external pacing
1 - 2 mg IV/IO, may repeat every 5 minutes as needed to a max total dose of 4 mg. If no IV, 2 mg IM, may repeat once in 10 minutes.

CPR Induced consciousness –
1 mg IV/IO. May repeat every 5 - 10 mins. as needed to max total dose of 4 mg.

Anxiety/Agitation for hospice/palliative care patients –
0.5 mg IV/IM for mild to moderate symptoms. 1.0 mg IV/IM for severe symptoms.

PEDIATRIC DOSING:

Seizures –
0.1 mg/kg IV/IO to a max single dose of 2 mg or 0.2 mg/kg IM to a max single dose of 4 mg. Repeat IV/IO dose every 5 minutes until seizure stops to a max total dose of 8 mg. Repeat IM dose every 10 minutes until seizure stops to a max total dose of 8 mg.

Pharmacological Sedation (Age > 12 only) –
0.05 mg/kg IV/IM, max single dose of 2 mg IV and 4 mg IM. May repeat once in 10 mins.

Sedation after intubation with or without drug assistance –
0.05 mg/kg IV/IO to a max single dose of 2 mg, may repeat every 5 - 10 minutes as needed up to a max total dose of 4 mg.

Sedation before cardioversion (with no IV) –
0.1 mg/kg IM to a max single dose of 2 mg.

Sedation for pacing –
0.05 mg/kg IV/IO to a max single dose of 2 mg, may repeat every 5 minutes to a max total dose of 4 mg. If no IV, 0.1 mg/kg IM to a max single dose of 2 mg, may repeat once in 10 minutes.

Magnesium Sulfate – 20.170

OLMC REQUIRED:
Seizures in eclampsia/pre-eclampsia. Asthma in pediatric patients.

SUPPLIED: 1 gram (50%) / 2 ml vial or 5 grams (50%) / 10 ml vial

PHARMACOLOGY AND ACTIONS:
Magnesium is a cation that is present in human cells and intercellular fluids. It acts as an antiarrhythmic agent and is useful in the treatment of polymorphic ventricular tachycardia due to an underlying prolonged QTc interval, ventricular fibrillation, and ventricular tachycardia.

INDICATIONS:

A. Polymorphic ventricular tachycardia (stable wide complex, irregular tachycardia associated with an underlying prolonged QTc Torsade de Pointes).
B. Patients with prolonged QTc (> 500 msec) who are at risk for Torsade de Pointes.
C. For the treatment of seizures in women with pre-eclampsia/eclampsia with OLMC approval.
D. In severe asthma as a smooth muscle relaxant and inhibitor of histamine.

CONTRAINDICATIONS:
None in the emergency setting.

PRECAUTIONS:
In the non-arrest patient, magnesium sulfate may cause hypotension, bradycardia, decreased reflexes, and respiratory depression.

ADULT DOSING:

Wide complex, irregular tachycardia -
Dose is 2 grams IV/IO over 1 - 2 minutes.

Prolonged QTc (> 500 msec.) -
Dose is 2 grams IV over 15 - 20 minutes.

Eclampsia/Pre-eclampsia -
Contact OLMC for dosing in this situation. Normal dose is 4 grams IV over 15 - 20 minutes.

Asthma -
Dose is 2 grams IV over 15 - 20 minutes.

PEDIATRIC DOSING:

Asthma -
Contact OLMC for dosing in this situation.

DILUTING FOR IV ADMINISTRATION

A. Dilute each gram of magnesium sulfate in 8 ml of normal saline.
(Example: Mix 1 gram in 8 ml of NS; mix 2 grams in 16 ml of NS)

B. For use with IV pump, dilute either 2 grams or 4 grams of magnesium sulfate in 100 ml of normal saline or lactated ringers (in Buretrol or 100 ml bag).

Midazolam (Versed®) – 20.190

OLMC REQUIRED: No

SUPPLIED: 10 mg / 2 ml vial

PHARMACOLOGY AND ACTIONS:
Midazolam is a benzodiazepine with potent sedative, anti-anxiety, and anticonvulsant properties. It also causes significant antegrade amnesia when administered IV.

INDICATIONS:
A. Patient actively seizing upon EMS arrival or having repetitive seizures without regaining consciousness.
B. To relieve anxiety and produce amnesia during cardioversion, pacing, or following Drug Assisted Airway Management (DAAM).
C. To facilitate restraint in patients whose cause of agitation is likely drug ingestion (especially stimulants), withdrawal, or from a postictal state.
D. CPR Induced Consciousness.

CONTRAINDICATIONS:
In seizures, do not give unless patient is actively seizing.

PRECAUTIONS:
Midazolam causes respiratory depression and/or hypotension especially if administered rapidly. Monitor patient closely.

SIDE EFFECTS AND NOTES:
A. Common side effects include drowsiness, hypotension, respiratory depression, and apnea. These are more likely to occur in the very young and the elderly. Rarely, patients may experience paradoxical agitation.
B. Respiratory depression is more likely in patients who have taken other CNS depressant drugs such as opioids alcohol, sedative-hypnotics, or when given rapidly.
C. Midazolam is metabolized in the liver and excreted by the kidney. Doses should be adjusted accordingly in patients with underlying hepatic or renal diseases and low flow states such as congestive heart failure.

ADULT DOSING:

Seizures -
2.5 - 5 mg IV/IO or 10 mg IM/IN. Repeat every 5 minutes until seizure stops.

Pharmacological sedation -
2.5 mg IV/IO or 5 mg IM. May repeat once in 10 minutes.
For immediate threat (RASS +3 or +4): 2.5 - 5 mg IV/IO or 5 - 10 mg IM with repeat doses of 1 - 2 mg IV/IO every 5 minutes as needed.

Induction medication for DAAM (Least desirable option) -
10 mg IV/IO if systolic BP is $\geq$ 100 mmHg.
5 mg IV/IO if systolic BP < 100 mmHg.

Sedation after intubation & for induced hypothermia shivering -
2.5 - 5 mg IV/IO if systolic BP is $\geq$ 100 mmHg. Repeat every 15 minutes as necessary to maintain sedation.

Sedation before cardioversion (with no IV) -
5 mg IM/IN

Sedation for Pacing -

2.5 - 5 mg IV/IO or 5 mg IM/IN, may repeat once. Call OLMC for additional orders.

CPR Induced Consciousness-

Up to 2.5 mg IV/IO used in conjunction with fentanyl. May repeat every 5 - 10 minutes as needed.

PEDIATRIC DOSING:

Seizures -

0.1 mg/kg IV/IO to a max of 5 mg, or
0.3 mg/kg IM/IN to a max of 10 mg

* Repeat every 5 minutes until seizure stops.

Pharmacological sedation (Age > 12 only) -

0.1 mg/kg IV/IM, max 10 mg IM and 6 mg IV. May repeat every 10 mins. as needed. (Refer to pediatric pharmacological sedation flow chart in the Agitated Patient Protocol 10.015).

Induction medication for DAAM (Least desirable option) -

0.2 mg/kg IV/IO not to exceed adult dose.

Sedation after intubation with or without paralytics -

0.1 mg/kg IV/IO, max dose 2.5 mg, repeat every 15 minutes as necessary to maintain sedation.

Sedation before cardioversion -

0.2 mg/kg IM/IN to a max of 5 mg

Sedation for pacing -

0.1 mg/kg IV/IO, max dose 5 mg. May repeat once after 5 minutes.

* Call OLMC for additional orders.

Morphine Sulfate – 20.200

OLMC REQUIRED: No

SUPPLIED: Varies

PHARMACOLOGY AND ACTIONS:
Morphine is a narcotic analgesic that induces drowsiness, mental clouding, and mood changes. It also increases venous capacitance, decreases venous blood return (preload), and reduces systemic vascular resistance at the arteriolar level (afterload). This may lead to decreases in myocardial oxygen demand. Onset of action when given IV is 2 - 3 minutes and peak effect occurs at 7 - 10 minutes. Duration is 3 - 5 hours.

INDICATIONS:

A. Suspected ischemic chest pain unresponsive to nitroglycerin.
B. Pain due to burns or musculoskeletal injury.

CONTRAINDICATIONS:

A. Known allergy to morphine or sulfates (Sulfa drugs are not sulfates).
B. Blood pressure less than 100 mmHg systolic.
C. Trauma or pain of the head or abdomen.
D. Respiratory rate less than 14 breaths per minute or oxygen saturation less than 90%. 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 anti-depressants). Naloxone and respiratory support must be available when using morphine.
B. If hypotension develops, it is usually responsive to naloxone administration and Trendelenburg position. If hypotension persists, follow Shock protocol.

SIDE EFFECTS AND NOTES:

A. The goal of morphine administration is patient comfort (not the total elimination of pain but reduction in perception of pain by the patient).
B. Morphine is a Schedule II controlled substance. Follow your agencies Controlled Substance policy or procedure for control and monitoring of use.

ADULT DOSING:

Pain - Musculoskeletal injuries, burns, chest pain -
2 - 8 mg IV. Repeat every 15 - 20 minutes to max of 20 mg. If no IV give 5 - 10 mg IM. May repeat IM with 5 mg every 15 - 20 minutes to a maximum of 20 mg.

PEDIATRIC DOSING (< 20kg):

Pain - Musculoskeletal injuries, burns, chest pain -
0.1 mg / kg IV/IM. May repeat IM after 15 - 20 minutes. Do not exceed adult dosing.

Naloxone (Narcan®) – 20.210

OLMC REQUIRED: No

SUPPLIED: 2 mg / 2 ml pre-filled syringe

PHARMACOLOGY AND ACTIONS:
Naloxone is an opioid antagonist that competitively binds to opioid receptor sites, but which exhibits almost no pharmacologic activity of its own. Duration of effect is 1 - 4 hours.

INDICATIONS:
A. Reversal of opioid effects, particularly respiratory depression, due to opioid drugs either ingested or injected or administered during treatment. Opioid drugs include fentanyl, morphine, meperidine, hydromorphone, oxycodone, hydrocodone, and codeine.
B. Diagnostically in coma of unknown etiology to rule out or reverse opioid depression.

CONTRAINDICATIONS:
Do not use in neonates.

PRECAUTIONS:
A. In patients physically dependent on opioids, violent withdrawal symptoms may occur. Be prepared to restrain the patient.
B. Some opioid intoxications may require up to 8 mg of naloxone to reverse symptoms (e.g. methadone, carfentanil).

SIDE EFFECTS AND NOTES:
A. The duration of some opioids is longer than naloxone, repeat doses may be necessary. Monitor the patient closely. Patients who have received naloxone must be transported to the hospital because coma may reoccur when naloxone wears off.
B. Side effects are rare. Do not hesitate to use if indicated.
C. If no effect is seen from naloxone administration, consider other causes of coma.

ADULT DOSING:
Reversal of opioid effects, coma of unknown etiology -
0.5 mg IV. Repeat every 2 minutes up to 2 mg titrating to respiratory rate. If no IV, give 2 mg IM/IN. If no response to initial dose and opiate intoxication is still suspected, repeat 2 mg IV/IM/IN every 3 - 5 minutes up to a maximum of 8 mg total.

PEDIATRIC DOSING:
Reversal of opioid effects, coma of unknown etiology -
0.1 mg / kg IV/IM/IN up to 2 mg. May repeat q 3 - 5 minutes up to 2 mg / dose. Max total dose 8 mg. Do not use in neonates.

Nitroglycerin – 20.220

OLMC REQUIRED: See Contraindications (B).

SUPPLIED: 0.4 mg metered dose spray, 0.4 mg tablets, 50 mg/10 ml vial

PHARMACOLOGY AND ACTIONS:
Nitroglycerin is a vasodilator. It is a smooth muscle relaxant that reduces venous tone causing pooling of blood in the peripheral veins, decreasing peripheral resistance, and thereby decreasing cardiac preload. It also causes mild dilation of the coronary arteries.

INDICATIONS:
A. Presumed ischemic chest pain.
B. Decompensated heart failure.
C. SCAPE (Sympathetic Crashing Acute Pulmonary Edema).

CONTRAINDICATIONS:
A. Blood pressure less than 100 mmHg systolic.
B. Patients who have taken Viagra® (sildenafil citrate), Levitra® (vardenafil HCl) or other similar drugs within 24 hours, or who have taken Cilais® (tadalafil) within 48 hours. Contact OLMC for direction.

PRECAUTIONS:
A. Nitroglycerine can cause hypotension in 10% of patients.
B. Nitroglycerin should be used with caution in patients with an inferior myocardial infarction (ST elevation in II, III and AVF) as this can result in hypotension due to an associated right ventricle infarction (RVI).
C. RVI may be present in up to 50% of inferior myocardial infarctions. 12-lead ECG clues to RVI include STE in III > II. RVI can also be confirmed with a right sided 12 lead ECG and STE ≥ 1 mm in V_4R. RVI patients are preload dependent and may benefit from IV fluids.
D. Generalized vasodilatation can cause profound hypotension and reflex tachycardia.
E. IV should be established prior to administration in patients who have not taken nitroglycerin previously, or who have a potential for hemodynamic instability.

SIDE EFFECTS AND NOTES:
A. Common side effects are headache, flushing, and dizziness.
B. Because nitroglycerin causes generalized smooth muscle relaxation, may relieve chest pain caused by esophageal spasm.

ADULT DOSING:
Chest pain-
0.4 mg SL every 5 minutes until pain is relieved as long as systolic BP is greater than 100 mmHg.
Decompensated heart failure –
Nitroglycerine 0.4 mg SL; repeat every 3 - 5 minutes. *(Do not administer nitroglycerine without OLMC approval if patient has taken sildenafil (Viagra®), vardenafil (Levitra®) or other similar drugs in the last 24 hours, or tadalafil (Cialis®) within the last 48 hours).*

SCAPE - Sympathetic Crashing Acute Pulmonary Edema (extreme respiratory distress, systolic BP > 160 mmHg, diaphoresis, tachycardia, decreased oxygen saturation).

- 0.4 mg SL; repeat every 3 - 5 minutes.
- Once CPAP/BiPAP is established; push dose 1 mg IV if respiratory distress persists and systolic BP remains > 160 mmHg. May repeat once in 5 minutes if respiratory distress persists and if SBP > 160 mmHg.

PEDIATRIC DOSING:
Contact OLMC for dosing.

Push dose NTG:

INDICATIONS:
SCAPE (Sympathetic Crashing Acute Pulmonary Edema) evidenced by: Rapid onset, extreme respiratory distress, diaphoresis, markedly elevated systolic blood pressure > 160, tachycardia, and decrease oxygen saturation.

DOSE:
Push dose 1 mg IV. May repeat once in 5 minutes.

MIXING OPTIONS*:

A. To make a 0.5 mg/ml concentration:
1. Expel 1 ml of Normal Saline from a 10 ml flush.
2. Draw up 1 ml of NTG (5 mg/ml concentration).
3. Result is a concentration 0.5 mg/ml in the 10 ml syringe.
4 Administer 2 ml of the 0.5 mg/ml concentration over 5 - 10 seconds.

B. To make a 0.2 mg/ml concentration:
1. Draw up all 10 ml from the vial of NTG (50 mg/10 ml vial).
2. Put medication in 250 ml bag of Normal Saline.
3. Result is a 0.2 mg/ml concentration.
4. Mix for 10 seconds.
5. Draw up 5 ml of this mixture.
6. Administer 5 ml of the 0.2 mg/ml concentration over 5 - 10 seconds.

***Push-dose NTG should not be mixed with lactated ringers for dilution purposes due to compatibility concerns.**

Norepinephrine (Levophed®) – 20.225

OLMC REQUIRED: No

SUPPLIED: 4 mg/4 ml ampules or vials

PHARMACOLOGY AND ACTIONS:
Norepinephrine stimulates alpha receptors in the peripheral vasculature, producing vasoconstriction related increase in systemic blood pressure. Concurrent beta receptor stimulation may produce increases in heart rate and mild bronchodilation.

INDICATIONS:
Obstructive, cardiogenic and distributive shock unresponsive to fluid administration.

CONTRAINDICATIONS:
Hypovolemic shock.

PRECAUTIONS:

A. Norepinephrine should be given in a large, patent vein (i.e. antecubital or larger). Do not administer through a hand or leg vein, as these are more likely to be affected by vaso-occlusive diseases and more prone to ischemic complications.
B. Extravasation of norepinephrine into tissue may cause necrosis. The IV should be checked for patency prior to administration and monitored continuously.
C. Norepinephrine is a potent vasoconstrictor and may cause hypertension. The rate of flow should be carefully monitored, and blood pressures checked often.
D. Consider hypovolemia and treat this with appropriate fluids before administration of norepinephrine.

SIDE EFFECTS AND NOTES:

A. Symptoms may include headache, palpitations, tachycardia, chest pain, and eventual hypertension.
B. Reflex bradycardia can result from an increase in blood pressure.

ADULT DOSING:

Cardiogenic/Distributive/Obstructive shock -
Begin at 4 mcg/min. If no response, increase every 5 minutes in 4 mcg/min increments to max of 24 mcg/min. Goal is MAP > 65 mmHg (SBP > 90 mmHg).

PEDIATRIC DOSING:
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 minutes may increase to 0.4 mcg/kg/min. Goal is age appropriate systolic blood pressure.

MIXING/ADMINISTRATION:
Add one 4 mg ampule or vial to 500 ml of NS or LR, or two 4 mg ampules or vials to 1000 ml of NS or LR for a concentration of 8 mcg/ml. Administer via infusion pump or 60 gtt/ml infusion set (**Infusion pump preferred).**

For example: Adults (8 mcg/ml concentration)

Mcg/min	4	8	12	16	20	24
Drops/min	30	60	90	120	150	180

Olanzapine (Zyprexa®)– 20.227

OLMC REQUIRED: No

SUPPLIED:
5 mg or 10 mg orally dissolving tablets (ODT)

PHARMACOLOGY AND ACTIONS:

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

INDICATIONS:
To avoid the need for physical restraint in the mildly agitated patient who is willing to take an oral agent. (**RASS +1, see Agitated Patient protocol 10.015).**

CONTRAINDICATIONS
Known hypersensitivity.

PRECAUTIONS AND NOTES:

A. May cause QTc prolongation, but unlikely with a single dose. Obtain ECG before administration if known history or suspicion for prolonged QTc or cardiovascular disease.
B. Use with caution in suspected drug overdose.
C. Administer tablet immediately once it is removed from the blister unit or bottle. Tablets disintegrate in the mouth and can be swallowed subsequently with saliva or liquid.
D. Patients who have received olanzapine (ODT) may be transported directly to Unity Hospital (see Behavioral Health Emergencies protocol 30.025).

ADULT DOSING:
10 mg PO.

For patients > 65 years old, dose should be reduced to 2.5 - 5 mg ODT.

PEDIATRIC DOSING:
2.5 mg ODT for < 20 kg or
5 mg ODT for ≥ 20 kg

***The 10 mg ODT tablets can be quartered or the 5 mg ODT tablets can be halved to obtain the 2.5 mg dose.**

Ondansetron (Zofran®) – 20.230

OLMC REQUIRED:
Patients < 6 months except for children in spinal motion restriction or children receiving chemotherapy.

SUPPLIED: 4 mg oral tablet; 4 mg / 2 ml vial

PHARMACOLOGY AND ACTIONS:
Ondansetron is a potent, highly selective serotonin (5-HT3) receptor agonist. Its precise mode of action in the control of nausea is not known. Pharmacologic agents and other triggers may cause release of 5-HT3 receptors. Ondansetron blocks the initiation of this reflex. Ondansetron is commonly used in the treatment of nausea in patients who are receiving chemotherapy or as a postoperative nausea treatment. Peak plasma concentrations of the drug occur 10 minutes after IV administration, and 40 minutes after IM injection. Both routes have the same elimination half-life of 4 hours.

INDICATIONS:
Prevention and control of uncomplicated nausea and vomiting.

CONTRAINDICATIONS:
Known hypersensitivity to Zofran or similar medications.

PRECAUTIONS:

A. Hypersensitivity reactions have been reported in patients who have exhibited hypersensitivity to other 5-HT3 medications (Anzemet®, Kytril®).
B. Patients with bowel obstruction should be monitored closely following administration.
C. Ondansetron may precipitate if mixed with alkaline solutions.
D. ECG changes including QTc interval prolongation and Torsade de Pointes have been observed in patients receiving ondansetron. Monitor patient's ECG closely.

SIDE EFFECTS AND NOTES:

A. The most common side effects include headache, dizziness, drowsiness, and shivers.
B. Body aches, agitation, dysuria, hypotension, and rash have also been reported in a very small number of patients.

ADULT DOSING:

Nausea & vomiting -
8 mg oral dissolving tablet or 4 mg IV/IM. Give slowly over two minutes if giving IV. If nausea and/or vomiting are inadequately controlled after 10 minutes, may repeat dose once.

PEDIATRIC DOSING:

Nausea & vomiting (children 6 months - 2 yrs)
2 mg oral dissolving tablet.

Nausea & vomiting (children 2 yrs - 12 yrs)
4 mg oral dissolving tablet **or**
0.1 mg/kg IV/IM. Give slowly over two minutes if giving IV. Do not exceed 4 mg.

Oxygen – 20.240

OLMC REQUIRED: No

SUPPLIED: Various. D cylinder contains 415 liters at 2,000 psi.

PHARMACOLOGY AND ACTIONS:
Oxygen added to the inspired air raises the amount of oxygen in the blood and the amount delivered to the tissues. Breathing in most persons is regulated by small changes in acid/base balance and CO_2 levels and it takes a large drop in oxygen concentration to stimulate respiration.

INDICATIONS:
A. Suspected hypoxemia or respiratory distress from any cause.
B. Acute chest pain in which cardiac ischemia or myocardial infarction is suspected.
C. Shock from any cause.
D. Major trauma.
E. Carbon monoxide poisoning.

CONTRAINDICATIONS: None

PRECAUTIONS:
A. If the patient is not breathing adequately on their own, the treatment of choice is ventilation with oxygen, not just supplemental oxygen.
B. In a small percentage of patients with chronic lung disease, administration of oxygen will decrease respiratory drive. Do not withhold oxygen because of this possibility. Be prepared to assist ventilations if needed.
C. Titrate oxygen to the lowest level required to achieve an $SpO_2 \geq 94\%$.

SIDE EFFECTS AND NOTES:
A. Non-humidified oxygen is drying and irritating to mucous membranes.
B. Restless may be an important sign of hypoxia.
C. Oxygen toxicity is not a risk in acute administration.
D. Nasal cannula prongs work equally well on nose and mouth breathers.

DELIVERY:

Nasal cannula -		
2 - 8 lpm		24 - 40% inspired O_2
Simple face mask -		
6 lpm		50 - 60% inspired O_2
Rebreather mask -		
10 - 12 lpm		90% inspired O_2
Bag valve mask -		
Room air		21% inspired O_2
12 lpm		40% inspired O_2
With reservoir	+	90% inspired O_2

Oxymetazoline Hydrochloride (Afrin®) – 20.245

OLMC REQUIRED: No

SUPPLIED: 0.5 fl oz nasal solution or other various sizes

PHARMACOLOGY AND ACTIONS:
Oxymetazoline hydrochloride is a selective alpha 1 adrenergic receptor agonist and alpha 2 adrenergic receptor partial agonist that causes localized vasoconstriction.

INDICATIONS:
Epistaxis uncontrolled by direct pressure.

CONTRAINDICATIONS:

A. Allergy to oxymetazoline hydrochloride.
B. Monoamine Oxidase Inhibitor (MAOI) use within the past 14 days.
C. Diastolic blood pressure > 110 mmHg.

SIDE EFFECTS AND NOTES:

A. Avoid administration into the eyes, which will dilate pupils.
B. Temporary burning, stinging, dryness in the nose, runny nose, and sneezing may occur.

ADULT DOSING:

Epistaxis -
Instill two sprays to each affected nostril.

PEDIATRIC DOSING:

A. Follow adult dosing.
B. Oxymetazoline hydrochloride should be avoided if child cannot follow instructions to blow their nose or are unable to tolerate the administration of a nasal medication.

Oxytocin (Pitocin®) – 20.246

OLMC REQUIRED: No

SUPPLIED: 10 unit/ml, 1 ml vial

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

INDICATIONS:
Prophylactic use to reduce risk of postpartum hemorrhage after delivery.

CONTRAINDICATIONS:
A. Uterine Rupture
B. Incomplete delivery

PRECAUTIONS:
When administered IV, must be given slowly over 1 minute. Rapid infusion may lead to hypotension and dysrhythmias.

SIDE EFFECTS AND NOTES:
Confusion, seizures, difficulty breathing, fast or irregular heartbeat, headache, hives, pelvic or abdominal pain, skin rash, or itching.

ADULT DOSING:
Postpartum-
10 IU IV/IM if the neonate is a singleton. For multiple births, administer only after last neonate has been delivered.

PEDIATRIC DOSING:
Not indicated for pediatrics. Consider OLMC.

Pralidoxime (2-Pam®) – 20.250

OLMC REQUIRED: For IV use.

SUPPLIED: 600 mg / 2 ml auto-injector, 1 gm powder vial – reconstitute with 20 ml NS

PHARMACOLOGY AND ACTIONS:
The principal action of Pralidoxime is to reactivate cholinesterase which has been inactivated by an organophosphate pesticide or related compound. The drug's most critical effect is in relieving paralysis of respiratory muscles. 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 chemicals.
B. Control of overdose by anticholinesterase drugs (e.g. treatment of myasthenia gravis).

CONTRAINDICATIONS:
None in the emergency setting.

PRECAUTIONS:

A. Rapid IV injection may cause tachycardia, laryngospasm, muscle rigidity, and transient neuromuscular blockade. Administration should be done slowly and preferably by infusion.
B. Pralidoxime is a relatively short acting drug; repeat dosing may be necessary.

SIDE EFFECTS AND NOTES:
Dizziness, blurred vision, diplopia, headache, drowsiness, nausea, tachycardia, and muscle weakness have been reported following administration.

ADULT DOSING:
Refer to Haz-Mat Protocol – Organophosphate Poisoning for dosing.

PEDIATRIC DOSING:
Refer to Haz-Mat Protocol – Organophosphate Poisoning for dosing.

Proparacaine – 20.255

OLMC REQUIRED: No

SUPPLIED: 0.5% solution in 15 ml bottle

PHARMACOLOGY AND ACTIONS:
Proparacaine hydrochloride is a short-acting local anesthetic of the ester type with an onset of action within 30 seconds. Duration is up to 15 minutes.

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

CONTRAINDICATIONS:
Known hypersensitivity to any component of the solution.

PRECAUTIONS:
Systemic effects are rare with topical use.

SIDE EFFECTS AND NOTES:
Instillation of Proparacaine in the recommended concentration and dosage produces little or no initial irritation, stinging, or burning. These effects may occur several hours after use.

ADULT DOSING:

Chemical burns or foreign body to outer eye -

Instill one drop in the affected eye. If there is no effect within one minute, three additional drops may be instilled at one-minute intervals. For transports longer than 15 minutes, if eye pain returns, 1 - 4 additional drops may be instilled to continue anesthetic effect.

PEDIATRIC DOSING:
Same as adult

Rocuronium (Zemuron®) – 20.257

OLMC REQUIRED: No

SUPPLIED: 100 mg in 10 mL vial

PHARMACOLOGY AND 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 90 seconds for induction dose and 1 to 3 minutes for maintenance dose. Time to recovery is 20 to 30 minutes. Metabolism is 5 to 35% renal and the remainder by the liver.

INDICATIONS:
A. For sustained neuromuscular blockade in the intubated patient.
B. For Drug Assisted Airway Management (DAAM) in the patient when succinylcholine is contraindicated or unavailable.

CONTRAINDICATION:
Maintainance of paralysis in patients in status epilepticus

PRECAUTIONS:
A. Use of pulse oximetry is required.
B. Rocuronium 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.
D. Rocuronium should not be administered simultaneously with furosemide, methylprednisolone, or sodium bicarbonate.

ADULT AND PEDS DOSING:

Maintenance of post-intubation paralysis - 0.5 mg/kg IV/IO.

Induction for DAAM – 1.2 mg/kg IV/IO.

Sodium Bicarbonate – 20.260

OLMC REQUIRED: Pediatric hyperkalemia and crush injury

SUPPLIED: 50 mEq / 50 ml pre-filled syringe

PHARMACOLOGY AND ACTIONS:
Sodium bicarbonate is an alkalotic solution which neutralizes acids found in the blood. Acids are increased in the blood when body tissues become hypoxic due to cardiac or respiratory arrest. Acidosis depresses cardiac contractility and cardiac response to catecholamines and makes the heart more likely to fibrillate and less likely to defibrillate. Current guidelines no longer recommend routine use of sodium bicarbonate, except in cases of arrest secondary to hyperkalemia, cyclic antidepressant overdose, or acidosis.

INDICATIONS:

A. Acidosis associated with PEA and asystole.
B. To control arrhythmias or asystole in cyclic antidepressant overdose or hyperkalemia.
C. Chlorine inhalation injury.

CONTRAINDICATIONS: None

PRECAUTIONS:

A. Addition of too much bicarbonate may result in alkalosis that is difficult to reverse and may cause as many problems in resuscitation as acidosis.
B. May increase cerebral acidosis, especially in diabetic ketoacidosis.
C. Do not mix sodium bicarbonate with calcium preparations. Slowly flush one drug from the catheter before administering the other.

SIDE EFFECTS AND NOTES:
Each amp of sodium bicarbonate contains 50 mEq of sodium. This may increase intravascular volume and hyperosmolarity resulting in cerebral impairment.

ADULT DOSING:

Sodium Channel Blockade overdose (Tricyclic Antidepressants, Diphenhydramine, propranolol, Type 1a or 1c anti-dysrhythmics) -
1 mEq/kg IV or IO.

PEA, asystole -
1 mEq/kg IV or IO. May repeat q 10 minutes at 0.5 mEq/kg.

Hyperkalemia -
50 mEq IV or IO.

Crush injury -
50 mEq IV or IO.

Chlorine Inhalation -
2.5 ml of 8.4% Sodium Bicarbonate via nebulizer

Sodium Bicarbonate – 20.260

PEDIATRIC DOSING:

A. Use same dosing as for adult with exception of hyperkalemia and crush injury; call OLMC for dosing in that situation.
B. For children less than 10 kg (1 yr.), dilute by one-half with normal saline prior to administration.

Sodium Thiosulfate – 20.265

OLMC REQUIRED: All situations.

SUPPLIED: 12.5 grams / 50 ml vial

PHARMACOLOGY AND 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 system is slow to respond to large amounts of cyanide. The rhodanese enzyme reaction can be accelerated by supplying an exogenous source of sulfur. This is commonly accomplished by administering sodium thiosulfate.

INDICATIONS:
Cyanide poisoning.

CONTRAINDICATIONS:
Do not administer to a patient who has been given hydroxocobalamin (Cyano-Kit).

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 effect.
B. It is not known whether Sodium Thiosulfate can cause fetal harm when administered to a pregnant woman and should only be administered in this setting if clearly needed.

SIDE EFFECTS AND NOTES:
Sodium thiosulfate is administered as a slow push over 10 minutes. Consider using a Buretrol® or similar device.

ADULT DOSING:
Cyanide poisoning -
50 ml slow IV over 10 - 20 minutes.

PEDIATRIC DOSING:
Cyanide poisoning -
1.65 ml/kg slow IV over 10 - 20 minutes.

Succinylcholine – 20.270

OLMC REQUIRED: No

SUPPLIED: 200 mg / 10 ml vial

PHARMACOLOGY AND ACTIONS:
Succinylcholine is a short acting motor nerve depolarizing skeletal muscle relaxant. It competes with acetylcholine to combine with cholinergic receptors in the motor end plate causing depolarization inhibiting neuromuscular transmission. After intravenous injection, paralysis is obtained within 1 - 2 minutes and persists for approximately 4 - 6 minutes. Effects then start to fade and return to normal. It has no effect on consciousness. Muscle relaxation begins in the eyelids and jaw, then progresses to the limbs, abdomen, diaphragm and finally intercostal muscles. Succinylcholine is hydrolyzed by plasma pseudocholinesterase and is excreted by the kidneys.

INDICATIONS:
To achieve temporary paralysis where endotracheal intubation is indicated.

CONTRAINDICATIONS:

A. Hypersensitivity to the drug.
B. Major burns and crush injuries between 48 hours and 6 months old.
C. Stroke or spinal cord injuries with profound residual deficits between 48 hours and 6 months old.
D. Neuromuscular disease (e.g. muscular dystrophy, multiple sclerosis).
E. Suspected hyperkalemia (e.g. 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, ventilation equipment, and resuscitation drugs should be readily available.
C. Succinylcholine produces paralysis but does not alter a person's level of consciousness. Paralysis in the conscious patient is very frightening, therefore, sedation should be provided to the patient during the procedure. Verbal explanations should be provided to the patient during the procedure, even if you do not think they can hear you.

SIDE EFFECTS AND NOTES:
In rare individuals, because of pseudocholinesterase deficiency, paralysis may persist for a prolonged period. Be prepared to continue to assist ventilations as needed.

ADULT DOSING:

Drug Assisted Airway Management (DAAM) -
1.5 mg/kg IV/IO

PEDIATRIC DOSING:

DAAM -
1.5 mg/kg IV/IO for patients $\geq$ 6 years old.
2 mg/kg IV/IO for patients < 6 years old.

Tranexamic Acid (TXA)– 20.277

OLMC REQUIRED: No

SUPPLIED: 1000 mg (1 gram) / 10 ml vial

PHARMACOLOGY AND ACTIONS:
Tranexamic acid (TXA) is a synthetic analog of the amino acid lysine. It reversibly binds to lysine receptor sites on plasminogen to decrease the conversion of plasminogen to plasmin. This antifibrinolytic effect reduces breakdown of fibrin and helps to stabilize clots to reduce bleeding. TXA also has anti-inflammatory properties.

INDICATIONS:

A. Moderate to severe head trauma, either blunt or penetrating, in patients with a GCS ≤ 12 and with a reactive pupil.
B. Hemorrhagic shock from blunt or penetrating trauma with a systolic blood pressure < 70 mmHg.
C. Significant postpartum hemorrhage (> 500 ml).

CONTRAINDICATIONS

A. Patients less than 15 years old (or weight < 50 kg if age unknown)
B. > 2 hours from time of injury for hemorrhagic shock or TBI
C. GCS of 3 with no reactive pupil
D. EMS chest compressions (manual or mechanical)
E. Patients with clinical concern for epilepsy/seizures, MI, stroke, PE, DVT, renal failure, or dialysis
F. Known or suspected pregnancy
G. Drowning
H. Hanging
I. Burns > 20% TBSA

PRECAUTIONS AND SIDE EFFECTS:

A. Hypotension has been observed with **rapid IV injection**.
B. TXA, by causing clots to get stronger, can make MI, stroke, PE, and DVTs more challenging to manage.
C. TXA is renally cleared, so its use in patients with known renal failure or dialysis should be avoided.
D. Reported side effects have included seizures, nausea, vomiting, and chest pain.

ADULT DOSING (Age ≥ 15):

Head trauma, hemorrhagic shock, or postpartum hemorrhage: 2 g slow IV/IO push.

PEDIATRIC DOSING:

Not indicated in patients < 15 years of age suffering from head trauma, hemorrhagic shock, or postpartum hemorrhage. Consider OLMC.

Vecuronium (Norcuron®) – 20.290

OLMC REQUIRED: No

SUPPLIED: 10 mg vial of powder and 10 ml vial of diluent solution

PHARMACOLOGY AND ACTIONS:
Vecuronium is a non-depolarizing neuromuscular blocking agent causing skeletal muscle relaxation. It reversibly binds the acetylcholine receptor, blocking the action of acetylcholine. Neuromuscular blockade occurs within 2 - 3 minutes. Time to recovery is 30 - 45 minutes. Vecuronium metabolism is 5 - 35% renal with the remainder done in the liver.

INDICATIONS:
A. For sustained neuromuscular blockade in the intubated patient.
B. As the first line agent for Drug Assisted Airway Management (DAAM) in the patient where succinylcholine is contraindicated.

CONTRAINDICATIONS:
Patients in status epilepticus who require intubation.

PRECAUTIONS:
A. Patients with renal or hepatic failure may experience prolonged paralysis.
B. Vecuronium has no effect on consciousness and must be used with a sedative or induction agent.

SIDE EFFECTS AND NOTES:
A. Vecuronium 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.
B. Vecuronium can be used to maintain paralysis even if intubation was performed without Succinylcholine.

ADULT DOSING:
0.1 mg/kg IV/IO.

PEDIATRIC DOSING:
Same as adults.

Ziprasidone (Geodon®) – 20.300

OLMC REQUIRED: No

SUPPLIED: 20 mg single dose vial when reconstituted

PHARMACOLOGY AND ACTIONS:

A. Antipsychotic.
B. The mechanism is related to blockade of dopamine and serotonin receptors producing sedation and tranquilization.
C. Onset of action of a single IM dose is from 15 - 30 minutes and duration of action is 2 - 4 hours. The peak effect may not be apparent for up to 2 hours.

INDICATIONS:
Pharmacological sedation in the agitated and combative patient.

CONTRAINDICATIONS:
Known allergy.

PRECAUTIONS:

A. May cause hypotension. Treat shock per protocol when feasible.
B. Use caution when administering ziprasidone to patients who have taken other CNS depressant drugs (e.g. sedative-hypnotics, alcohol, opioids). Consider reduced doses in these cases.
C. May induce Torsade de Pointes. Monitor ECG and Q-T interval following use, if feasible.
D. Extrapyramidal symptoms have been reported. If severe, treat with diphenhydramine 1 mg/kg IV/IM to a max of 50 mg.
E. Use with caution in patients with a seizure disorder or condition that causes seizures.
F. Ziprasidone is for IM dosing only

NOTES & PRECAUTIONS:

A. Somnolence, dizziness, headache, and nausea have been reported following administration.
B. Reconstitution: Add 1.2 ml sterile water for injection and shake vigorously until completely dissolved.
    - 1 ml = 20mg of ziprasidone.

ADULT DOSING:
10 - 20 mg IM. Do not repeat. (For patients > 65, max dose is 10 mg IM.)

PEDIATRIC DOSING (Age > 12 only):
10 mg IM. Do not repeat.