D. ALS PHARMACOLOGY

1. ACETAMINOPHEN

a) Indications

Patients ages 2 years and above judged to be in mild to moderate discomfort (e.g., 2–5 on FACES scale)

b) Adverse Effects

Not clinically significant

c) Precautions

Administration of acetaminophen for mild to moderate pain does not eliminate the need for transport of the patient to the hospital to receive a comprehensive evaluation of the cause of the pain and appropriate definitive treatment.

d) Contraindications

(1) Head injury
(2) Hypotension
(3) Administration of acetaminophen or acetaminophen containing medications within the previous four hours

ALERT MANY COMMON COLD PREPARATIONS CONTAIN ACETAMINOPHEN.

(4) Inability to swallow or take medications by mouth
(5) Respiratory distress
(6) Persistent vomiting
(7) Known or suspected liver disease (including patients suspected of current alcohol ingestion)
(8) Allergy to acetaminophen
(9) Patients less than 2 years of age

e) Preparations Use Unit Dose Only

(DO NOT USE MULTIDOSE BOTTLE OF LIQUID)
Unit dose 160 mg/5 mL liquid
Unit dose 325 mg pill or tablet

f) Dosage

(1) Less than 2 years of age: Not indicated
(2) 2–4 years: Unit dose 160 mg/5 mL
(3) 5–12 years: TWO unit doses of 160 mg/5 mL each for a total of 320 mg/10 mL
(4) 13 years and above: FOUR unit doses of 160 mg/5 mL each for a total of 640 mg/20 mL OR in a form of 325 mg pill or tablet x2 for a total of 650 mg with sips of water as tolerated by the patient.

2. ACTIVATED CHARCOAL (WITHOUT SORBITOL)

a) Pharmacology

Variable drug or toxin absorption when ingested

b) Pharmacokinetics

Adsorbs poisons and prevents toxins from entering body systems

c) Indications

Poisoning by mouth

d) Contraindications

(1) Altered mental status
(2) Patients who have received an emetic

e) Adverse Effects

Not clinically significant

f) Precautions

Does not adsorb all drugs and/or toxic substances

g) Dose

(1) Adult: Administer 1 gram/kg
(2) Pediatric: Administer 1 gram/kg

ALERT

POISON INFORMATION CENTER RECOMMENDATIONS SHOULD BE SOLICITED IN CONJUNCTION WITH MEDICAL CONSULTATION, BUT MEDICATION ORDERS CAN ONLY BE ACCEPTED FROM AN APPROVED BASE STATION OR CONSULTATION CENTER.

3. ADENOSINE (ADENOCARD®)

a) Pharmacology

(1) Naturally occurring purine nucleoside
(2) Used to treat narrow complex tachycardia, PSVT with WPW
(3) Slows conduction through the AV node
(4) No effect on ventricular contractility
(5) Causes peripheral vasodilatation (often dramatic)

b) Pharmacokinetics

Onset of action within 5–20 seconds following an IV dose; half-life is 10 seconds

c) Indications

(1) To slow the rate of narrow complex tachycardia
(2) Is only effective on SVT/PSVT
(3) No effect on VT, atrial fibrillation, or flutter
(4) In stable, wide complex tachycardia (possible VT) for pediatric with caution

d) Contraindications

(1) Known hypersensitivity
(2) History of moderate to severe asthma or active bronchospasm
(3) Polymorphic or irregular wide complex tachycardia

e) Adverse Effects

Flushing, dyspnea, chest pressure, nausea, headache, dizziness, and hypotension

f) Precautions

(1) Effects antagonized by theophylline.
(2) Effects enhanced by dipyridamole (Persantine®), digitalis, carbamazepine, calcium channel blockers, and benzodiazepines.
(3) Be prepared for up to 40 seconds of asystole

g) Dosage

(1) Adult:
6 mg rapid IVP bolus followed by a rapid flush
Give 12 mg if no response within 2 minutes.
Give 12 mg more if no response within another 1–2 minutes.

ALERT

REDUCE DOSAGE BY HALF FOR PATIENTS WITH TRANSPLANTED HEARTS AND THOSE TAKING DIPYRIDAMOLE OR CARBAMAZEPINE.

(2) Pediatric: 0.1 mg/kg rapid IVP/IO; maximum initial dose 6 mg.
Second and third doses: 0.2 mg/kg rapid IVP/IO; maximum single additional dose 12 mg.

5. AMIODARONE

a) Pharmacology

Prolongs duration and refractory period of action potential. Slows electrical conduction, electrical impulse generation from sinoatrial node, and conduction through accessory pathways. Also dilates blood vessels.

b) Pharmacokinetics

Amiodarone primarily alters/blocks the potassium and sodium ion permeability across the myocardial membrane, which in effect, stabilizes the ion channels and changes impulse conduction through the myocardium. Amiodarone also has some effects on beta receptors and calcium channels.

c) Indications

(1) Prevent recurrence of ventricular fibrillation/tachycardia after defibrillation and conversion to supraventricular rhythm
(2) Ventricular tachycardia (VT)
(3) Ventricular fibrillation (VF)

d) Contraindications

(1) Second or third degree AV blocks
(2) Sensitivity to amiodarone
(3) Idioventricular escape rhythms
(4) Accelerated idioventricular rhythm
(5) Sinus bradycardia or arrest or block
(6) Hypotension
(7) Cardiogenic shock
(8) Ventricular conduction defects
(9) Iodine hypersensitivity

e) Adverse Effects

(1) Bradycardia
(2) Hypotension
(3) Prolonged QT interval

f) Precautions

May prolong the QT interval increasing risk of torsades de pointes, and VF. Amiodarone inhibits atrioventricular conduction and decreases myocardial contractility, increasing the risk of AV block or of hypotension with any calcium channel blocker.

g) Dosing

(1) Adult with pulse: 150 mg IV/IO over 10 minutes (mixed in 50 - 100 mL of approved diluent). May repeat once.

(2) Adult without pulse VF/VT/(torsades after magnesium sulfate): 300 mg IV/IO. May repeat one time
150 mg IV/IO

(3)  Pediatric with pulse: 5 mg/kg IV/IO over 20 minutes (mixed in 50 - 100 mL of approved diluent)

(4) Pediatric without pulse: 5 mg/kg IV/IO; max single dose 300 mg. May repeat twice to a maximum of 15 mg/kg.

7. ATROPINE SULFATE

a) Pharmacology

(1) Parasympatholytic (vagolytic action)
(2) Anticholinergic (accelerates the heart rate)

b) Pharmacokinetics

(1) Accelerated heart rate within minutes of IV injection.
(2) Peak effect is seen within the first 15 minutes.
(3) Atropine disappears rapidly from the blood.
(4) Excreted in the urine within the first 12 hours.

c) Indications

(1) Symptomatic bradycardia
(2) Organophosphate poisoning
(3) Nerve agents

d) Contraindications

(1) Known hypersensitivity
(2) Dysrhythmias in which enhancement of conduction may accelerate the ventricular rate and cause decreased cardiac output (e.g., atrial fibrillation, atrial flutter, or PAT with block)
(3) Relative Contraindications (weigh risk/benefits):
    (a) AV block at His-Purkinje level (second-degree Type II AV Block and third-degree AV Block)
    (b) Suspected acute myocardial infarction or ischemia
    (c) Glaucoma

e) Adverse Effects

(1) Excessive doses of atropine can cause delirium, restlessness, disorientation, tachycardia, coma, flushed and hot skin, ataxia, blurred vision, dry mucous membranes.
(2) Ventricular fibrillation and tachycardia have occurred following IV administration of atropine.

f) Precautions

Not clinically significant

g) Dosage

(1) Adult:
Bradycardia: Administer 0.5–1 mg IVP repeated every 3–5 minutes to a total dose of 0.04 mg/kg

(2) Pediatric:
Bradycardia: Administer 0.02 mg/kg IV/IO; maximum single dose 0.5 mg; ET 0.04–0.06 mg/kg, dilute 5 mL;
repeat once

(3) Organophosphate poisoning:
   (a) Adult: Administer 2–4 mg IVP or IM every 5–10 minutes.
   (b) Pediatric: Administer 0.02 mg/kg IVP/IO or IM every 5–10 minutes.

(4) Nerve agent exposure
See MARK I / DuoDote Protocol.

9. CALCIUM CHLORIDE (10% SOLUTION)

a) Pharmacology

(1) Increase cardiac contractile state and ventricular automaticity
(2) Is useful in reversing cardiac arrhythmias due to hyperkalemia (often seen in renal dialysis patients)

b) Pharmacokinetics

Rapid onset of action with IV administration

c) Indications

(1) Hyperkalemia
(2) Hypocalcemia
(3) To treat adverse effects caused by calcium channel blocker overdose
(4) Hypotension secondary to diltiazem administration
(5) Respiratory depression, decreased reflexes, flaccid paralysis, and apnea following magnesium sulfate administration

d) Contraindications

(1) Not indicated in cardiac arrest except when hyperkalemia, hypocalcemia, or calcium channel toxicity is highly suspected
(2) Patient currently taking digoxin with suspected calcium channel blocker overdose

e) Adverse Effects

(1) Bradycardia may occur with rapid injection.
(2) Syncope, cardiac arrest, arrhythmia, bradycardia

f) Precautions

(1) Use with caution on patients taking digitalis, as calcium may increase ventricular irritability and precipitate digitalis toxicity.
(2) If given with sodium bicarbonate, calcium will precipitate.
(3) Calcium salts may produce coronary and cerebral artery spasm.

g) Dosage

(1) Adult: Administer 0.5–1 gram SLOW IVP over 10 minutes.
Maximum dose 1 gram
Administer 500 mg SLOW IVP for: hypotension following diltiazem administration.
Respiratory depression, decreased reflexes, flaccid paralysis, and apnea following magnesium sulfate administration
(2) Pediatric: Administer 20 mg/kg (0.2 mL/kg) SLOW IVP/IO (50 mg/min)
Maximum dose 1 gram

10. DEXAMETHASONE

a) Indications
(1) Moderate to severe asthma exacerbation
(2) Croup
(3) Anaphylaxis

b) Adverse Effects
(1) Headache
(2) Edema
(3) Vertigo
(4) Fluid retention
(5) Adrenal insufficiency and immunosuppression with long-term use
(6) HTN
(7) CHF
(8) Nausea and vomiting
(9) Dyspepsia
(10) Anaphylaxis

c) Precautions
(1) Caution with diabetes
(2) Known TB
(3) Osteoporosis
(4) Hepatic impairment
(5) CHF
(6) Seizure disorder

d) Contraindications
(1) Hypersensitivity to drug
(2) Known systemic fungal infection
(3) Premature infants

e) Dosage (IV solution used for PO administration)
(1) Adult: 10 mg IV (preferred, if established) or PO
(2) Pediatric:
(a) Asthma: 0.5 mg/kg PO (preferred) or IV to a maximum of 10 mg
(b) Croup: 0.5 mg/kg PO/IM/IV to a maximum of 10 mg

11. DEXTROSE

a) Pharmacology

Dextrose is a water-soluble monosaccharide found in corn syrup and honey.

b) Pharmacokinetics

(1) Dextrose restores circulating blood sugar and is rapidly utilized following IV injection.

(2) Excess dextrose is rapidly excreted unchanged in the urine.

c) Indications

Correction of altered mental status due to low blood sugar (hypoglycemia) seizures and cardiac arrest

d) Contraindications

Known hyperglycemia

e) Adverse Effects

May worsen hyperglycemia (high blood sugar)

f) Precautions

(1) May worsen preexisting hyperglycemia

(2) Tissue necrosis if extravasation occurs

g) Dosage

(1) Adult:

(a) If blood glucose is less than 70 mg/dL, administer 10% dextrose in 50 mL (5 grams) boluses, one minute apart, to a maximum of 250 mL **OR** 25 grams of 50% dextrose IVP, until:

(i) the patient has a return to normal mental status, and

(ii) the patient's blood glucose is at least 90 mg/dL.

(iii) If, following 250 mL of 10% dextrose or 25 grams of 50% dextrose, patient has persistently altered mental status and blood glucose less than 90 mg/dL, repeat dosing regimen in (a).

(2) Pediatric:

(a) **Patient less than 28 days -** if blood glucose is less than 40 mg/dL administer 2 mL/kg of 10% dextrose IV/IO.
D10W is prepared by mixing one part of D50W with four parts LR.
Recheck glucose after first dose.
If blood glucose is less than 40 mg/dL, obtain medical consultation to administer second dose of D10W.

(b) **Patients 28 days up to 4 years -** if blood glucose is less than 70 mg/dL, administer 2–4 mL/kg of 10% dextrose IV/IO to a maximum of 25 grams.
Recheck glucose after first dose.
If blood glucose is less than 70 mg/dL, obtain medical consultation to administer second dose of D10W.

(i) If unable to start IV and blood glucose is less than 70 mg/dL, administer 0.5 mg glucagon IM/IN.

(ii) Medical consult for additional dosing to a maximum of 3 mg IM/IN

(c) **Patients 5 years up to patient's 18th birthday -**if blood glucose is less than 70 mg/dL, administer 2–4 mL/kg of 10% dextrose IV/IO to a maximum of 25 grams.

Recheck glucose after first dose.

If blood glucose is less than 70 mg/dL, obtain medical consultation to administer second dose of D10W.

(i) If unable to start IV and blood glucose is less than 70 mg/dL, administer 1 mg glucagon IM/IN.

(ii) Medical consult for additional dosing to a maximum of 3 mg IM/IN

14. DIPHENHYDRAMINE HYDROCHLORIDE (BENADRYL®)

a) Pharmacology

Antihistamine

b) Pharmacokinetics

(1) Effect begins within 15 minutes of IV dose.
(2) Peak effect 1–4 hours
(3) Metabolized by the liver
(4) The half-life ranges from 2–10 hours.

c) Indications

(1) Allergic reaction
(2) Anaphylaxis
(3) Dystonic reactions

d) Contraindications

Known allergy to diphenhydramine

e) Adverse Effects

Drowsiness, loss of coordination, blurred vision, headache, hypotension, tachycardia, palpitations, thickening of bronchial secretions leading to chest tightness, and wheezing

f) Precautions - Should be used with caution in patients with:

(1) Severe vomiting
(2) Alcohol intoxication
(3) Nursing mothers

g) Dosage (NEW ’20)

(1) Adult: Administer 25–50 mg SLOW IVP or IM
(2) Pediatric: Administer 1 mg/kg SLOW IV or IM

16. EPINEPHRINE 1:10,000/1:1,000 (NEW '20)

a) Pharmacology

(1) The administration of epinephrine causes increases in:
  (a) Systemic vascular resistance
  (b) Systemic arterial pressure
  (c) Heart rate (positive chronotropic effect)
  (d) Contractile state (positive inotropic effect)
  (e) Myocardial oxygen requirement
  (f) Cardiac automaticity
  (g) AV conduction (positive dromotropic effect)

(2) Causes bronchial dilation by smooth muscle relaxation

b) Pharmacokinetics

(1) IV administered epinephrine has an extremely rapid onset of action.
(2) Is rapidly inactivated by the liver
(3) Subcutaneous administration of epinephrine results in slower absorption due to local vasoconstriction.
(4) Local massage will hasten absorption.
(5) Topically applied nebulizer within the respiratory tract, epinephrine has vasoconstrictor properties that result in reduction of mucosal and submucosal edema. It also has bronchodilator properties that reduce airway smooth muscle spasms.

c) Indications

(1) Medical cardiac arrest and pediatric traumatic arrest
(2) Moderate to severe allergic reaction/anaphylaxis
(3) IV push epinephrine should be reserved for cardiac arrest patients
(4) Epinephrine infusion (IV/IO) should be reserved for patients in shock refractory to fluid bolus or for patients in anaphylactic shock
(5) Severe asthma
(6) Respiratory stridor (suspected croup)

d) Contraindications

(1) Hypertension
(2) Preexisting tachydysrhythmias with a pulse (ventricular and supraventricular)
(3) Use with pregnant women should be avoided whenever possible
(4) IVP epinephrine (1:1,000) should not be administered to any patient with a pulse

e) Adverse Effects

(1) Tachydysrhythmias (supraventricular and ventricular)
(2) Hypertension
(3) May induce early labor in pregnant women

(4) Headache
(5) Nervousness
(6) Decreased level of consciousness
(7) Rebound edema may occur 20–30 minutes after administration to croup patients.

f) Precautions

(1) Do not mix with sodium bicarbonate as this deactivates epinephrine.
(2) Epinephrine causes a dramatic increase in myocardial oxygen consumption.
(3) Its use in the setting of an acute MI should be restricted to cardiac arrest.

g) Dosage

(1) Cardiac Arrest **(NEW '20)**
  (a) Adult:
    (i) Administer 1 mg (1:10,000) IVP/IO every 4 minutes to a maximum of 4 doses for the initial arrest. If arrest recurs following any period of ROSC, administer a maximum of 2 additional doses
  (b) Pediatric:
    (i) Administer 0.01 mg/kg (0.1 mL/kg) of 1:10,000 IVP/IO every 4 minutes to a maximum of 4 doses for the initial arrest. If arrest recurs following any period of ROSC, administer a maximum of 2 additional doses
    (ii) ET: Administer 0.1 mg/kg of 1:1,000, diluted with 5 mL of LR; repeat every 4 minutes to a maximum of 4 doses for the initial arrest. If arrest recurs following any period of ROSC, administer a maximum of 2 additional doses
  (c) Neonate:
    (i) Administer 0.01 mg/kg (0.1 mL/kg) of 1:10,000 IVP/IO every 4 minutes to a maximum of 4 doses for the initial arrest. If arrest recurs following any period of ROSC, administer a maximum of 2 additional doses.
    (ii) ET: Administer 0.1 mg/kg of 1:1,000, diluted with 5 mL of LR; repeat every 4 minutes to a maximum of 4 doses for the initial arrest. If arrest recurs following any period of ROSC, administer a maximum of 2 additional doses
(2) Bradycardia
  (a) Adult: Using epinephrine infusion (1 mg epinephrine in 100 mL LR), administer 1 mL/min (60 drops/min) using a 60 drop-set. If systolic blood pressure remains less than 90 mmHg, obtain medical consultation for further dosing. Infusion pump: 2-10 mcg/min.
  (b) Pediatric:
    (i) Administer 0.01 mg/kg (0.1 mL/kg) of the 1:10,000 IVP/IO; repeat every 3–5 minutes
    (ii) ET: 0.1 mg/kg of 1:1,000, diluted with 5 mL of LR; repeat every 3–5 minutes

(c) Neonate:
(i) Administer 0.01 mg/kg (0.1 mL/kg) of 1:10,000 IVP/IO; repeat every 3–5 minutes
(ii) ET: 0.03 mg/kg of 1:10,000, diluted with 1 mL of LR

(3) Allergic Reaction/Anaphylaxis/Asthma
(a) ADULT
For patients who are in extremis with severe hypotension or impending respiratory failure:
(i) Administer epinephrine 0.5 mg every 5 minutes up to a total of 3 doses.
(ii) If patient remains hypotensive or with impending respiratory failure, administer epinephrine infusion per management of shock with epinephrine infusion (below)

(b) PEDIATRIC
(i) Administer epinephrine: 1:1,000 IM
Less than 5 years of age: administer 0.15 mg in 0.15 mL IM
5 years and greater: administer 0.5 mg in 0.5mL IM
(ii) May repeat IM dose every 5 minutes for a total of 3 doses for severe reactions
(iii) Epinephrine infusion (see management of non-traumatic shock with epinephrine infusion below)

(4) Croup
(a) Adult: not indicated
(b) Pediatric
(i) Administer 2.5 mL of epinephrine 1:1,000 via nebulizer.
If patient does not improve, administer a second dose of 2.5 mL of epinephrine 1:1,000 via nebulizer.

ALERT

ALL PATIENTS WHO RECEIVE NEBULIZED EPINEPHRINE MUST BE TRANSPORTED BY AN ALS UNIT.

(5) Cardiogenic Shock
(a) If rales are present, administer fluid bolus, titrate to a systolic blood pressure of 90 mmHg or greater. Maximum single of bolus of 250 mL of LR IV.

(b) Additional fluid requires medical consultation.

(c) Initiate epinephrine infusion
(i) Add 1 mg of epinephrine (either 1:1,000 or 1:10,000) in a 100 mL bag of LR or NS
(ii) Use a Microdrip set (60 drops/mL) for infusion administration
(iii) Adult epinephrine infusion dosage:
(1) Administer infusion through a free-flowing IV, ideally 20 gauge or larger, or by IO
(2) Start infusion at 1 mL/min (60 drops/min) IV/IO
(3) Check blood pressure every 5 minutes. If MAP is less than 65 mmHg or systolic blood pressure is less than 90 mmHg, increase to a maximum rate of 2 mL/min (120 drops/min).

(4) If above blood pressure goals are not met upon reaching maximum rate, obtain online medical consultation.

(6) Hypovolemic or Septic Shock
  (a) If lungs are clear, administer fluid bolus of 20 mL/kg of LR IV. Titrate to a systolic blood pressure of 90 mmHg (or mean arterial pressure of 65 mmHg). Maximum patient dose of 2,000 mL of LR
  (b) If hypotension persists after 2 L of LR are provided, consider additional LR up to a maximum of 30 mL/kg total.
  (c) Initiate epinephrine infusion if systolic blood pressure remains less than 90 mmHg (or mean arterial pressure less than 65 mmHg) after IV fluid bolus of 30 mL/kg LR.

(7) Anaphylactic shock: Initiate epinephrine infusion for patients who are in extremis with severe hypotension or impending respiratory failure, after having administered 3 doses of IM epinephrine. (Refer to Anaphylaxis Protocol.)

(8) Neurogenic shock (suspected spinal cord injury which typically presents with hypotension and bradycardia)
  (a) If lungs are clear, administer fluid bolus of 20 mL/kg of LR IV. Titrate to a systolic blood pressure of 110 mmHg (or mean arterial pressure of 85 mmHg). Maximum patient dose of 2,000 mL of LR.
  (b) Initiate epinephrine infusion if systolic blood pressure remains less than 110 mmHg (or mean arterial pressure less than 85 mmHg).

h) Pediatric epinephrine infusion dosage

(1) The following dosing chart should be used for pediatric patients less than 50 kg (using approved epinephrine infusion and 60 drop set):

Weight range (kg)	Initial epinephrine dose	If goal blood pressure not achieved at 5 min, increase to
LESS than 10 kg	6 drops/min (0.1 mL/min)	12 drops/min (0.2 mL/min)
10-19 kg	12 drops/min (0.2 mL/min)	24 drops/min (0.4 mL/min)
20-29 kg	18 drops/min (0.3 mL/min)	36 drops/min (0.6 mL/min)
30-39 kg	24 drops/min (0.4 mL/min)	48 drops/min (0.8 mL/min)
40-49 kg	30 drops/min (0.5 mL/min)	60 drops/min (1.0 mL/min)

(2) Blood pressure goal:
  (a) For patients 10 years and older (including adults), systolic blood pressure greater than 90 mmHg;
  (b) For patients under 10 years of age, systolic blood pressure greater than 70 + 2x age in years mmHg; OR
  (c) Systolic blood pressure ordered by the pediatric base station.

(3) If above blood pressure goal not met after 10 minutes, obtain online medical consultation.

17. FENTANYL

(Required unless Morphine OSP approved)

Pharmacology

(1) Synthetic opioid binds with opiate receptors in the CNS, altering both perception and emotional response to pain.
(2) Fentanyl is significantly more potent than morphine. 100 mcg of fentanyl is equivalent to 10 mg of morphine.

a) Pharmacokinetics

Onset of action is 2–3 minutes after IV dose and effects last 30 minutes to 1 hour.

b) Indications

(1) The patient reports moderate to severe pain.
(2) In the clinician's judgment the patient will benefit from treatment with an opioid analgesic, including patients who are MOLST and/or EMS/DNR patients or being pre-medicated for a procedure.

c) Contraindications

(1) Hypersensitivity or known allergy to fentanyl
(2) Uncorrected respiratory distress or hypoxemia refractory to supplemental oxygen
(3) Uncorrected hypotension, defined as a persistent systolic pressure less than 90 mmHg.

d) Adverse Effects

(1) Respiratory depression/arrest
(2) Altered mental status
(3) Increased vagal tone due to suppression of sympathetic pathways (slowed heart rate)
(4) Constricted pupils (pinpoint)
(5) Increased cerebral blood flow

e) Precautions

(1) Naloxone reverses all effects.
(2) To reduce the risk of chest wall rigidity (especially in children), fentanyl should be administered slowly and titrated to effect.
(3) Vital signs should be monitored frequently.
(4) Hypotension is a greater possibility in volume-depleted patients.
(5) Elderly patients and those with impaired renal function may be more sensitive to the medication's effects.

f) Dosage

(1) Adult: Fentanyl IN preferred IV/IO/IM
  (a) Administer 1 mcg/kg to a maximum initial dose of 200 mcg (For IN route, dosing may be limited due to volume limitations - administration of max 1mL per nare).
  (b) Reassess in 5–10 minutes. If pain remains moderate to severe, then administer a second dose of fentanyl 1 mcg/kg to a maximum dose of 200 mcg.
  (c) Obtain on-line medical direction for additional doses, if required.

(2) Pediatric: Fentanyl IN. If IN route not accessible, IV/IO/IM
   (a) Administer 1 mcg/kg to a maximum initial dose of 200 mcg (For IN route, dosing may be limited due to volume limitations - administration of max 1mL per nare).
   (b) Reassess in 5–10 minutes. If pain remains moderate to severe, then administer a second dose of fentanyl 1 mcg/kg to a maximum dose of 200 mcg.
   (c) Obtain on-line medical direction for additional doses, if required.

18. GLUCAGON

a) Pharmacology

(1) Hormone synthesized by the pancreas
(2) Increases blood glucose concentration
(3) Inhibits gastric and pancreatic secretions
(4) May increase heart rate and cardiac output
(5) May decrease blood pressure
(6) Increases metabolic rate

b) Pharmacokinetics

(1) Destroyed by the GI tract and is not effective orally
(2) Maximum hyperglycemic activity occurs within 30 minutes and disappears after 1–2 hours.
(3) Relaxation of smooth muscle occurs within 8–10 minutes and persists for 12–27 minutes.
(4) The half-life is 3–10 minutes.
(5) Degraded in liver and kidneys

c) Indications

(1) Patients with altered mental status who are suspected of being hypoglycemic where IV access is not obtainable
(2) Beta blocker overdose

d) Contraindications

Known hypersensitivity

e) Adverse Effects

Nausea and vomiting

f) Precautions

Glucagon only works if liver has significant glycogen stores.

g) Dosage

(1) For suspected hypoglycemia without IV access:
  (a) Adult: Administer 1 mg IM/IN (Medical consult for additional dosing to a maximum of 3 mg IM)
  (b) Pediatric:
    (i) 1 mg IM/IN (5 years of age up to patient's 18th birthday) (Medical consult for additional dosing to a maximum of 3 mg IM/IN)
    (ii) 0.5 mg IM/IN (28 days–4 years of age) (Medical consult for additional dosing to a maximum of 3 mg IM/IN)

(2) For suspected beta blocker overdose:
  (a) Adult: Administer 1 mg IVP every 5 minutes
  (b) Pediatric: Administer every 5 minutes
    (i) 1 mg IVP (5 years of age up to patient's 18th birthday) every 5 minutes
    (ii) 0.5 mg IVP (28 days–4 years of age) every 5 minutes

19. HALOPERIDOL (HALDOL®)

a) Pharmacology

(1) An effective anxiolytic agent. Very effective in the management of aggressive and violent patients.
(2) Also has anti-emetic properties. Useful in the management of severe nausea and vomiting.
(3) Weak anticholinergic (atropine-like) and alpha-blocking agent (vasodilation).

b) Pharmacokinetics

Onset of action is within 10 minutes of the IM administration.

c) Indications

Chemical restraint for violent, agitated, and aggressive patients who present a danger to themselves or to others and who cannot be safely managed otherwise. Most violent/agitated patients can be handled with verbal or physical restraint alone.

d) Contraindications

(1) Children under 5 years of age
(2) Parkinson's disease
(3) CNS depression
(4) Acute CNS injury
(5) Excited delirium

e) Adverse Effects

(1) Extrapyramidal symptoms (dystonic reaction) are the most common side effects. These are generally not encountered with short-term use. In the event that they should develop, a single dose of diphenhydramine 25–50 mg (1 mg/kg for pediatrics to a max of 25 mg) will generally relieve symptoms.
(2) Hypotension and tachycardia are common (20–25%) but usually self-limiting side effects. Fluid bolus is indicated with a significant drop blood pressure or hypotension.
(3) Haloperidol has been known to cause torsades de pointes ventricular tachycardia. Once the patient has been medicated, place the patient on a cardiac monitor and monitor for dysrhythmias.

f) Precautions

(1) Violent patients should be physically restrained while the medication is administered.

(2) May mask subsequent evaluation.

g) Dosage (May combine with midazolam in same syringe)

(1) Adult

(a) **Patient 18–69 years of age:**
5 mg IM or IV

(b) **Patient greater than 69 years of age:**
2.5 mg IM or IV

(2) Pediatric

(a) **Child less than 5 years of age:**
Contraindicated

(b) **Child 5–12 years of age:**
0.05 mg/kg IM or IV, max of 2.5 mg

(c) **Patient 13 up to 18th birthday:**
2.5–5 mg IM or IV

8. IPRATROPIUM (ATROVENT®)

a) Pharmacology

(1) Anticholinergic (parasympatholytic) bronchodilator
(2) Bronchodilator is site-specific, not systemic
(3) Dries respiratory tract secretions
(4) Most effective in combination with a beta-adrenergic bronchodilator

b) Pharmacokinetics

(1) Improved pulmonary function in 15–30 minutes
(2) Peak effects occur in 1–2 hours
(3) Duration of action is usually 4–5 hours

c) Indications

(1) Allergic reactions/anaphylaxis
(2) Bronchial asthma
(3) Reversible bronchospasms associated with chronic bronchitis and emphysema

d) Contraindications

(1) Hypersensitivity to the drug
(2) Hypersensitivity to atropine
(3) Less than 1 year of age

e) Adverse Effects

(1) More common: dry mouth, cough, or unpleasant taste
(2) Less common: vision changes, eye burning or pain, dizziness, headache, nervousness, palpitations, sweating, trembling, chest tightness, rash, hives, or facial sweating

f) Precautions

(1) Use with caution in patients with congestive heart failure, heart disease, hypertension, glaucoma, and with elderly patients.
(2) May worsen the condition of glaucoma if it gets into the eyes. Having the patient close their eyes during nebulization may prevent this.
(3) Not to be used as a single agent—must be used in combination with a beta-agonist.

g) Dosage

(2) Adult:
Single administration ONLY, 500 **mcg** (2.5 mL) by nebulized aerosol connected to 6–8 lpm of oxygen in combination with albuterol 2.5 mg.

(2) Pediatric:
Single administration ONLY. In combination with albuterol, nebulized aerosol is connected to 6–8 lpm of oxygen.

(a) **Less than 1 year of age:** contraindicated

(b) **Age 1 year but less than 2 years:**
250 **mcg** (1.25 mL) by nebulized aerosol

(c) **Age 2 and older:**
500 **mcg** (2.5 mL) by nebulized aerosol

21. KETOROLAC (TORADOL®) (NEW '20)

Optional Supplemental Protocol

1. PHARMACOLOGY

a) Inhibits synthesis of prostaglandin, which, in turn, reduces pain and inflammation
b) Antipyretic agent
c) Does not affect CNS, peripheral acting analgesic, therefore, it does not possess the same sedative properties as a narcotic

2. PHARMACOKINETICS

a) Onset: Approximately 30 minutes
b) Peak effects: 1-2 hours
c) Half-life: 4-6 hours

3. INDICATIONS

a) Management of moderate to severe acute pain
b) Consider as a first line medication for renal stones/colic
c) Burns - mild to moderate
d) Non-traumatic neuromuscular pain

4. CONTRAINDICATIONS

a) Hypersensitivity to ketorolac, aspirin, and other NSAIDs
b) Current usage of aspirin or NSAIDs within 6 hours
c) Severe headache or head injury
d) Bleeding or clotting disorder
e) Renal disease or transplant
f) Active or history of peptic ulcer disease (PUD), active or recent history of GI bleed, and active or history of GI perforation
g) Pregnancy or breast feeding
h) Suspected ACS
i) Trauma with suspected bleeding
j) Patients who have not yet reached their second birthday

5. ADVERSE EFFECTS

a) Burning or pain at the injection site
b) Rash / itching
c) GI distress
d) Nausea / vomiting

6. DOSAGE

a) Adult: Administer single dose of 15 mg IV only. No repeat doses.
If IV is unavailable: Administer single dose of 30 mg IM. No repeat doses.

b) Pediatric:
(1) Newly born to 2 years of age: Contraindicated
(2) Age 2 to patients who have not reached their 18th birthday: Administer 0.5 mg/kg IV only to a maximum total dose of 15 mg. No repeat doses.
If IV is unavailable: Administer 1 mg/kg IM to a maximum total dose of 30 mg. No repeat doses.

23. LIDOCAINE (XYLOCAINE®)

a) Pharmacology

(1) Anesthesia for IO infusions
(2) Nasal anesthesia

b) Pharmacokinetics

(1) Extremely rapid (within minutes) onset following IV administration and lasts approximately 10–20 minutes
(2) Mucosal anesthesia with onset in 1–5 minutes

c) Indications

(1) Anesthesia for IO infusions
(2) Nasal tracheal intubation
(3) Decrease intracranial pressure with Rapid Sequence Intubation

d) Contraindications

(1) AV blocks
(2) Sensitivity to lidocaine
(3) Idioventricular escape rhythms
(4) Accelerated idioventricular rhythm
(5) Sinus bradycardia or arrest or block
(6) Hypotension
(7) Shock
(8) Ventricular conduction defects

e) Adverse Effects

(1) Lidocaine may cause clinical evidence of toxicity usually related to the central nervous system.
(2) Toxicity:
  (a) Early: muscle twitching, slurred speech, altered mental status, decreased hearing, paresthesia (pins and needles), anxiety, apprehension, visual disturbances, nausea, numbness, difficulty breathing or swallowing, decreased heart rate
  (b) Late: convulsions, hypotension, coma, widening of QRS complex, prolongation of the P-R interval, hearing loss, hallucinations

f) Precautions

(2) Reduce the dosage in patients with decreased cardiac output, liver dysfunction, and the elderly (age over 70).

g) Dosage

(1) Adult/Adolescent with an IO infusion: To prevent or treat pain during an IO infusion in patients greater than or equal to 13 years of age, administer 20–40 mg (1–2 mL) of 2% (preservative free) lidocaine IO.

(2) IO infusion in patients less than 13 years of age: To prevent or treat pain during an IO infusion for patients under 13 years of age, consult a Pediatric Base Station.

(3) Nasal Pharyngeal Anesthesia (age 13 years and greater)
Draw up 4 mL of lidocaine 4% (40 mg/mL) and using mucosal atomization device, administer 2 mL per nare. The patient IV, gel, and intranasal dosing should not exceed 3 mg/kg.

h) Interfacility Transport Only

(1) IV Infusion

(2) Maintain the IV infusion of lidocaine at the rate established by the sending physician and record vital signs every 15 minutes.
(See Lidocaine Infusion for Interfacility Transport.)

25. MIDAZOLAM (VERSED®)

a) Pharmacology

(1) Sedative
(2) Hypnotic
(3) Anticonvulsant

b) Pharmacokinetics

(1) A short-acting benzodiazepine with strong hypnotic, anticonvulsant activity, and amnestic properties
(2) Onset of action is extremely rapid following IV administration; approximately 1.5 minutes, and for IM approximately 15 minutes.
(3) Duration of effect is 1–4 hours with half-life of 1.5 to 3 hours in healthy adult.

c) Indications

(1) Sustained and/or recurrent seizures
(2) Precardioversion to reduce anxiety
(3) Awake patient requiring transcutaneous pacing (TCP)
(4) Nasal Tracheal Intubation
(5) Implanted Cardioverter Defibrillator (ICD) Malfunction
(6) Nerve/organophosphate exposure
(7) Bucking Endotracheal Intubated patient
(8) Chemical Restraint
(9) Moderate to severe stimulant toxicity
(10) Excited Delirium Syndrome

d) Contraindications

(1) Hypotension (See below for ET bucking)
(2) Known hypersensitivity to midazolam

e) Adverse Effects

(1) Respiratory depression or apnea
(2) Hypotension

f) Precautions

(1) The effects of midazolam can be accentuated and significantly potentiated by CNS depressants, such as opioids or alcohol.
(2) Midazolam is five times as potent per milligram as diazepam and there is an increased risk of respiratory depression.

g) **Dosage** (paramedic and CRT-(I) may perform without consult for patients with active seizures.)

All indications in c) above, except for Bucking Endotracheal Intubated patient, Chemical Restraint, and Excited Delirium Syndrome

(1) Adult:

ALERT REDUCE THE BELOW IV/IO/IN/IM BY 50% FOR PATIENTS 69 YEARS OR OLDER.

(a) 0.1 mg/kg in 2 mg increments SLOW IVP over 1–2 minutes per increment with maximum single dose 5 mg.

(b) If IV unavailable, 5 mg IN/IM may be administered.
IN administration max 1 mL per nare

(c) Additional doses up to a maximum total dose 10 mg require medical consultation for all clinicians.
For seizures lasting greater than 10 minutes (status), consider IO administration of midazolam.

(d) If suspected severe nerve agent exposure, clinicians may administer midazolam 5 mg IM without medical consultation.

(2) Pediatric:

(a) 0.1 mg/kg in 2 mg increments. SLOW IVP over 1–2 minutes per increment to a maximum single dose of 5 mg.

(b) If IV unavailable, 0.2 mg/kg IN/IM
IN administration max 1 mL per nare
Maximum total dose 5 mg

(c) Additional doses up to a maximum total dose 5 mg require medical consultation for all clinicians.
For life-threatening conditions, consider IO administration of midazolam.

(d) If suspected severe nerve agent exposure, clinicians may administer midazolam as above without medical consultation.

(3) Chemical Restraint

(a) Patient 18–69 years: midazolam 5 mg IM/IV
Patient greater than 69 years: midazolam 2.5 mg IM/IV
Repeat doses may be given with medical direction

(b) Pediatric: Not indicated

(4) Bucking Endotracheal Intubated patient

(a) Adult: Administer 0.05 mg/kg SLOW IVP over 1–2 minutes, while maintaining systolic BP greater than 90 mmHg. STOP ONCE BUCKING HAS RESOLVED AND VENTILATION IS RELAXED. Maximum single dose is 5 mg.
Additional doses require medical consultation.

(b) Pediatric: Administer 0.05 mg/kg SLOW IVP over 1–2 minutes, while maintaining systolic BP greater than 60 in neonates, 70 in infants, [70 + (2 x years) = systolic BP] for patients greater than 1 year of age. Maximum total dose 5 mg.

ALERT

ADMINISTER UP TO 0.05 MG/KG IV WHEN TREATING ENDOTRACHEAL TUBE BUCKING, STOPPING ONCE BUCKING HAS RESOLVED AND VENTILATION IS RELAXED.

(5) Excited Delirium Syndrome (ExDS)

(a) If severe agitation persists after second dose of IV/IO ketamine, consider midazolam 2.5 mg IV/IO.

(b) If IV/IO unavailable:

(i) If severe agitation persists after IM ketamine dose, administer midazolam 5 mg IM.

(c) Patients aged 13 to those who have not yet reached their 18th birthday:

(i) If severe agitation persists after second dose of IV/IO ketamine, consider midazolam 0.1 mg/kg SLOW IVP/IO over 1–2 minutes. Maximum single dose 2.5 mg.

(ii) If IV/IO unavailable:

a. If severe agitation persists after IM ketamine dose, administer midazolam 2.5 mg IM.

27. NALOXONE (NARCAN®)

a) Pharmacology
Reverses all effects due to opioid (morphine-like) agents. This drug will reverse the respiratory depression and all central and peripheral nervous system effects.

b) Pharmacokinetics
(1) Onset of action is within a few minutes if administered IVP and within 5 minutes if administered IN.
(2) Intramuscular and pediatric/neonatal endotracheal administration results in a slower onset of action.
(3) Patients responding to naloxone may require additional doses and transportation to the hospital since most opioids last longer than naloxone.
(4) Has no effect in the absence of opioids

c) Indications
To reverse respiratory depression induced by opioids

d) Contraindications
Patients under 28 days of age.

e) Adverse Effects
Opioid withdrawal

f) Precautions
(1) Naloxone may induce opioid withdrawal in patients who are physically dependent.
(2) Certain drugs may require much higher doses of naloxone for reversal than are currently used.
(3) Should be administered and titrated so respiratory efforts return, but not intended to restore full consciousness

g) Dosage
(1) Adult: Administer 0.4–2 mg IVP/IO (titrated)/IM/IN (if delivery device is available, divide administration of the dose equally between the nares to a maximum of 1 mL per nare); **OR** administer 4 mg/0.1 mL IN in one nare. Repeat as necessary to maintain respiratory activity.
(2) Pediatric: Administer 0.1 mg/kg IVP/IO (titrated)IM/IN (if delivery device is available, divide administration of the dose equally between the nares to a maximum of 1 mL per nare); **OR** administer 4 mg/0.1 mL IN in one nare. May be repeated as necessary to maintain respiratory activity. ET dose: 0.2–0.25 mg/kg

30. ONDANSETRON (ZOFRAN®)

a) Pharmacology

A selective blocking agent of the serotonin 5-HT3 receptor type

b) Pharmacokinetics

Anti-nausea and anti-emetic with onset of action within 5–15 minutes IV and 30 minutes IM

c) Indications

(1) Prevention and control of nausea and/or vomiting
(2) Ondansetron can be administered in an effort to reduce the nausea or vomiting complications associated with certain existing injuries, medical illness, or medication side effects (e.g., penetrating eye injury, high risk for aspiration, or following opioid administration).

d) Contraindications

Known hypersensitivity to ondansetron
Patients less than 28 days

e) Adverse Effects

(1) Hypotension
(2) Tachycardia
(3) Extrapyramidal reactions
(4) Seizures
(5) QT interval prolongation

f) Precautions

(1) Monitor EKG, pulse oximetry, and blood pressure.
(2) Have emesis basin and suction ready.

g) Dosage

(1) Adult: 8 mg SLOW IV over 2–5 minutes OR 4-8 mg IM OR 8 mg orally disintegrating tablet (ODT)
May repeat once without medical consultation.
For third repeat dose to a patient with maximum total dose of 24 mg.

(2) Pediatric:
Patients 28 days to 12 years old: 0.1 mg/kg SLOW IV over 2–5 minutes
Patients who are 13 to 18 years old: 8 mg ODT OR 8 mg SLOW IV over 2–5 minutes
OR
If no IV: 0.1 mg/kg IM (with max single dose of 8 mg);
May repeat once without medical consultation.
For third repeat dose to a patient with maximum total dose of 0.3 mg/kg or 24 mg, whichever is lower.

31. OXYGEN

a) Pharmacology

(1) Increases oxygen content of the blood
(2) Improves tissue oxygenation
(3) Decreases energy expended for respirations

b) Pharmacokinetics

Changing the percentage of inspired oxygen results in an increased blood and tissue level equilibration within 5–20 minutes.

c) Indications

(1) If evidence of hypoxia (Less than 94% SpO_2)
(2) Respiratory distress
(3) Cardiopulmonary arrest
(4) Trauma
(5) Suspected CO exposure
(6) Dyspnea

d) Contraindications

Not clinically significant

e) Adverse Effects

High concentrations of oxygen will reduce the respiratory drive in some COPD patients; these patients should be carefully monitored.

f) Precautions

(1) Never withhold oxygen from those who need it.
(2) Oxygen should be given with caution to patients with COPD.
(3) Simple or partial rebreather face masks must be supplied with a minimum 6 lpm.
(4) Non-breather (NRB) face masks must be supplied with a minimum 12 lpm.

g) Dosage

(1) Adult: Administer 12–15 lpm via NRB mask or 2–6 lpm via nasal cannula, as needed. CO exposure: Administer 100% oxygen via NRB mask. Maintain SpO_2 at 100%
(2) Pediatric: Administer 12–15 lpm via NRB mask or 2-6 lpm via nasal cannula, as needed. CO exposure: Administer 100% oxygen via NRB mask. Maintain SpO_2 at 100%

Percent O_2 Saturation	Ranges	General Patient Care
94–100%	Normal	Give oxygen as necessary
91–93%	Mild Hypoxia	Give oxygen as necessary
86–90%	Moderate Hypoxia	Give 100% oxygen Assisting Ventilations if necessary
less than or equal to 85%	Severe Hypoxia	Give 100% oxygen Assist Ventilations If indicated, Intubate
ALERT	INACCURATE OR MISLEADING SpO_2 READINGS MAY OCCUR IN THE FOLLOWING PATIENTS: HYPOTHERMIC, HYPOPERFUSION (SHOCK), CO POISONING, HEMOGLOBIN ABNORMALITY, ANEMIA, AND VASOCONSTRICTION.	

32. SODIUM BICARBONATE

a) Pharmacology

Sodium bicarbonate corrects acidosis.

b) Pharmacokinetics

(1) Rapid onset of action in the blood
(2) Delayed onset of action in the tissues

c) Indications

(1) Used in cardiac arrest only after more definitive treatments
(2) Hyperkalemia
(3) Tricyclic and phenobarbital overdose
(4) Pretreatment for patients with decreased renal function who will be receiving IV contrast dye

d) Contraindications

Preexisting alkalosis

e) Adverse Effects

(1) Worsened intracellular acidosis due to carbon dioxide formation
(2) Hyperosmolality
(3) May precipitate congestive heart failure
(4) Metabolic alkalosis
(5) Acute hypokalemia
(6) Exacerbation of central venous acidosis
(7) Shifting the oxyhemoglobin dissociation curve, inhibiting the release of oxygen to the tissues

f) Precautions

(1) Inactivates simultaneously-administered catecholamines
(2) Priorities before use:
    (a) Intubation
    (b) Hyperventilation
    (c) Defibrillation
    (d) Epinephrine
    (e) Antiarrhythmics

g) Dosage

(1) Should only be given after airway has been secured and ventilations achieved
(2) Adult: Administer 1 mEq/kg IVP bolus initially with 0.5 mEq/kg at 10-minute intervals.
(3) Pediatric: Administer 1 mEq/kg IVP/IO; for patients less than 1 year of age, must be diluted (1:1) with LR.

(4) Hyperkalemia
(Reserve for patients with suspected CRUSH SYNDROME or patients with functional kidneys by history.)

ALERT FLUSH IV WITH 5 ML OF LR BETWEEN CALCIUM AND BICARBONATE ADMINISTRATION.

(a) Adult:

Consider sodium bicarbonate 50 mEq SLOW over 5 minutes and then initiate drip of sodium bicarbonate 100 mEq in 1,000 mL LR to run over 30–60 minutes.

(b) Pediatric:

Consider sodium bicarbonate 1 mEq/kg IV over 5 minutes. For patients less than 1 year of age, must be diluted 1:1 with LR.

(5) IV drip for diuresis prior to receiving IV contrast dye:
Continue the sodium bicarbonate drip at the rate ordered by the sending physician. Document the base solution and the amount of sodium bicarbonate that was added to the solution and the total volume infused.

Do not administer IVP medications through the same IV line as the bicarbonate drip unless compatibility has been established. Flush the line well before and after giving any IVP medication.

33. TERBUTALINE (JURISDICTIONAL OPTION ONLY WHEN APPROVED BY STATE EMS MEDICAL DIRECTOR – NEW '20)

a) Pharmacology

(1) Stimulates beta-2 receptors located in the smooth bronchioles
(2) Causes relaxation of bronchospasm

b) Pharmacokinetics

Relieves bronchospasm in acute and chronic airway disease with minimal cardiovascular effect

c) Indications

(1) Asthma
(2) Reversible airway obstruction associated with bronchitis or emphysema

d) Contraindications

(1) Patients under 12 years of age

e) Adverse Effects

(1) Tachycardia
(2) Palpitations
(3) Nervousness
(4) Tremors
(5) Dizziness
(6) Nausea
(7) Vomiting

f) Precautions

(1) Exercise caution when administering to patients with hypertension or cardiac history
(2) Monitor EKG

g) Dosage

(1) Patients 12 years of age and older:
Administer 0.25 mg IM. May repeat one time after 15 minutes if there is not adequate improvement. Maximum total dose 0.5 mg IM.
(2) Patients less than 12 years of age: Not indicated

4. ALBUTEROL (PROVENTIL®, VENTOLIN®)

a) Pharmacology

(1) Synthetic sympathomimetic amine (a type of stimulant)
(2) Stimulates beta-2 adrenergic receptors of the bronchioles
(3) Minimal effect on blood pressure
(4) Minimal cardiac effects
(5) Main effect is bronchodilation.
(6) It may cause some vasodilation as evidenced by headache or flushing.

b) Pharmacokinetics

(1) Bronchodilation begins within 5–15 minutes after inhalation.
(2) Peak effect occurs in 30–120 minutes.
(3) Duration of action is usually 3–4 hours.

c) Indications

(1) To reverse bronchospasm (wheezing)
(2) Hyperkalemia

d) Contraindications

Known hypersensitivity

e) Adverse Effects

Tachycardia, palpitations, peripheral vasodilation, tremors, nervousness, headache, sore throat, PVCs, nausea, and vomiting

f) Precautions

(1) Bronchospasm may worsen in rare situations due to patient tolerance or hypersensitivity.
(2) If respirations worsen, consider discontinuing use.
(3) Should be used with caution in patients with hyperthyroidism or coronary artery disease.
(4) Use with caution when administering to patients taking MAO inhibitors or tricyclic antidepressants, which may be potentiated by albuterol.
(5) Medical direction required before administering to pregnant patient or patient having a cardiac history.

g) Dosage

Bronchospasm

(1) Adult: 2.5 mg by nebulized aerosol connected to 6–8 lpm of oxygen; may repeat one time

(2) Pediatric: May repeat one time; connect to 6–8 lpm of oxygen

(a) **Age 2 or older:** 2.5 mg by nebulized aerosol

(b) **Age less than 2 years:** 1.25 mg by nebulized aerosol

Hyperkalemia

(3) Adult: 20 mg (if available) by nebulized aerosol connected to 6–8 lpm of oxygen

(4) Pediatric

(a) **Age 2 or older:** 2.5 mg by nebulized aerosol

(b) **Age less than 2 years:** 1.25 mg by nebulized aerosol

6. ASPIRIN (NEW ’20)

a) Pharmacology

(1) Platelet inhibitor
(2) Anti-inflammatory

b) Pharmacokinetics

Blocks platelet aggregation

c) Indications

Suspected Acute Coronary Syndrome and/or ST Elevation MI (STEMI) **(NEW ’20)**

d) Contraindications

(1) Known hypersensitivity.
(2) Patients who receive a full dose (324 mg) of aspirin prior to EMS arrival. **(NEW ’20)**

e) Adverse Effects

(1) Heartburn
(2) Nausea and vomiting
(3) Wheezing

f) Precautions

GI bleeding and upset

g) Dosage

(1) Adult: 324 mg or 325 mg chewed
(2) Pediatric: Not indicated

12. DIAZEPAM (VALIUM®)

a) Pharmacology

(1) Sedation, hypnosis, alleviation of anxiety, muscle relaxation, anticonvulsant activity
(2) Little cardiovascular effect

b) Pharmacokinetics

(1) Onset of action is extremely rapid following IV administration.
(2) Half-life ranges from 20–90 minutes.

c) Indications

(1) Sustained and/or recurrent seizures
(2) Severe nerve agent exposure

d) Contraindications

(1) Known hypersensitivity, head injury
(2) Should be used with caution in patients with altered mental status, hypotension, or acute narrow angle glaucoma

e) Adverse Effects

(1) Lightheadedness, motor impairment, ataxia, impairment of mental and psychomotor function, confusion, slurred speech, amnesia
(2) Additive effect with ethanol
(3) Irritability and excitation may be seen paradoxically.

f) Precautions

(1) Respiratory depression may occur with IV administration, especially if given too rapidly.
(2) Respiratory support may be required.
(3) Use with caution in pregnant patients, persons ingesting alcohol, or persons ingesting sedatives.

g) Dosage (paramedic may perform without consult for patients with active seizures if midazolam is not available.)

(1) Adult: Administer 2.5–10 mg in 2.5 mg increments SLOW IVP/IM
(IM requires all clinicians to obtain medical consultation.)
Maximum total dose 10 mg
(2) Pediatric: Administer 0.1 mg/kg in 2.5 mg increments SLOW IVP/IO/IM (IM requires all clinicians to obtain medical consultation.)
Maximum total dose 5 mg
Rectal Dose: Administer up to 0.2 mg/kg; maximum total dose 10 mg

Severe nerve agent exposure (clinicians may administer without consult):

(3) Adult: Administer 10 mg IM.
(4) Pediatric: greater than 30 kg: Administer 10 mg via auto-injector or 0.1 mg/kg IM, maximum of 10 mg.

13. DILTIAZEM (CARDIZEM®)

a) Class

Calcium channel blocker

b) Actions

(1) Inhibits the movement of calcium ions across cardiac muscle cells
(2) Decreases conduction velocity and ventricular rate

c) Indications

Symptomatic atrial fibrillation and atrial flutter

d) Contraindications

(1) Hypotension below 100 mmHg, second or third degree heart block, hypersensitivity to the drug
(2) Patients less than 18 years of age

e) Precautions

Use cautiously in patients with renal failure or congestive heart failure.

f) Side effects

(1) Headache
(2) Nausea
(3) Vomiting
(4) Bradycardia
(5) Hypotension

g) Significant interactions

Congestive heart failure may result if used along with beta blockers.

h) Dosage

(1) Adult
  (a) 0.25 mg/kg (maximum dose 20 mg) by IV bolus administered SLOW IV over 2 minutes; if response is not adequate, repeat in 15 minutes with a dosage of 0.35 mg/kg (maximum dose 25 mg) over 2 minutes.
  (b) For patients older than 50 years of age, borderline blood pressure, known renal failure, or CHF, consider initial bolus 5–10 mg administered IV over 2 minutes.
(2) Pediatric:
Contraindicated for patients less than 18 years of age. If needed, consult Pediatric Base Station.

i) Overdose or Toxicity Presentation

Generally consists of exaggeration of side effects, including severe hypotension and symptomatic bradycardia

j) Treatment of Overdose or Other Adverse Reactions

(1) Give general supportive measures, monitor vitals, administer oxygen.

(2) Hypotension:

(a) If lungs are clear, administer fluid bolus 20 mL/kg of LR; titrate to a systolic blood pressure of 100 mmHG.

(b) If rales are present, administer fluid bolus, maximum of 250 mL of LR. Titrate to a systolic of 100 mmHg.

(c) Administer calcium chloride 500 mg SLOW IVP.

(3) Bradycardia: Consider atropine (0.5 to 1 mg); if necessary, consider pacing.

15. DOPAMINE HYDROCHLORIDE (INTROPIN®) (JURISDICTIONAL OPTION ONLY WHEN APPROVED BY THE STATE EMS MEDICAL DIRECTOR - NEW '20)

a) Pharmacology

(1) Alpha and beta adrenergic receptor stimulator
(2) Dopaminergic receptor stimulator
(3) Precursor of norepinephrine
(4) At low doses, less than 2 **mcg**/kg/min
  (a) Dilates renal and mesenteric blood vessels
  (b) Venoconstricts
  (c) Arterial resistance varies
(5) At moderate doses, 2–6 **mcg**/kg/min beta1 stimulating effect on heart
  Results in increased cardiac output
(6) High dose, 6–10 **mcg**/kg/min
  Exhibits alpha1 effects; peripheral vasoconstriction including renal and mesenteric vessels, increases left and right ventricular preload
(7) Doses greater than or equal to 10 **mcg**/kg/min
  Alpha1 stimulating effects may reverse mesenteric and renal artery dilatation resulting in decreased blood flow, causing increased preload due to effects on venous system

b) Pharmacokinetics

(1) Extremely rapid onset of action
(2) Extremely brief duration of action
(3) The rate of administration may be used to control the effect of dopamine.

c) Indications

(1) Cardiogenic shock
(2) Septic shock
(3) Anaphylactic shock
(4) Hypovolemic shock (after sufficient volume replacement)

d) Contraindications

(1) Preexisting tachydysrhythmias
(2) Uncorrected hypovolemia

e) Adverse Effects

(1) Anginal pain
(2) Tachydysrhythmias
(3) Nausea and vomiting
(4) Hypertension
(5) Undesirable degree of vasoconstriction

f) Precautions

(1) Extravasation should be reported to the hospital staff on arrival.
(2) Patients receiving monoamine oxidase (MAO) inhibitors are extremely sensitive to the effects of dopamine and should receive a much lower dosage than is usually given.
(3) Patients with pheochromocytoma are extremely sensitive to dopamine and may develop profound hypertension in response to minimal doses.

g) Dosage

(1) For IV/IO infusion only. The preferred route of administration is IV.
(2) In general, the infusion rate is adjusted to blood pressure and clinical response.
(3) Adult: Administer 2–20 **mcg**/kg/min IV drip titrated to BP of 100 systolic or medical consultation selected BP; initial infusion rate 2–5 **mcg**/kg/min
(4) Pediatric: Administer 2–20 **mcg**/kg/min IV drip titrated age specific BP or medical consultation selected BP; initial infusion rate is 2 **mcg**/kg/min

20. KETAMINE (KETANEST®, KETASET®, KETALAR®)

a) Pharmacology

Hypnotic analgesic

b) Pharmacokinetics

A rapid-acting nonbarbiturate hypnotic analgesic agent characterized by normal pharyngeal-laryngeal reflexes, normal or enhanced skeletal muscle tone, and possible cardiovascular and respiratory stimulation.

ALERT ONSET OF ACTION FOR **IV/IO** KETAMINE MAY BE 5–10 MINUTES.
ONSET OF ACTION FOR **IN/IM** KETAMINE MAY TAKE UP TO 15–20 MINUTES.

c) Indications

(1) The patient reports moderate to severe pain.
(2) The patient displaying signs and symptoms of excited delirium syndrome.
(3) Ventilatory difficulty secondary to bucking or combativeness in intubated patients. **(NEW ’20)**
(4) CPR-induced awareness. **(NEW ’20)**

d) Contraindications

(1) Known hypersensitivity to ketamine
(2) Penetrating eye injury

ALERT INDICATED FOR MUSCULOSKELETAL EXTREMITY/BACK PAIN. NOT FOR CHEST PAIN, ABDOMINAL/FLANK PAIN, OR HEADACHE.

e) Adverse Effects

(1) Although respiration is frequently stimulated, respiratory depression may occur with rapid IV administration. Laryngospasm has been known to occur.
(2) Although hypotension may occur, blood pressure and heart rate are frequently stimulated.
(3) Involuntary myoclonus that may mimic seizure activity
(4) Possible enhanced secretions
(5) Possible unpleasant dreams and delirium upon emergence from sedation

f) Precautions

(1) The likelihood of respiratory depression and undesired pressor effects is increased by too rapid IV administration.
(2) Myoclonic movements are possible and should not be confused for, seizure activity, or emergence from sedation.
(3) Some patients who have received ketamine for control of excited delirium syndrome go on to requiring advanced airway management. ALS clinicians should closely monitor such patients to anticipate airway needs.

ALERT TO AVOID DOSING ERRORS, CLINICIANS SHOULD BE AWARE AND CONFIRM PROPER SELECTION OF CONCENTRATION PRIOR TO ADMINISTRATION. KETAMINE IS PROVIDED FOR IM OR IN ADMINISTRATION IN 100 MG PER ML CONCENTRATION. FOR IV ADMINISTRATION, KETAMINE IS PROVIDED IN 10 MG PER ML.

g) Dosage

(1) Pain Management

(a) Adult: Administer 0.2 mg/kg IV/IO over 1–2 minutes. Maximum single dose 20 mg.

(i) Reassess in 5–10 minutes. If pain remains moderate to severe, then administer a second dose of ketamine 0.2 mg/kg IV/IO over 1–2 minutes. Maximum single dose 20 mg.

(ii) If IV unavailable, administer 0.5 mg/kg IN/IM (if delivery device is available; divide administration of the dose equally between the nares to a maximum of 1 mL per nare).

(iii) Reassess in 15 minutes. If pain remains moderate to severe, then administer a second dose of ketamine 0.5 mg/kg IN/IM.

(b) Pediatric: Administer 0.2 mg/kg IV/IO over 1–2 minutes. Maximum single dose 20 mg.

(i) Reassess in 5-10 minutes. If pain remains moderate to severe, then administer a second dose of ketamine 0.2 mg/kg IV/IO over 1–2 minutes. Maximum single dose 20 mg.

(ii) If IV unavailable, administer 0.5 mg/kg IN/IM (if delivery device is available, divide administration of the dose equally between the nares to a maximum of 1 mL per nare).

(iii) Reassess in 15 minutes. If pain remains moderate to severe, then administer a second dose of ketamine 0.5 mg/kg IN/IM.

(2) Excited Delirium Syndrome

(a) Adult

(i) IV dosing: Administer 1 mg/kg IV/IO. Maximum single IV/IO dose 100 mg.

a. If severe agitation persists, administer 1 mg/kg IV/IO. Maximum single IV/IO dose 100 mg. Maximum total IV/IO dose 200 mg.

b. If agitation persists after second dose of IV/IO ketamine, consider midazolam 2.5 mg IV/IO.

(ii) IM dosing: 4 mg/kg IM. Maximum total IM dose 400 mg.

a. If severe agitation persists after IM ketamine dose, administer midazolam 5 mg IM.

b. Additional dose of 4 mg/kg IM ketamine for persistent agitation requires medical consultation.

(b) Pediatric

(i) IV dosing: For children 13 to 18 years of age, administer 1 mg/kg IV/IO. Maximum single IV/IO dose 100 mg. Maximum total IV/IO dose 200 mg.

a. Patients who have not yet reached their 13th birthday require medical consult: Administer 1 mg/kg IV/IO. Maximum single IV dose 100 mg. Maximum total IV/IO dose 200 mg.

b. If severe agitation persists, administer 1 mg/kg IV/IO. Maximum single IV dose 100 mg.
c. If agitation persists after second dose of IV ketamine, consider midazolam 0.1 mg/kg in 2.5 mg increments SLOW IVP/IO over 1–2 minutes. Maximal single dose of midazolam 2.5 mg.

(ii) IM dosing: Patients aged 13 to 18 years, administer 4 mg/kg IM. Maximum IM dose 400 mg.
a.  Patients who have not yet reached their 13th birthday require medical consult: Administer 4 mg/kg IM. Maximum IM dose 400 mg.
b. If severe agitation persists, administer midazolam 2.5 mg IM.
c.  Additional dose of 4 mg/kg IM ketamine for persistent agitation requires medical consultation.

(3) Ventilatory difficulty secondary to bucking or combativeness in intubated patients. **(NEW ’20)**
(a) **Ketamine** may be preferred for patients who have hypotension or possible hypovolemia, or if ventilatory difficulty is thought to be the result of pain response.
(i) Dose: Administer 2 mg/kg IVP/IO over 60 seconds. May repeat 2 additional doses of 1 mg/kg for IVP/IO every 10–15 minutes to a total of 3 doses as needed. Additional doses require medical consultation.

(4) CPR-induced awareness **(NEW ’20)**
(a) Adult
(i) Consider ketamine 1 mg/kg IV/IO.
(ii)  Repeat doses with medical consultation.

(b) Pediatric
(i)  Obtain medical consultation from a pediatric base station.

22. LACTATED RINGER'S

a) Pharmacology

(1) Isotonic crystalloid solution

(2) Lactated Ringer's (LR) contains:

(a) Sodium (Na+)	130 mEq/liter
(b) Potassium (K+)	4 mEq/liter
(c) Calcium (Ca++)	3 mEq/liter
(d) Chloride (Cl-)	109 mEq/liter
(e) Lactate	28 mEq/liter

b) Pharmacokinetics

Lactated Ringer's is a water and electrolyte replacement.

c) Indications

(1) Hypovolemia (limitation in multiple/severe trauma without head injury)

(2) Keep vein open

(3) Fluid boluses

d) Contraindications

Fluid overload states

e) Adverse Effects

Rare in therapeutic doses

f) Precautions

(1) Patients receiving Lactated Ringer's should be monitored to prevent circulatory overload.

(2) Lactated Ringer's should be used with caution in patients with congestive heart failure or renal failure.

g) Dosage (NEW '20)

(1) Adult:

(i) For patients with multiple/severe trauma but **without head injury**: Administer small boluses of LR (maximum single bolus of 250 mL prior to additional blood pressure check) to achieve and maintain a systolic blood pressure of greater than or equal to 90 mmHg.

(ii) For multiple/severe trauma **with head injury**: Administer small boluses of LR (maximum single bolus of 250 mL prior to additional blood pressure check) to achieve and maintain a systolic blood pressure greater than or equal to 110 mmHg.

(iii) For all other patients: Titrate to a systolic pressure of 90 mmHg. Maximum dose 2,000 mL without medical consultation.

(2) Pediatric:
   (a) KVO
   (b) If age-related vital signs and patient's condition indicate hypoperfusion, administer initial fluid bolus of 20 mL/kg LR IV/IO. Fluid boluses for neonates and volume-sensitive children are 10 mL/kg.
   (c) If patient's condition does not improve, administer the second fluid bolus of 20 mL/kg LR IV/IO.
   (d) Third and subsequent fluid boluses at 20 mL/kg LR IV/IO with medical consultation.

24. MAGNESIUM SULFATE

a) Pharmacology

Physiologic calcium channel blocker and also blocks neuromuscular transmission. Hypomagnesemia can cause cardiac dysrhythmias. It is also a CNS depressant effective in the management of seizures during pregnancy. It does this by decreasing the amount of acetylcholine liberated from motor nerve terminals. Magnesium is necessary for many biochemical processes and plays a role in the transmission of electrical impulses.

b) Pharmacokinetics

With intravenous administration the onset of anticonvulsant action is immediate and lasts about 30 minutes. Magnesium is excreted solely by the kidney at a rate proportional to the plasma concentration and glomerular filtration rate.

c) Indications

(1) Torsades de pointes
(2) Seizures with pregnancy
(3) Refractory VF and VT after amiodarone administration
(4) Moderate to severe asthma/bronchospasm exacerbation

d) Contraindications

(1) Heart blocks
(2) Renal impairment
(3) Hypermagnesemia

e) Adverse Effects

(1) Respiratory depression
(2) Flushing
(3) Sweating
(4) Hypotension
(5) Depressed reflexes

f) Precautions

(1) May exaggerate effects of CNS depressants and neuromuscular blocking agents
(2) Due to concern of hypotension, IV fluid bolus should be initiated if hypovolemia is suspected.
(3) Magnesium toxicity is a concern with higher doses and would present with respiratory depression, decreased reflexes, flaccid paralysis, and apnea. Calcium chloride 500 mg SLOW IVP for above indications of toxicity.

g) Dosage

(1) Adult:

(a) Seizure activity associated with pregnancy: 4 grams IV/IO over 10 minutes (mixed in 50–100 mL of approved diluent)

(b) Refractory VT/VF: 1–2 grams IV/IO over 2 minutes

(c) Moderate to severe asthma/bronchospasm exacerbation: 1–2 grams IV/IO over 10–20 minutes (mixed in 50–100 mL of approved diluent)

(d) Torsades de pointes: 1–2 grams IV/IO over 2 minutes

(2) Pediatric (under 18 years old):

(a) Seizure activity associated with pregnancy: 4 grams IV/IO over 10 minutes (mixed in 50–100 mL of approved diluent)

(b) Moderate to severe asthma/bronchospasm exacerbation: consider magnesium sulfate 50 mg/kg IV/IO (mixed in 50 - 100 mL of approved diluent) to max of 2 grams given over 10–20 minutes

ALERT

MAGNESIUM ADMINISTRATION OFTEN CAUSES HYPOTENSION IN CHILDREN. CONSIDER ADMINISTERING BOLUS 20 ML/KG OF LACTATED RINGER'S WITH THE ADMINISTRATION OF MAGNESIUM.

(c) Torsades de pointes: 25 mg/kg to a max of 2 grams IV/IO over 2 minutes

h) Interfacility Transport

(1) A paramedic may administer continuous infusion established by a sending facility, not to exceed the ordered total dose, and monitoring the patient for signs and symptoms of magnesium toxicity.

(2) Magnesium sulfate used for tocolytic control is an RN-level indication.

26. MORPHINE SULFATE

(Optional Supplemental Protocol, which allows for jurisdictional selection of both fentanyl and morphine OR replacement of fentanyl by morphine as the opioid of choice)

Pharmacology

(1) Decreases pain perception and anxiety
(2) Relaxes respiratory effort
(3) Causes peripheral dilation, which decreases preload
(4) Decreases left ventricular afterload

a) Pharmacokinetics

(1) Binds with opiate receptors in the CNS, altering both perception and emotional response to pain
(2) Onset of action is in less than 5 minutes after IV dose and effects last 4–5 hours.
(3) Causes peripheral arterial and venous vasodilation

b) Indications

(1) The patient reports moderate to severe pain.
(2) In the clinician's judgment the patient will benefit from treatment with an opioid analgesic, including patients who are MOLST and/or EMS/DNR patients or being pre-medicated for a procedure.
(3) Pulmonary Edema/Congestive Heart Failure (Pediatric only)

c) Contraindications

(1) Hypersensitivity or known allergy to morphine
(2) Uncorrected respiratory distress or hypoxemia refractory to supplemental oxygen
(3) Uncorrected hypotension, defined as a persistent systolic pressure less than 90 mmHg

d) Adverse Effects

(1) Respiratory depression/arrest
(2) Altered mental status (decreased level of consciousness)
(3) Increased vagal tone due to suppression of sympathetic pathways (slowed heart rate)
(4) Nausea and vomiting
(5) Constricted pupils (pinpoint)
(6) Increased cerebral blood flow

e) Precautions

(1) Naloxone reverses all effects.
(2) Should be administered slowly and titrated to effect.
(3) Vital signs should be monitored frequently.
(4) Hypotension is a greater possibility in volume-depleted patients.

f) Dosage

(1) Adult: IV/IM
  (a) Administer 0.1 mg/kg to a maximum initial dose of 20 mg.
  (b) Reassess in 5–10 minutes. If pain remains moderate to severe, then administer a second dose of morphine 0.05 mg/kg to a maximum additional dose of 10 mg.
  (c) Obtain on-line medical direction for additional doses, if required.
(2) Pediatric: IV/IM
  (a) Administer 0.1 mg/kg to a maximum initial dose of 20 mg.
  (b) Reassess in 5–10 minutes. If pain remains moderate to severe, then administer a second dose of morphine 0.05 mg/kg to a maximum additional dose of 10 mg.
  (c) Obtain on-line medical direction for additional doses, if required.
(3) Pediatric Pulmonary Edema/CHF
  (a) 0.1 mg/kg SLOW IVP/IO/IM (1–2 mg/min). Maximum dose 5 mg.

28. NITROGLYCERIN

a) Pharmacology

(1) Vasodilator-effect on veins more than arteries
(2) Decreases right heart return (preload) by venous pooling, thereby decreasing myocardial workload and oxygen consumption

b) Pharmacokinetics

(1) Absorbed through oral mucosa
(2) Antianginal and vasodilation effects within 1–2 minutes after administration. Half-life is 1–4 minutes.
(3) Duration of action is less than 5 minutes.

c) Indications

(1) For treatment of angina
(2) Congestive heart failure, acute pulmonary edema

d) Contraindications

(1) Known hypersensitivity
(2) Pediatric patient under the age of 13
(3) Any patient having taken medication for Pulmonary Artery Hypertension (e.g., Adcirca® or Revatio®) or erectile dysfunction (e.g., Viagra®, Levitra®, or Cialis®) within the past 48 hours. Medical consultation is required to override this contraindication.
(4) Asymptomatic hypertension
(5) Blood pressure below 90 mmHg systolic
(6) Heart rate less than 60

e) Adverse Effects

Headache, hypotension, nausea, vomiting, dizziness, and decreased level of consciousness

f) Precautions

May cause hypotension

g) Dosage

(1) Adult: Chest pain
  (a) If patient has a prescription or previous history of nitroglycerin use, administer nitroglycerin: 0.4 mg SL (may repeat dose 2 times at 3–5 minute intervals)
  May be repeated if symptoms persist, BP is greater than 90 mmHg, and pulse is greater than 60 bpm, to a maximum dose of 1.2 mg
  (b) If patient does **not** have a prescription or previous history of nitroglycerin use, establish IV prior to the administration of nitroglycerin, then administer nitroglycerin as above.
  (c) Additional doses may be administered with medical consultation.

(2) Adult: Pulmonary Edema/Congestive Heart Failure
   (a) Low dose - Administer 0.4 mg SL at 3–5 minute intervals to a maximum dose of 1.2 mg.
   (b) High dose - (until CPAP is applied or if CPAP is not tolerated)
      (i) Administer 1 dose of 0.4 mg SL and apply 1 inch of NTG paste.
      (ii) Administer 1 dose of 0.8 mg SL.
      (iii) Continue 0.8 mg NTG dosing to achieve a 20% reduction in systolic blood pressure.
(3) Pediatric: Requires medical consultation from Pediatric Base Station.

29. NITROGLYCERIN PASTE

a) Pharmacology

Nitroglycerin paste contains a 2% solution of nitroglycerin in a special absorbent paste. When placed on the skin, nitroglycerin is absorbed into the systemic circulation. In many cases, it may be preferred over nitroglycerin tablets because of its longer duration of action.

b) Pharmacokinetics

Nitroglycerin is a rapid smooth-muscle relaxant that reduces cardiac work and, to a lesser degree, dilates the coronary arteries. This results in increased coronary blood flow and improved perfusion of the ischemic myocardium. Relief of ischemia causes reduction and alleviation of chest pain. Pain relief following transcutaneous nitroglycerin administration usually occurs within 5 to 10 minutes, and therapeutic effects can be observed up to 30 minutes later. Nitroglycerin also causes vasodilation, which decreases preload. Decreased preload leads to decreased cardiac work. This feature, in conjunction with coronary vasodilation, reverses the effects of angina pectoris.

c) Indications

Patients in respiratory distress with moderate or severe symptoms and elevated systolic blood pressure.

d) Contraindications

(1) Known hypersensitivity
(2) Pediatric patient under the age of 13
(3) Any patient having taken medication for Pulmonary Artery Hypertension (e.g., Adcirca® or Revatio®) or erectile dysfunction (e.g., Viagra®, Levitra®, or Cialis®) within the past 48 hours. Medical consultation is required to override this contraindication.
(4) Asymptomatic hypertension
(5) Blood pressure below 90 mmHg systolic
(6) Heart rate less than 60

e) Adverse Effects

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

f) Precautions

Patients taking the drug routinely may develop a tolerance and require an increased dose. Headache is a common side effect of nitroglycerin administration and occurs as a result of vasodilation of the cerebral vessels.

Postural syncope sometimes occurs following the administration of nitroglycerin. This should be anticipated and the patient kept supine when possible. It is important to monitor the blood pressure continuously.

g) Dosage

(1) Adult: 1 inch of the NTG paste is applied. Measuring applicators are supplied.
(2) Pediatric: Requires medical consultation from Pediatric Base Station.

34. VERAPAMIL (ISOPTIN®)

(CRT-I & Paramedic only)

Jurisdictional option only when approved by the State EMS Medical Director. Administration of verapamil requires medical consultation.

a) Pharmacology

Calcium channel blocker

b) Pharmacokinetics

(1) Inhibits the movement of calcium ions across cardiac muscle cells
(2) Decreases conduction velocity and ventricular rate

c) Indications

(1) Narrow complex symptomatic atrial fibrillation or atrial flutter

d) Contraindications

(1) Hypotension below 100 mmHg, second or third degree heart block, hypersensitivity to the drug
(2) Patient with history of Wolff-Parkinson-White syndrome
(3) Ventricular tachycardia
(4) Patients less than 18 years of age

e) Precautions

Use cautiously in patients with renal failure, congestive heart failure, or on beta blockers.

f) Adverse Effects

(1) Hypotension (see Treatment of Overdose or Other Adverse Reactions)
(2) Bradycardia
(3) Vomiting
(4) Nausea
(5) Headache

g) Significant Interactions

Congestive heart failure may result if used along with beta blockers.

h) Dosage

(1) Adult:
   a) 2.5–10 mg slow IV over 2 minutes; if response is not adequate, repeat in 15 minutes with a dosage of 2.5–10 mg slow IV over 2 minutes with medical consultation.
(2) Pediatric:

Contraindicated for patients less than 18 years of age.

i) Overdose or Toxicity Presentation

Generally consists of exaggeration of side effects, including severe hypotension and symptomatic bradycardia

j) Treatment of Overdose or Other Adverse Reactions

(1) Give general supportive measures, monitor vitals, administer oxygen.

(2) Hypotension:

(a) If lungs are clear, administer fluid bolus 20 mL/kg of LR; titrate to a systolic blood pressure of 100 mmHG.

(b) If rales are present, administer fluid bolus, maximum of 250 mL of LR. Titrate to a systolic of 100 mmHg.

(c) Administer calcium chloride 500 mg SLOW IVP.

(3) Bradycardia: Consider atropine (0.5 to 1 mg); if necessary, consider pacing.