SECTION: Medication Reference

REVISED: 07/2017

Medication
13

MEDICATION REFERENCE

MEDICATION REFERENCE

34.	Ziprasidone *(Geodon)*	Medication 13 - 33

RSI Medications

35.	Lidocaine	Medication 13 - 34
36.	Etomidate	Medication 13 - 35
37.	Succinylcholine	Medication 13 - 36
38.	Vecuronium Bromide *(Norcuron)*	Medication 13 - 37

SECTION: Medication Reference

PROTOCOL TITLE: ODEMSA Drug Kit

REVISED: 06/2015

Medication
13-1

ODEMSA DRUG KIT

Primary Medications 1st Tier	Concentration	How Supplied	Form	Qty
Adenosine (Adenocard)	3 mg/ml	6 mg/2 ml	Inj	5
Albuterol Nebs	0.83 mg/ml	2.5 mg/3 ml	Inh	4
Amiodarone	50 mg/ml	150 mg/3 ml	Inj	4
Atropine Sulfate	0.1 mg/ml	1 mg/10 ml	Inj	2
Calcium Chloride 10%	100 mg/ml	1 gm/10 ml	Inj	1
Dexamethasone	10 mg/ml	10 mg/1 ml	Inj	1
Dextrose 10% 250ml bag	100mg/ml	25gm/250 ml	Inj	2
Diphenhydramine (Benadryl)	50 mg/ml	50 mg/1 ml	Inj	1
Epinephrine 1:1,000	1 mg/ml	1 mg/1 ml	Inj	2
Epinephrine 1:1,000	1 mg/ml	30 mg/30 ml	Inj	1
Epinephrine 1:10,000	0.1 mg/ml	1 mg/10 ml	Inj	5
Fentanyl	50 mcg/ml	100 mcg/ 2 ml	Inj	2
Furosemide (Lasix)	10 mg/ml	100 mg/10 ml	Inj	2
Glucagon	1 mg/ml	1 mg/1 ml	Inj	1
Ipratropium Nebs (Atrovent)	0.2 mg/ml	0.5 mg/2.5 ml	Inh	4
Magnesium Sulfate	500 mg/ml	1 gm/2 ml	Inj	2
Metoprolol (Lopressor)	1 mg/ml	5 mg/5 ml	Inj	2
Midazolam (Versed)	5 mg/ml	5 mg/ml	Inj	2
Naloxone (Narcan)	1 mg/ml	2 mg/2 ml	Inj	2
Nitroglycerin SL Tablets	0.4 mg/tablet	25 tablets	Tab	1
Nitropaste UD Packet	1 gm/inch	1 gm	Paste	4
Norepinephrine (Levophed)	1 mg/ml	4 mg/4 mL	Inj	2
Ondansetron (Zofran)	2 mg/ml	4 mg/2 ml	Inj	1
Sodium Bicarbonate	1 mEq/ml	50 mEq/ 50 ml	Inj	1
Ziprasidone (Geodon)	20 mg/ml	20 mg	Inj	1

MISC ITEMS	AMOUNT	QTY
Normal Saline	50 ml	1
D5W	100 ml	1
Sterile H_20 (use with Geodon)	10 ml	1
Filter Needles		5

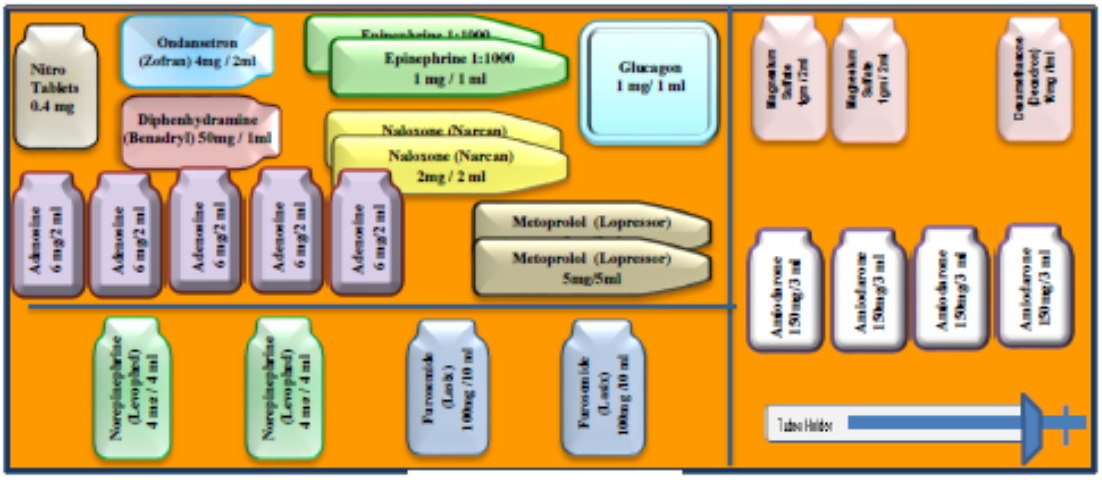
ACCESSORIES	QTY
Tubex Holder	1
IV Fluid Labels	3

Medication 13-1

Continued

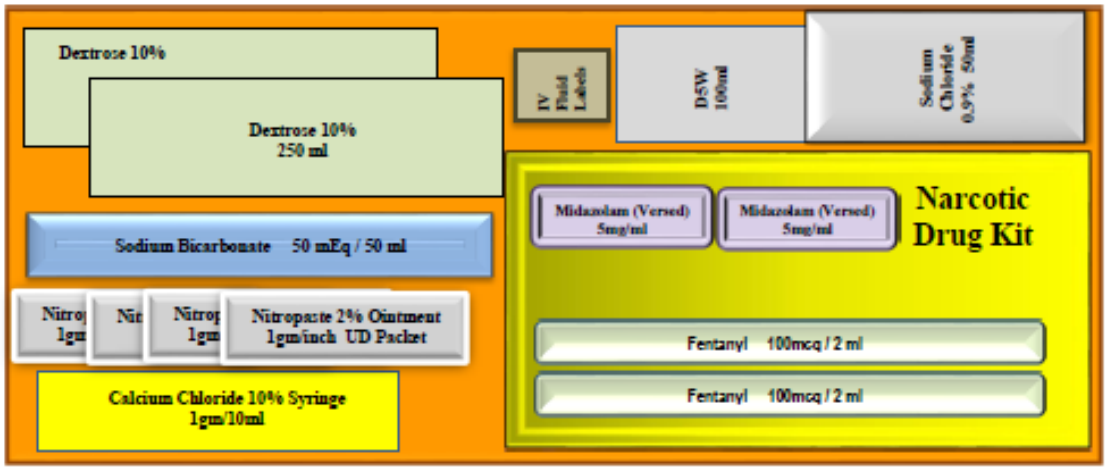
ODEMSA DRUG KIT

TOP TRAY



MIDDLE TRAY

BOTTOM TRAY



SECTION: Medication Reference

PROTOCOL TITLE: Adenosine

REVISED: 05/2012

Medication
13-2

ADENOSINE

DRUG NAME: Adenosine

TRADE NAME: Adenocard

DRUG CLASS:
1. Supraventricular anti-arrhythmic
2. Endogenous purine nucleoside

MECHANISM OF ACTION:
Slows conduction at the AV node, thus it slows conduction and blocks reentry pathways through the AV node.

INDICATIONS:
Hemodynamically stable PSVT (including WPW) refractory to vagal maneuvers

CONTRAINDICATIONS:
1. 2nd or 3rd degree heart block (without a functioning pacemaker)
2. Sick Sinus Syndrome
3. Known hypersensitivity
4. Pregnancy (C)
5. Known atrial fibrillation or atrial flutter (not effective)

PRECAUTIONS:
1. May cause refractory bronchospasm. Use with caution with COPD and asthma.
2. Extra caution (and lower than normal doses) should be used in patients receiving Carbamazepine (Tegretol) which could potentiate AV block of adenosine.
3. Lower than normal doses (3 mg or less) of Adenosine should be used in patients receiving Dipyridamole (Persantin).

DOSAGE:

Adults:
- 6.0 mg rapid IVP, immediately followed by rapid 10 ml Normal Saline flush.
- If No response in 1 - 2 minutes – 12 mg rapid IVP and 10 ml NS rapid IVP.
- If No response in 2 minutes – 12 mg rapid IVP and 10 ml NS rapid IVP.

Pediatrics:
- 0.1 mg / kg rapid IVP, max dose 6 mg, immediately followed by rapid Normal Saline flush.
- If No response in 1 - 2 minutes – 0.2 mg / kg, max dose 12 mg, rapid IVP and NS rapid IVP.

Medication
13-2
Continued

ADENOSINE

Pediatric Rapid flush bolus:

< 1 Year	**1 – 3 Years**	**4 Years**
2.5 ml	5.0 ml	10.0 ml

Age	Pre-Term	Term	6 Months
Weight (kg)	1.5	3.0	8.0
0.1 mg / kg	0.15 mg	0.3 mg	0.8 mg
0.2 mg / kg	0.3 mg	0.6 mg	1.6 mg

Age (in years)	1	3	6	8	10	12	14
Weight (kg)	10.0	14.0	20.0	25.0	34.0	40.0	50.0
0.1 mg / kg	1mg	1.4 mg	2 mg	2.5 mg	3.4 mg	4 mg	5 mg
0.2 mg / kg	2 mg	2.8 mg	4 mg	5 mg	7 mg	8 mg	10 mg

ONSET:
15 seconds or less

DURATION:
10 seconds

SIDE EFFECTS		
• Flushing • Chest pain • Dyspnea • Headache	• Diaphoresis • Metallic Taste • Dizziness • Lightheadedness	• Numbness • Nausea / Vomiting • Palpitations • Marked bradycardia

INTERACTIONS:
1. Additive effects – Digoxin, Calcium Channel Blockers
2. Antagonistic effects – Methylxanthines (caffeine, Theophylline)
3. Potentiating effects – Dipyridamole (Persantine)

PEARLS:
1. Higher doses of Adenosine are likely to be needed for patients receiving Theophylline or using large quantities of caffeine.

SECTION: Medication Reference

PROTOCOL TITLE: Albuterol

REVISED: 05/2012

Medication
13-3

ALBUTEROL

DRUG NAME: Albuterol Sulfate

TRADE NAME: Albuterol, Proventil, Ventolin

DRUG CLASS:
1. $Beta_2$ Agonist
2. Sympathomimetic

MECHANISM OF ACTION:
Acts selectively on $Beta_2$ receptor sites in the lungs, relaxing bronchial smooth muscle, decreasing airway resistance, and relief of bronchospasm. Although beta selective, it will cause some CNS stimulation, cardiac stimulation, increased diuresis, and gastric acid secretion.

INDICATIONS:
1. Bronchial asthma
2. Bronchospasm in acute exacerbation of COPD (chronic bronchitis, emphysema)
3. Bronchospasm associated with cardiac asthma
4. Bronchospasm in:
   a. Anaphylaxis
   b. Burns
   c. Toxic Inhalations

CONTRAINDICATIONS:
1. Known hypersensitivity
2. Tachydysrhythmias

PRECAUTIONS:
1. Hypertension
2. Lactation and Pregnancy (C)
3. Diabetes
4. Seizures
5. Known cardiac disease
6. Hyperthyroidism

DOSAGE:

Adults:
- **MDI:** 1 - 2 inhalations, repeated every 15 minutes as needed.
- **Nebulizer:** 5 mg (1 cc of 5% solution) via nebulizer with oxygen flow at 6 - 8 LPM, normally takes approximately 8 - 12 minutes to administer. May repeat as necessary.

Pediatrics:
- **MDI:** Compliance with MDI is difficult to achieve, nebulizer is preferred.
- **Nebulizer:** 2.5 mg (0.5 cc of 5% solution) via nebulizer with oxygen flow at 6 - 8 LPM, normally takes approximately 8 - 12 minutes to administer. May repeat as necessary.

Medication

13-3

Continued

ALBUTEROL

ONSET:
5 -15 minutes after inhalation, usually with prompt improvement

DURATION:
3 - 4 hours

SIDE EFFECTS:		
• Palpitations, Tachycardia • Anxiety, Nervousness • Dizziness	• Headache • Tremors • Nausea / Vomiting	• Hypertension • Dysrhythmias • Chest Pain

INTERACTIONS:
1. Additive effects – MAOI's, TCA's, and other sympathomimetics
2. Antagonistic effects – Beta Blockers including propanolol and Esmolol

PEARLS:
1. The first dose is administered in conjunction with Atrovent. Second and subsequent nebulizers are with Albuterol only.
2. The nebulizer system can be adapted to accommodate a mask if the patient is too fatigued or working too hard to hold the nebulizer. It can also be adapted to ET administration. Both ET and mask nebulizer treatments should have an O_2 flow rate of 8 - 10 L / min.
3. The medication chamber should be kept upright to ensure efficient medication administration, patients have a tendency to tilt the chamber, recheck it often. "*Tap*" the container toward the end of the treatment to ensure complete administration.
4. Monitor for dramatic increase in heart rate, development of frequent ventricular ectopy, or development of serious CNS symptoms.
5. Albuterol can cause hyperglycemia and hypokalemia. Both of these effects occur from stimulation of $beta_2$-receptors, resulting in gluconeogenesis and intracellular movement of potassium. These effects occur most commonly with inhalation (via nebulization) of relatively large doses of Albuterol (e.g., 5 - 10 mg).

SECTION: Medication Reference

PROTOCOL TITLE: Amiodarone

REVISED: 05/2012

Medication
13-4

AMIODARONE

DRUG NAME: Amiodarone

TRADE NAME: Cordarone, Pacerone

DRUG CLASS: Class III Anti-dysrhythmic

MECHANISM OF ACTION:
Acts directly on the myocardium to delay repolarization and increase the duration of the action potential.

INDICATIONS:
1. First line anti-dysrhythmic in ventricular fibrillation / pulseless ventricular tachycardia
2. Stable ventricular tachycardia (monomorphic or polymorphic)
3. Hemodynamically stable wide-complex tachycardia
4. Narrow-complex Supra-ventricular Tachycardia

CONTRAINDICATIONS:
1. Sick Sinus Syndrome and AV block *(not treated concomitantly with a pacemaker)*
2. Cardiogenic Shock
3. Pulmonary Congestion
4. Hypotension
5. Hypersensitivity
6. TCA Overdose
7. Use of Procainamide

PRECAUTIONS:
1. Heart failure *(because of negative inotropic effects)*
2. Should be avoided in congenital or acquired Long QT syndrome or history of Torsade de Pointe (TDP)
3. Pre-existing pulmonary disease *(may cause fatal pulmonary toxicity)*
4. Hepatic disease
5. Pregnancy (D)

DOSAGE:

Adults:
- Pulseless Arrest: 300 mg IVP initial dose then 150 mg IVP repeated once in 3 - 5 minutes. Maximum dose: 2 gm IV in 24 hours.
- Wide-Complex Tachycardia: 150 mg IV infusion over 10 minutes then administer 1 mg / min IV infusion over 6 hours.

Medication
13-4
Continued

AMIODARONE

Pediatrics:

- Pulseless Arrest: 5 mg / kg IVP, repeated once in 3 - 5 minutes.
- Perfusing Tachycardias: 5 mg / kg IV infusion over 40 minutes. Infusion may be repeated, up to a total dosage of 15 mg / kg / day IV.

ONSET:
2 - 3 minutes

DURATION:
Variable

SIDE EFFECTS		
• Hypotension • Dizziness • Headache • Bradycardia	• AV conduction abnormalities • Flushing / Salivation • QT prolongation	• Torsades de Pointe • Nausea & vomiting

INTERACTIONS:

1. Synergistic or additive effects with other anti-dysrhythmics.
2. May potentiate bradycardias and hypotension with beta-blockers and calcium channel blockers.
3. May potentiate the effects of warfarin (Coumadin).
4. Should not be used routinely with drugs that prolong the QT interval.
5. Amiodarone is incompatible with furosemide (lasix), heparin, and / or sodium bicarbonate. When possible, infuse via dedicated IV line.

Adult Infusion Mixing Procedures
150 mg over 10 minutes Add **150 mg of Amiodarone in 50 ml D_5W** (3mg / mL), with 10 gtt set, and run solution at 50 gtt / min (1gtt / second).
1 mg / minute infusion Dilute **150 mg Amiodarone in 100 ml D_5W** (1.5 mg / mL), attach 10 gtt set, and run solution at 7gtt / min (1gtt / 9 seconds).

Pediatric Dosing

Age	Term	6 mos	1 years	3 years	6 years	8 years	10 years	12 years	14 years
Weight (lb / kg)	6.6 lb 3 kg	17.6 lb 8 kg	22 lb 10 kg	30.8 lb 14 kg	44 lb 20 kg	55 lb 25 kg	75 lb 34 kg	88 lb 40 kg	110 lb 50 kg
Amiodarone 5 mg / kg	15 mg	40 mg	50 mg	70 mg	100 mg	125 mg	170 mg	200 mg	250 mg

SECTION: Medication Reference

PROTOCOL TITLE: Aspirin

REVISED: 05/2012

Medication
13-5

ASPIRIN

DRUG NAME: Aspirin (Acetylsalicylic acid)

TRADE NAME: ASA, Aspergum, Bayer Aspirin, Easprin, Ecotrin, Empirin

DRUG CLASS: Nonsteroidal anti-inflammatory drug (NSAID)

MECHANISM OF ACTION:
Aspirin is an anti inflammatory agent and an inhibitor of platelet function. Aspirin works by blocking the formation of the substance Thromboxane A_2, which causes platelets to aggregate and arteries to constrict. The use of aspirin has been shown to cause an overall reduction of mortality in patients experiencing AMI.

INDICATIONS:
1. Acute myocardial infarction
2. Suspected cardiac chest pain

CONTRAINDICATIONS:
1. Hypersensitivity
2. Active bleeding disorder

PRECAUTIONS:
Pregnancy (D)

DOSAGE:

Adults:
- 324 mg PO

Pediatrics:
- Not recommended

ONSET:
PO: 5 - 30 minute

DURATION:
PO: 1 - 4 hours

SIDE EFFECTS	
• Tinnitus • Heartburn • Gastrointestinal hemorrhage • Prolonged bleeding time	• Nausea and vomiting • Asthma attack (rare, with certain metabolic disorders,(i.e., C_1 Esterase deficiency)

Medication

13-5

Continued

ASPIRIN

INTERACTIONS:

May decrease anti-hypertensive effects of ACE inhibitors and beta-blockers

PEARLS:

1. Regardless of patient daily medication regimen, full dose should be given when treating chest pain.

SECTION: Medication Reference

PROTOCOL TITLE: Atropine

REVISED: 05/2012

Medication
13-6

ATROPINE

DRUG NAME: Atropine Sulfate

TRADE NAME: Atropine

DRUG CLASS:
1. Parasympathetic
2. Anticholinergic agent

MECHANISM OF ACTION:
Atropine is a competitive inhibitor of acetylcholine at muscarinic receptor sites. The increase of sympathetic activity seen with atropine administration is due to the drug's parasympatholytic effects. In the setting of symptomatic bradycardias, atropine decreases vagal effects on the heart resulting in increased chronotropy and dromotropy (with little or no inotropic effects). Atropine is also used in cholinergic exposures as a direct antidote for the poison.

INDICATIONS:
1. Symptomatic bradycardias
2. Pre-intubation in children
3. Poisoning with Organophosphates:
   - Carbamate
   - Mushrooms
   - Nerve gas
   - Other cholinergic agents

CONTRAINDICATIONS:
1. According to 2010 AHA guidelines, Atropine is no longer recommended in arrest setting
2. Non-arrest setting:
   a. Myasthenia gravis
   b. Closed angle glaucoma
   c. Atrial fibrillation and flutter
   d. Known hypersensitivity
   e. Thyrotoxicosis
   f. Urinary tract obstruction

Medication

13-6

Continued

ATROPINE

PRECAUTIONS:

1. Atropine may actually worsen 2nd degree Type II and 3rd degree AV blocks
2. CAD and HF
3. COPD
4. HTN
5. Renal / hepatic disease
6. Geriatrics
7. Pregnancy
8. Minimum doses: (Smaller doses can cause a paradoxical bradycardia)
   - Adult < 0.5 mg
   - Pediatric < 0.1 mg

DOSAGE:

Adults:

- Symptomatic Bradycardia: 0.5 – 1 mg IVP every 3 - 5 min. Maximum dose, 3 mg IVP.
- Poisonings: IV: 1 – 2 mg as needed to decrease cholinergic symptoms.
- Mark 1 Kit (Auto injector): 2 mg.

Pediatrics:

- Symptomatic Bradycardia: 0.2 mg / kg every 3 - 5 minutes, as needed. Minimum dose 0.1 mg; maximum dose 0.5mg in children and 1 mg in adolescents.
- Poisonings: 0.05 mg / kg every 3 - 5 minutes, as needed, to decrease cholinergic symptoms.

ONSET:

Within seconds

DURATION:

2 - 6 hours

SIDE EFFECTS	
1. Anti-cholinergic effects, (remember the pneumonic): • **Dry as a bone** - Dry mucous membranes, urinary retention, constipation • **Mad as a hatter** - Restlessness, tachycardia, palpitations, headache, dizziness • **Red as a beet** - Flushed, hot, dry skin • **Blind as a bat** - Pupillary dilation (mydriasis), blurred vision (cycloplegia), photophobia	
2. Tachydysrhythmias 3. Ventricular Tachycardia	4. Ventricular Fibrillation 5. Nausea and vomiting

ATROPINE

INTERACTIONS:

1. Anti-cholinergics increase vagal blockade.
2. Potential adverse effects when administered with digitalis, cholinergics, and neostigmine.
3. Enhanced effects are possible with antihistamines, Procainamide, quinidine, antipsychotics, antidepressants, benzodiazepines, and phenothiazines.
4. When administered too soon after sodium bicarbonate (without allowing sufficient fluid to flush the line), a precipitate will form.

PEARLS:

1. To recognize cholinergic poisonings remember the SLUDGE, DUMBELS, and Days of the week mnemonics.
2. Pushing “too small a dose” or pushing atropine too slowly may elicit paradoxical bradycardia.
3. Remember bradycardia in a pediatric patient, is often the result of hypoxia / hypoxemia rather than a primary cardiac problem. Ventilation is always preferred over pharmacological intervention.
4. In the setting of cholinergic poisoning, the treating physician may order a substantial dosage – often in the range of 10 – 40 mg.

ATROPINE

This page intentionally
left blank.

SECTION: Medication Reference

PROTOCOL TITLE: Bumetanide

REVISED: 05/2012

Medication
13-7

BUMETANIDE

DRUG NAME: Bumetanide

TRADE NAME: Bumex, Burinex

DRUG CLASS: Loop diuretic

MECHANISM OF ACTION:
Bumetanide has a rapid onset that inhibits reabsorption of both sodium and chloride in the ascending loop of Henle and proximal renal tubule. This inhibition interferes with the chloride-binding co-transport system, thus causing increased excretion of water, sodium, chloride, magnesium, phosphate, and calcium.

INDICATIONS:
1. Heart failure
2. Pulmonary Edema
3. Hypertensive crisis

CONTRAINDICATIONS:
1. Hypersensitivity to drug or sulfonamides
2. Anuria
3. Severe electrolyte imbalance

PRECAUTIONS:
1. May cause hypokalemia
2. Pregnancy (C)

DOSAGE:

Adults:
- 1 - 2 mg IV over 1 - 2 minutes

Pediatrics:
- Not recommended.

ONSET:
IV: 2 - 3 minutes

DURATION:
PO: 4 - 6 hours

SIDE EFFECTS	
• Muscle cramps • Hypotension • Dizziness	• Headache • Nausea & vomiting

INTERACTIONS:
May increase risk of digoxin toxicity from Bumetanide-induced hypokalemia

BUMETANIDE

PEARLS:

1. Bumetanide is only stocked in the ODEMSA drug box when a shortage of Furosemide has occurred.
2. Larger doses may be necessary in patients with impaired renal function to obtain the same therapeutic response.
3. Bumetanide may produce significant diuresis; it is important that patients are closely monitored for hypokalemia, hypomagnesemia, and volume depletion.
4. Dose equivalency (approximate):
    - Bumetanide 1 mg = furosemide 40 mg = torsemide 10 mg

SECTION: Medication Reference

PROTOCOL TITLE: Calcium Chloride 10%

REVISED: 05/2012

Medication
13-8

CALCIUM CHLORIDE 10%

DRUG NAME: Calcium Chloride 10%

TRADE NAME: Calcium Chloride, Calcium, $CaCl_2$

DRUG CLASS:
Electrolyte replacement

MECHANISM OF ACTION:
Calcium chloride increases the force of cardiac contractility by initiating myofibril shortening. In normally functioning hearts, calcium will produce positive inotropic and vasoconstrictive effects while increasing systemic arterial blood pressure. In abnormally functioning hearts, calcium will produce positive inotropic effects, which may increase or decrease systemic vascular resistance. Calcium chloride also appears to increase ventricular automaticity.

INDICATIONS:
1. Hyperkalemia
2. Hypermagnesemia (Antidote for respiratory depression due to magnesium sulfate administration)
3. Hypocalcemia (Calcium channel blocker overdose)

CONTRAINDICATIONS:
1. Hypercalcemia
2. Digitalis toxicity
3. Ventricular fibrillation during resuscitation

PRECAUTIONS:
1. May induce digitalis toxicity in patients receiving digoxin
2. Can cause tissue necrosis and sloughing
3. Pregnancy (C)
4. Respiratory disease / failure
5. Cor pulmonale

DOSAGE:

Adults:
- Calcium channel blocker OD: 2.0 - 4.0 mg / kg 10% solution slow IVP and repeat as necessary in 10 minute intervals.
- Asystole / PEA with suspected hyperkalemia: 4.0 mg / kg slow IVP.

Pediatrics:
- 20 mg / kg infused slowly over 10 minutes (no faster than 100 mg / min). Maximum 1 gm / dose.

ONSET:
5 - 15 minutes

Medication
13-8
Continued

CALCIUM CHLORIDE 10%

DURATION:
Dose dependent (effects may persist for 4 hours after IV administration)

SIDE EFFECTS	
• Metallic taste • Burning • “Heat waves” • Bradycardia (may cause asystole) • Hypotension • Cardiac arrhythmias	• Increased digitalis toxicity • Extravasation with necrosis and sloughing • Vasospasm in coronary and cerebral arteries • Nausea and vomiting

INTERACTIONS:
1. Precipitates with sodium bicarbonate epinephrine, and potassium phosphate.
2. When given to a patient on digoxin, can cause elevated digoxin levels and possibly digitalis toxicity.
3. May antagonize the effects of Verapamil.

PEARLS:
1. To prevent tissue necrosis, make sure to administer the drug through an IV that is patent and flowing well.
2. Flush well between administration of calcium chloride and sodium bicarbonate to avoid precipitate.
3. May sometimes be requested by medical control to be co-administered with Cardizem to offset hypotension in hypotensive patients.

SECTION: Medication Reference

PROTOCOL TITLE: Dexamethasone

REVISED: 06/2015

Medication
13-9

DEXAMETHASONE

DRUG NAME: Dexamethasone

TRADE NAME: Decadron®

DRUG CLASS: Glucocorticoids

MECHANISM OF ACTION:
Dexamethasone is a synthetic adrenocorticoid. Adrenocorticoids inhibit the release of pro-inflammatory chemicals by way of several mechanisms.

INDICATIONS:
1. Severe exacerbation of asthma
2. Croup

CONTRAINDICATIONS:
1. Hypersensitivity
2. Children less than 2 years of age
   - Less than 1 year of age for croup symptoms

PRECAUTIONS:
1. Recent myocardial infarction
2. Gastrointestinal ulcers
3. Cushing's Syndrome
4. Tuberculosis
5. Renal disease
6. Glaucoma
7. Diabetes mellitus
8. Hypertension
9. Cirrhosis or liver failure
10. Pregnancy (C)

DOSAGE:

Adults:
- 0.6 mg/kg IV/IM/PO *max dose:* 10 mg

Pediatrics:
- Greater than 2 years of age, 0.6 mg/kg IV/IM/PO *max dose:* 10 mg
- Croup symptoms: Greater than 1 year of age, 0.6mg/kg IV/IM/PO *max dose 10mg*

ONSET:
Variable

DURATION:
Variable

Medication

13-9

Continued

DEXAMETHSONE

SIDE EFFECTS	
• Hypertension • Pulmonary edema	• Hyperglycemia • Hypokalemia

INTERACTIONS:

1. May increase glucose and cholesterol levels.
2. Rapid intravenous injection of massive doses of glucocorticoids may sometimes cause cardiovascular collapse; the injection should therefore be given slowly over a period of several minutes.

SECTION: Medication Reference

PROTOCOL TITLE: Dextrose

REVISED: 06/2015

Medication
13-10

DEXTROSE

DRUG NAME: Dextrose

TRADE NAME: Dextrose, Dextrose 10%, Dextrose 50%, D_{50}, $D_{50}W$, Glucose

DRUG CLASS: Monosaccharide, principal form of carbohydrate used in the body

MECHANISM OF ACTION:
Increases serum blood glucose levels

INDICATIONS:
Hypoglycemia confirmed by glucometer

CONTRAINDICATIONS:
1. Intracranial hemorrhage
2. Cerebrovascular accident (CVA)
3. Closed head injury

PRECAUTIONS:
1. Can precipitate severe neurologic impairment in alcoholic patients (Wernicke-Korsakoff's syndrome). This is related to thiamine deficiency and thiamine should be given, when available, before dextrose in these cases.
2. If smaller veins are used, local venous irritation may occur.
3. Infiltration may cause necrosis.

DOSAGE:

Adults:
- 100mL bolus of Dextrose 10%

If bag of Dextrose 10% unavailable:
- 12.5 – 50.0 gm of Dextrose 50% solution, slow IVP

Pediatrics:
- If < 30 days old, administer Dextrose 10% (2mL/kg)
- If > 30 days old but <8 years old, administer Dextrose 10% (5mL/kg, max 100mL)

If bag of Dextrose 10% unavailable:
- If < 30 days old, administer Dextrose 10% (2 ml/kg**)** via IV or IO
- If > 30 days old but < 8 years old, administer Dextrose 25% (2 ml/kg) via IV or IO
- If > 8 years old, administer Dextrose 50% (0.5 mg/kg, max 25 mg) via IV/IO

ONSET:
Can be one (1) minute or less to see immediate improvement, usually 5 - 20 minutes to see complete resolution of signs and symptoms

DURATION:
Depends on the degree of hypoglycemia

DEXTROSE

SIDE EFFECTS	
• Pain, warmth, or burning upon administration • Infiltration/extravasation can cause necrosis	• Phlebitis, sclerosis, and thrombosis of vein can occur • Rhabdomyolysis

INTERACTIONS:
No significant interactions

PEARLS:
1. Symptomatic hypoglycemia nearly always means an altered mental status. Altered mental status often means a scene safety issue. **Make sure you are aware of your environment**, ensure you have sufficient personnel to handle the situation -- don't be hesitant to leave an unsafe scene.
2. Patient's family, friends, or relatives, if present, can be a good source of information about the patient's habits and their normal recovery from hypoglycemia.
3. When practical, obtain pre / post Dextrose administration glucometer readings. The post Dextrose reading should be obtained at least 10 minutes following administration.
4. Because the pH of Dextrose is quite irritating to the vasculature, use a reasonably large bore IV & large vein. To further minimize the irritation potential, run fluid wide open while administering D_{50} and check venous patency often.
5. It is acceptable to treat a hypoglycemic patient without using a full dose.
6. If the patient refuses transport, it is important to get them something substantial to eat and to ensure that someone will be with them for a while.
7. Because of the long half-life (therapeutic duration) associated with oral hypoglycemic agents and long acting insulin; often these patients have hypoglycemic relapses and therefore should be carefully monitored in a medical control facility. To the extent practical, these patients should be transported for further care.

Procedure for making Dextrose 25% and 10%	
Dextrose 25%	**Dextrose 10%**
In 50 ml syringe, mix 25 ml of Dextrose 50% with 25 ml Normal Saline. Mixture will yield 50 ml of Dextrose 25%	In 50 ml syringe, mix 10 ml of Dextrose 50% with 40 ml Normal Saline. Mixture will yield 50 ml of Dextrose 10%

Age	Pre-Term	Term	3 months	6 months	1 year	3 years	6 years	8 years
Weight (lb / kg)		6.6 lb 3 kg	13.2 lb 6 kg	17.6 lb 8 kg	22 lb 10 kg	30.8 lb 14 kg	44 lb 20 kg	55 lb 25 kg
Dextrose 10% (Bag	4.0 ml	6.0 ml	X	X	X	X	X	X

or diluted) 2 ml / kg								
Dextrose 10% (Bag) 5.0 ml / kg	X	X	30.0 ml	40.0 ml	50.0 ml	70.0 ml	100 ml	100 ml
Dextrose 25% 2.0 ml / kg	X	X	12.0 ml (3 gm)	16.0 ml (4 gm)	20.0 ml (5 gm)	28.0 ml (7 gm)	40.0 ml (10 gm)	50.0 ml (12.5 gm)

DEXTROSE

This page intentionally
left blank.

SECTION: Medication Reference

PROTOCOL TITLE: Diazepam

REVISED: 06/2015

Medication
13-11

DIAZEPAM

DRUG NAME: Diazepam

TRADE NAME: Valium, Diastat

DRUG CLASS:
1. Benzodiazepine (non-barbiturate sedative-hypnotic agent)
2. Anticonvulsant
3. Skeletal muscle relaxant
4. Schedule IV controlled substance

MECHANISM OF ACTION:
Diazepam acts at the level of the limbic, thalamic, and hypothalamic regions of the Central Nervous System (CNS) by enhancing effects the neurotransmitter GABA (inhibitory neurotransmitter). Diazepam also decreases nerve cell activity in all regions of CNS. As an anticonvulsant, diazepam augments pre-synaptic inhibitions of neurons, limiting the spread of electrical activity. However, diazepam does not alter the electrical activity of the seizure's focus.

INDICATIONS:
1. Major motor seizures / status epilepticus
2. Sedation prior to cardioversion
3. Sedation maintenance for mechanically ventilated patients
4. Skeletal muscle relaxant
5. Acute anxiety
6. Vertigo
7. Management of alcohol withdrawal symptoms

CONTRAINDICATIONS:
1. Shock
2. Coma
3. Respiratory Depression
4. Hypersensitivity
5. Closed – angle glaucoma

PRECAUTIONS:
1. Reduced doses, up to 50%, have been recommended when treating geriatric patients
2. Use caution when administering to patients with:
   - Hepatic dysfunction
   - Current substance abuse
   - Renal insufficiency
   - Parkinson's disease
   - Myasthenia gravis
   - History of drug addiction
   - Pregnancy (D)

DIAZEPAM

DOSAGE:

Adults:

Epileptic Convulsions:

- 2.5 – 5.0 mg IV or IM. Dose may be repeated every 5 minutes as needed.

Sedation Maintenance:

- 0.1 mg / kg slow IVP, every 30 minutes as needed, maximum single dose 5.0 mg.

Behavioral Emergency:

- 5.0 mg IV or IM.

Pediatrics:

Seizures and Sedation:

- 0.3 mg / kg via IV or IO slowly over no less than one minute. Dose may be repeated every 5 minutes for continued seizures.
- Rectal dosing: 0.5 mg / kg via PR.

Age	Pre-Term	Term	3 months	6 months	1 year	3 years	6 years	8 years
Weight (lb / kg)	3.3 lb 1.5 kg	6.6 lb 3 kg	13.2 lb 6 kg	17.6 lb 8 kg	22 lb 10 kg	30.8 lb 14 kg	44 lb 20 kg	55 lb 25 kg
Diazepam IV (5.0 mg / ml) 0.3 mg / kg	0.1 ml	0.2 ml	0.4 ml	0.5 ml	0.6 ml	0.84 ml	1.2 ml	1.5 ml
Diazepam PR (5.0 mg / ml) 0.5 mg / kg	0.15 ml	0.3 ml	0.6 ml	0.8 ml	1.0 ml	1.4 ml	2.0 ml	2.0 ml

ONSET:

IV – 5 Minutes
IM – 15 – 30 Minutes

DURATION:

IV – 15 – 60 Minutes
IM – 15 – 60 Minutes

SIDE EFFECTS	
Minor	**Major**
• CNS depression • Dizziness • Drowsiness • Lethargy • Ataxia	• Respiratory depression • Apnea • Hypotension • Cardiac arrest • Valium rage

DIAZEPAM

INTERACTIONS:
Normal saline flush should precede and follow administration, because of its incompatibility with all other drugs.

PEARLS:
1. Diazepam pushed rapidly will have more "*dramatic*" effects than pushed slowly.
2. When giving an IM injection of diazepam, use a large muscle mass (i.e., gluteus). Versed or Ativan are both more readily absorbed through the muscle mass, and may be considered a better choice in certain situations, when available.
3. "Diastat" is a pre-filled tube of Diazepam specifically designed for rectal administration. It is pre-measured, and is often made available to parents by their family physician to administer to children with severe seizure disorders. Preliminary studies show it **MAY** have less incidence of respiratory depression, but all precautions still apply.

DIAZEPAM

This page intentionally
left blank.

SECTION: Medication Reference

PROTOCOL TITLE: Diltiazem

REVISED: 06/2015

Medication
13-12

DILTIAZEM

DRUG NAME: Diltiazem

TRADE NAME: Cardizem

DRUG CLASS:
Antiarrhythmic Class IV

MECHANISM OF ACTION:
Diltiazem is a class IV antiarrhythmic agent. It decreases the automaticity in the sinoatrial (SA) node and prolongs refractoriness in the atrioventricular (AV) node. Diltiazem also inhibits the influx of extracellular calcium ions to myocardial and vascular smooth muscle cells, as well as decreasing the cardiac contractility and inhibiting constriction of vascular smooth muscle. In patients with PSVT, Diltiazem interrupts the reentry pathway in the AV node and restores normal sinus rhythm. Finally, it decreases ventricular response rate in atrial fibrillation and flutter.

INDICATIONS:
1. Atrial fibrillation with a ventricular response of 120 beats per minute or greater
2. Paroxysmal supraventricular tachycardia (PSVT) accompanied by a narrow QRS complexes refractory to vagal maneuvers and adenosine

CONTRAINDICATIONS:
1. Bradycardia
2. Hypotension
3. Patients who present in HF
4. Pregnancy (C)

PRECAUTIONS:
1. Patients who receive long term beta blocker therapy

DOSAGE:

Adults:
- 0.25 mg / kg bolus over **2 minutes.** If response is inadequate, 0.35 mg / kg over 2 minutes 15 minutes after initial dose.

Pediatrics:
- 1.0 mcg / kg slow IVP.

ONSET:
IV: 1 - 3 minutes

DURATION:
15 minutes after first dose and can be continuously infused for up to 24 hours

Medication
13-12
Continued

DILTIAZEM

SIDE EFFECTS	
Minor	**Major**
• Nausea and vomiting • Headache • Drowsiness • Sore throat	• Severe bradycardia • HF • Hypotension (*may be reversed with 0.5-1.0 gm Calcium Chloride)* • Facilitated accessory conduction in patients with WPW syndrome.

INTERACTIONS:
Beta blockers

PEARLS:
1. Patients with a high intake of grapefruit or grapefruit juice may be at risk for life threatening interactions regarding Diltiazem.
2. Diltiazem is used to treat hypertension (high blood pressure), angina (chest pain), and certain heart rhythm disorders.
3. Diltiazem should not be used in "sick sinus syndrome" or "AV block" (unless the patient has a pacemaker), low blood pressure, or if they've recently had a heart attack.

SECTION: Medication Reference

PROTOCOL TITLE: Diphenhydramine

REVISED: 06/2015

Medication
13-13

DIPHENHYDRAMINE

DRUG NAME: Diphenhydramine Hydrochloride

TRADE NAME: Benadryl

DRUG CLASS:
1. Antihistamine
2. H_1 Antagonist

MECHANISM OF ACTION:
Diphenhydramine blocks H_1 receptors, causing bronchoconstriction and contraction of the gut, and H_2 receptors causing peripheral vasodilation and secretion of gastric acid. As an H_1 antagonist, Diphenhydramine also has Anticholinergic properties in varying degrees which accounts for its anti-dyskinetic and anti-emetic effects.

INDICATIONS:
1. Anaphylaxis
2. Allergic Reactions
3. Urticaria
4. Sedation
5. Motion Sickness and vertigo
6. Nausea and vomiting
7. Histamine release secondary to DXM use
8. Extrapyramidal / dystonic reaction

CONTRAINDICATIONS:
1. Hypersensitivity
2. Acute asthma attack
3. Lower respiratory tract disease
4. Newborns and nursing mothers

PRECAUTIONS:
1. Hypertension
2. Cardiac disease
3. Renal disease
4. Bronchial asthma
5. Seizures
6. Pregnancy Category (C)
7. Closed angle glaucoma (avoid if at all possible)

DOSAGE:

Adults:
- 25.0 – 50.0 mg IV or IM

Pediatrics:
- 1.0 mg / kg IV or IO. Maximum dose of 25 mg

Medication
13-13
Continued

DIPHENHYDRAMINE

ONSET:
IV – Immediate
IM – 30 minutes

DURATION:
IV – 4 - 7 hours
IM – 4 - 7 hours

SIDE EFFECTS	
• Drowsiness / Dizziness • Lack of coordination • Confusion • Dry mouth • Drying of bronchial secretions	• Blurred vision • Urinary retention • Hypotension • Tachycardia • Bradycardia

INTERACTIONS:
1. Additive effects – other CNS depressants
2. MAOIs – May prolong the anticholinergic effects

PEARLS:
1. Adjunctive therapy to epinephrine in anaphylaxis & severe allergic reactions. The epinephrine causes immediate bronchodilation by activating B_2 receptors, while the diphenhydramine inhibits further histamine response.
2. Sometimes given with Phenergan, Inapsine, and Haldol as pre-treatment for dystonic effects, and for additional sedation.

SECTION: Medication Reference

PROTOCOL TITLE: Dopamine

REVISED: 10/2017

Medication
13-14

DOPAMINE

DRUG NAME: Dopamine Hydrochloride

TRADE NAME: Dopamine, Intropin

DRUG CLASS:
1. Adrenergic dopaminergic catecholamine
2. Sympathomimetic

MECHANISM OF ACTION:
Dopamine is a naturally occurring catecholamine that is the chemical precursor of norepinephrine. It produces endogenous norepinephrine release leading to increased cardiac contractility and increased systemic vascular resistance. Dopamine is generally dose dependent in its effects:

- **1 - 2 mcg / kg / min** - stimulates the dopaminergic receptors causing dilation of the renal, mesenteric, and cerebral arteries.
- **2 - 10 mcg / kg / min** - stimulates the beta receptors causing inotropic and chronotropic responses.
- **10 - 20 mcg / kg / min** - stimulates the alpha and beta receptors causing vasoconstriction of renal, mesenteric, and peripheral arteries and veins.
- **> 20 mcg / kg / min** - Mimics pure alpha effects similar to epinephrine-like effects. Although rare, it is occasionally used at this range in-hospital.

INDICATIONS:
1. Cardiogenic shock
2. Cardiogenic shock with pulmonary edema (HF)
3. Hypovolemic shock / hypotension (after fluid resuscitation)
4. Neurogenic shock
5. Septic shock

CONTRAINDICATIONS:
1. Women on oxytocin
2. Tachydysrhythmias
3. Ventricular fibrillation
4. Ventricular tachycardia
5. Uncorrected hypovolemia
6. Patients with known heochromocytoma

PRECAUTIONS:
1. MAOIs, TCAs, cardiac stimulants, and vasopressors may cause increased heart rate, hypertensive crisis and SV dysrhythmias
2. Will precipitate in basic, alkaline solutions
3. May cause necrosis, sloughing at infusion site
4. Pregnancy (C)

Medication
13-14
Continued

DOPAMINE

DOSAGE:

Adults:

- 2.0 – 20.0 g / kg / minute titrated to effect. Infusion is made by adding 160 mg of Dopamine to 100 mL normal saline, yielding 1600 mcg/mL concentration.

Pediatrics:

- 2.0 – 20.0 g / kg / minute titrated to effect. Infusion is made by adding (6 mg x weight in kg) to 100 ml normal saline: **1 gtt / min (cc / hr) = 1 mcg / kg / min**

ONSET:
2 – 4 minutes

DURATION:
10 – 15 minutes

SIDE EFFECTS:

- Dysrhythmias, including ventricular fibrillation and ventricular tachycardia
- Hypertension
- Headache / Dizziness
- Nausea and vomiting
- Tremors
- Tachycardia
- Flushing
- Angina, AMI
- Ectopy
- Bradycardia

INTERACTIONS:

1. Potentiating effects – TCAs, MAOIs
2. Precipitates in alkaline solutions
3. May cause hypotension when used concomitantly with phenytoin (Dilantin)

PEARLS:

1. Can cause tissue necrosis and sloughing. Take care to avoid infiltration, use central intravenous access or the large veins of the arm.
2. The dose should be titrated to patient's (desired) hemodynamic response.

60 gtts/mL set

Dopamine

160 mg in 100 mL → 1600 mcg/mL

Drip rate using 60 gtts set – DROPS per MINUTE

Desired Drip Rate:		mcg/kg/min				
lbs	kg	**2 mcg/kg/min**	**5 mcg/kg/min**	**10 mcg/kg/min**	**15 mcg/kg/min**	**20 mcg/kg/min**
5	2			1	1	2
10	5		1	2	3	3
15	7	1	1	3	4	5
20	9	1	2	3	5	7
25	11	1	2	4	6	9
30	14	1	3	5	8	10
35	16	1	3	6	9	12
40	18	1	3	7	10	14
45	20	2	4	8	12	15
50	23	2	4	9	13	17
55	25	2	5	9	14	19
60	27	2	5	10	15	20
65	30	2	6	11	17	22
70	32	2	6	12	18	24
75	34	3	6	13	19	26
80	36	3	7	14	20	27
85	39	3	7	14	22	29
90	41	3	8	15	23	31
95	43	3	8	16	24	32
100	45	3	9	17	26	34
125	57	4	11	21	32	43
150	68	5	13	26	38	51
175	80	6	15	30	45	60
200	91	7	17	34	51	68
225	102	8	19	38	58	77
250	114	9	21	43	64	85
275	125	9	23	47	70	94
300	136	10	26	51	77	102
325	148	11	28	55	83	111
350	159	12	30	60	89	119

DOPAMINE

DOPAMINE

This page is intentionally left blank

SECTION: Mediation Reference

PROTOCOL TITLE: Epinephrine

REVISED: 06/2015

Medication
13-15

EPINEPHRINE

DRUG NAME: Epinephrine

TRADE NAME: Adrenaline, Epi

DRUG CLASS:
1. Adrenergic catecholamine
2. Sympathomimetic

MECHANISM OF ACTION:
- β_1 - Contractility, inotropic, increases AV conduction, and automaticity
- β_2 - Bronchodilation and skeletal muscle vasodilation
- α_1 - Peripheral vasoconstriction and "fight or flight" response
- Small doses – Beta effects dominate increasing vasodilation
- Large doses – Alpha effects dominate increasing vasoconstriction, systemic vascular resistance, and blood pressure

INDICATIONS:
1. Anaphylaxis
2. Acute bronchospasm associated with asthma or COPD (refractory to first-line agents
3. Pulseless Arrest
4. Croup, epiglottitis, and RSV

CONTRAINDICATIONS:
1. None in cardiac arrest, severe anaphylaxis
2. Hypersensitivity

PRECAUTIONS:
1. Hypertension
2. Ischemic heart disease
3. Cerebrovascular insufficiency
4. Deactivates / precipitates with alkaline solutions (sodium bicarbonate)
5. Will increase myocardial oxygen demand
6. Pulmonary edema
7. Pregnancy (C)
8. Geriatrics
9. Protect from light

****All patients receiving inhaled beta agonists and / or Anticholinergic medications should be observed for at least one hour for return of symptoms following treatment.*

Medication
13-15
Continued

EPINEPHRINE

DOSAGE:

Adults:

Pulseless Arrest

- 1 mg (1:10,000) IVP every 3 - 5 minutes

Anaphylaxis

- 0.5 mg (1mg/ml) IM (preferred) or SQ
- Infusion for refractory case: 2.0 – 10.0 μg / min infusion titrated to BP response
- Epinephrine Neb (for laryngeal edema only): 5.0 mg (1:1,000) nebulized undiluted

Acute Bronchospasm (associated with asthma or COPD refractory to first line agents)

- 0.3 mg (1:1,000) IM (preferred) or SQ

Symptomatic Bradycardia and Hypotension and Refractory Hypotension in Calcium Channel Blocker and Beta Blocker Overdose

- 2.0 – 10.0 μg / minute infusion titrated to BP response

Pediatrics:

Pulseless Arrest

- 0.01 mg / kg (1:10,000) IV/ IO every 3 - 5 minutes
- **Neonates:** 0.01 – 0.03 mg / kg (1:10,000) IV/IO every 3 - 5 minutes

Anaphylaxis

- 0.01 mg / kg (1:1,000, 0.01 ml / kg) IM (preferred) or SQ, max dose 0.3 mg
- Racemic Epinephrine (2.25%) Neb (for laryngeal edema only): 0.5 ml (2.25%) mixed with 3.0 ml Normal Saline nebulized
- Infusion for refractory case: 0.1 – 2.0 μg / kg / minute infusion with Medical Control authorization

Croup and Diagnosed RSV

- Racemic Epinephrine (2.25%) Neb (for laryngeal edema only): 0.5 ml (2.25%) mixed with 3.0 ml Normal Saline nebulized

ONSET:

IV: 1 – 2 minutes
IM / SQ: 5 – 10 minutes

DURATION:

5 – 10 minutes

EPINEPHRINE

SIDE EFFECTS	
• Anxiety / Fear / Tremors • Pallor • Angina • Hypertension • Nausea & vomiting	• Arrhythmias • Ventricular Fibrillation • Tachycardia • Dizziness • Headache

INTERACTIONS:

1. Potentiating by TCAs and MAOIs
2. Antagonized by beta blockers
3. Precipitates in alkaline solutions

PEARLS:

1. Sodium bicarbonate and furosemide will inactivate epinephrine; ensure that you flush the IV line well following administration of either of these agents.

Epinephrine IV Infusion				
Add 1 mg of Epinephrine 1:10,000 in 250 ml D_5W (4 mcg / ml) and attach 60 gtts IV tubing.				
Mcg / minute	2.0 mcg	5.0 mcg	7.0 mcg	10.0 mcg
Drops / minute (mL / hr)	30 gtts	75 gtts	100 gtts	150 gtts

EPINEPHRINE

This page intentionally
left blank.

SECTION: Medication Reference

PROTOCOL TITLE: Fentanyl

REVISED: 06/2015

Medication
13-16

FENTANYL

DRUG NAME: Fentanyl Citrate

TRADE NAME: Sublimaze, Atiq (lollypop form for pediatrics)

DRUG CLASS:
1. Synthetic opiate, narcotic analgesic
2. Opiate
3. Schedule II controlled substance

MECHANISM OF ACTION:
Fentanyl is a potent opiate receptor agonist causing decreased pain impulse transmission in the CNS and euphoria. Fentanyl causes peripheral vasodilation by depressing the responsiveness of alpha-adrenergic receptors. Since it decreases both preload and afterload, it may also decrease myocardial oxygen demand.

INDICATIONS:
1. Moderate to severe pain
2. Sedation maintenance for mechanically ventilated patients

CONTRAINDICATIONS:
Hypersensitivity

PRECAUTIONS:
1. Respiratory depression
2. Severe heart disease
3. Geriatrics
4. Pregnancy (C), increases to (D) when administered for prolonged periods or high doses when administered to patients who are close to full term
5. Liver / kidney failure (may prolong duration)

DOSAGE:

Adults:
- 1.0 - 3.0 mcg / kg slow IVP, every 20 - 30 minutes as needed
- 2 mcg/kg INTRANASAL (first dose max of 50 mcg) ½ dose in each nostril. May consider additional dose of up to 100 mcg after 5 minutes if pain persists.

Pediatrics:
- 2 mcg/kg INTRANASAL (first dose max of 50 mcg) ½ dose in each nostril. May consider additional dose of up to 100 mcg after 5 minutes if pain persists.
- 1.0 mcg / kg slow IVP

ONSET:
IN: 1-3 minutes IV: 1 - 3 minutes IM: 10 - 20 minutes

DURATION:
1 - 2 hours, with peak effects 30 minutes post administration

FENTANYL

SIDE EFFECTS	
• Dizziness	• Lightheadedness
• Altered level of consciousness	• Bradycardia
• Hallucinations	• Tachycardia
• Euphoria	• Nausea & Vomiting
• Mental impairment	• CNS depression
• Hypotension	• Respiratory depression
• Seizures (rare)	• Muscle rigidity

INTERACTIONS:

1. CNS depressants may enhance effects (antihistamines, anti-emetics, sedatives, hypnotics, barbiturates, and alcohol.
2. Do not mix in line with heparin.

PEARLS:

1. Fentanyl MUST be given slowly, as chest wall muscle rigidity, seizures, and hypotension have been associated with rapid administration.
2. Fentanyl is significantly more potent than Morphine (approximately 50 - 100 times as potent, mg to mg). At clinically equivalent doses, Fentanyl is similar in effectiveness to morphine, with a quicker onset and shorter duration.
3. Compared to other opiates (e.g., Demerol or Morphine), it has less profound adverse effects, minimal histamine release, and does not adversely affect the seizure threshold.
4. Apnea and significant respiratory depression have been noted with doses > 5 mcg / kg.
5. Any opiate analgesics can cause spasm of the Sphincter of Oddi (ampulla) and the renal tract. Fentanyl is not believed to have any more adverse effect on this than Morphine.
6. Narcotic analgesia used to be considered contraindicated in the pre-hospital setting for abdominal pain of unknown etiology. It was thought that analgesia would hinder the ER physician or surgeon's evaluation of abdominal pain. It is now becoming widely recognized that severe pain actually confounds physical assessment of the abdomen and that narcotic analgesia rarely diminishes all of the pain related to the abdominal pathology. It would seem to be both prudent & humane to "take the edge off of the pain" in this situation, with the goal of reducing, not necessarily eliminating the discomfort. Additionally, in the practice of modern medicine the exact diagnosis of the etiology of abdominal pain is rarely made on physical examination alone, but also includes laboratory tests, x-ray, ultrasound, and CT scan, essential in the diagnosis of abdominal pain. Therefore medication of abdominal pain is both humane and appropriate medical care.

SECTION: Medication Reference

PROTOCOL TITLE: Furosemide

REVISED: 06/2015

Medication
13-17

FUROSEMIDE

DRUG NAME: Furosemide

TRADE NAME: Lasix

DRUG CLASS:
Sulfonamide-type loop diuretic

MECHANISM OF ACTION:
Furosemide inhibits the reabsorption of both sodium and chloride in the ascending limb of the loop of Henle, resulting in an excretion of sodium, chloride, and water. In addition, it increases renal excretion of potassium, hydrogen, calcium, magnesium, bicarbonate, ammonium, and phosphate. Furosemide also decreases left ventricular filling pressure (preload) by first decreasing peripheral vascular resistance and increasing peripheral venous capacity.

INDICATIONS:
1. Pulmonary edema
2. Heart failure (HF)

CONTRAINDICATIONS:
1. Hypovolemia, dehydration
2. Severe pre-existing electrolyte
3. Hypersensitivity to sulfonamides and thiazides

PRECAUTIONS:
1. Diabetes mellitus (may worsen control)
2. Renal disease
3. Hepatic disease
4. Anuria
5. Pregnancy (C)
6. May cause electrolyte imbalance

DOSAGE:
Adults:
- Recommend 20 - 80mg slow IVP for adults

Pediatrics:
- 0.5 – 1.0 mg / kg slow IVP, maximum dose of 6.0 mg / kg / day

ONSET:
5 minutes, peak at 10 - 20 minutes

DURATION:
6 hours

FUROSEMIDE

SIDE EFFECTS	
• Transient or permanent hearing loss, • Tinnitus • Hypovolemia • Hyperglycemia • Hyperuricemia	• Hypotension • Hypokalemia (or other electrolyte imbalances) • Weakness • Dizziness

INTERACTIONS:

1. Incompatible with any drug in syringe.
2. Additive effects – Anti-hypertensive's, nitrates, and other diuretics.

PEARLS:

1. The secret to avoiding transient / permanent deafness or tinnitus when administering furosemide is to administer it *SLOWLY*. "Ototoxicity increased proportionately as the rate of infusion of parenteral furosemide increased from 4 mg / min (no ototoxicity), to 5 - 6 mg / min (no ototoxicity), to 25 mg / min (9 / 15 patients developed reversible hearing loss), to 67 mg / min (10 / 10 patients developed tinnitus and deafness that persisted for 90 minutes.[1]
2. When administering the medication to a pregnant patient, the benefits must outweigh the risks (life or limb situation).
3. In the pre-hospital setting, furosemide should be administered IV, to the extent practical.
4. The initial effects from increased venous capacitance should be seen within about 5 minutes. Diuresis will begin within 15 - 30 minutes after administration.

Age	Pre-term	Term	6 months
Weight (lb / kg)	3.3 lb 1.5 kg	6.6 lb 3 kg	17.6 lb 8 kg
Furosemide 0.5 mg / kg	0.75 mg	1.5 mg	4.0 mg
Furosemide 1.0 mg / kg	1.5 mg	3.0 mg	8.0 mg

Age	1 year	3 years	6 years	8 years	10 years	12 years	14 years
Weight (lb / kg)	22 lb 10 kg	30.8 lb 14 kg	44 lb 20 kg	55 lb 25 kg	75 lb 34 kg	88 lb 40 kg	110 lb 50 kg
Furosemide 0.5 mg / kg	5.0 mg	7.0 mg	10.0 mg	12.5 mg	17.0 mg	20.0 mg	25.0 mg
Furosemide 1.0 mg / kg	10.0 mg	14.0 mg	20.0 mg	25.0 mg	34.0 mg	40.0 mg	50.0 mg

[1] DeVito JM, Vance JR. Furosemide-associated ototoxicity. Clinical Pharm. 1983; 2:507-9.

SECTION: Medication Reference

PROTOCOL TITLE: Glucagon

REVISED: 06/2015

Medication
13-18

GLUCAGON

DRUG NAME: Glucagon

TRADE NAME: Glucagon

DRUG CLASS:
Pancreatic hormone (α_2 cells in pancreas)

MECHANISM OF ACTION:
Glucagon increases blood glucose by stimulating glycogenolysis and inhibiting conversion of glucose to glycogen. This process stimulates gluconeogenesis (metabolism of glucose in the liver), relaxes the smooth muscle of the GI tract, and produces positive inotropic and chronotropic effects.

INDICATIONS:
1. Hypoglycemia
2. β-blocker or calcium channel blocker toxicity

CONTRAINDICATIONS:
1. Known hypersensitivity
2. Known insulinoma (can precipitate hypoglycemia secondary to insulin release)
3. Known pheochromocytoma (can precipitate substantial hypertension secondary to catecholamine release)

PRECAUTIONS:
1. Cardiac disease, CAD
2. Geriatrics
3. Malnutrition
4. Alcoholism
5. Hepatic disease
6. Renal insufficiency
7. Pregnancy (B)

DOSAGE:

Adults:

Hypoglycemia
- 1.0 mg IM

Beta blocker Overdose
- 1.0 mg IVP / IO if no response to atropine. If no response in five (5) minutes, administer one (1) repeat dose 1 mg IVP / IO.

Calcium channel blocker overdose
- 1.0 mg IVP / IO if no response to calcium chloride. If no response in five (5) minutes, administer one (1) repeat dose 1 mg IVP / IO.

GLUCAGON

Pediatrics:

Hypoglycemia

- Less than 20 kg: 0.5 mg IM
- Greater than or equal to 20 kg: 1mg IM

Beta blocker Overdose

- 1.0 mg IVP / IO if no response to atropine. If no response in five (5) minutes, administer one (1) repeat dose 1 mg IVP / IO.

Calcium channel blocker overdose

- 1.0 mg IVP / IO if no response to calcium chloride. If no response in five (5) minutes, administer one (1) repeat dose 1 mg IVP / IO.

ONSET:
IV – 5 - 20 minutes
IM – 30 minutes

DURATION:
1 - 2 hours

SIDE EFFECTS	
• Nausea and vomiting • Angina (rare)	• Urticaria (rare) • Dizziness (rare)

INTERACTIONS:
Beta blockers may interfere with glucagon's actions

PEARLS:

1. Glucagon only works when there are normal liver stores of glycogen. It will not work in patients with chronic hypoglycemia, malnutrition, starvation. It also may not work in patients with chronic alcoholism for similar reasons, including hepatic disease.
2. First line treatment for hypoglycemia is always glucose. Use glucagon as a last resort in insulin-dependent diabetics as they will already have depleted stores of glycogen. Glucagon will deplete glycogen stores further and it takes some time for the stores to regenerate.
3. Any patient receiving glucagon should be transported to an appropriate medical facility to be monitored for refractory hypoglycemia.

Age	Term	3 months	6 months	1 year	3 years	6 years	8 years
Weight (lb / kg)	6.6 lb 3 kg	13.2 lb 6 kg	17.6 lb 8 kg	22 lb 10 kg	30.8 lb 14 kg	44 lb 20 kg	55 lb 25 kg
Glucagon	0.5 mg	0.5 mg	0.5 mg	0.5 mg	0.5 mg	1.0 mg	1.0 mg

SECTION: Medication Reference

PROTOCOL TITLE: Ipratropium

REVISED: 06/2015

Medication
13-19

IPRATROPIUM

DRUG NAME: Ipratropium Bromide

TRADE NAME: Atrovent

DRUG CLASS: Anti-cholinergic

MECHANISM OF ACTION:
Ipratropium antagonizes the action of acetylcholine by blocking muscarinic cholinergic receptors, resulting in bronchodilation and drying of respiratory tract secretions.

INDICATIONS:
1. Bronchial asthma
2. Bronchospasm in acute exacerbation of COPD (chronic bronchitis, emphysema)
3. Bronchospasm in: Anaphylaxis, Burns, Toxic inhalations
4. Bronchospasm associated with cardiac asthma

CONTRAINDICATIONS:
1. Known hypersensitivity .
2. Known hypersensitivity to atropine, atropine derivatives, or bromide

PRECAUTIONS:
1. Cardiac disease, CAD
2. Hypertension
3. Geriatrics
4. Pregnancy (B)

DOSAGE:

Adults:

Nebulizer

- 0.5 mg via nebulizer with 6 – 8 liters of Oxygen. Do not repeat

Pediatrics:

Nebulizer

- 0.25 mg via nebulizer with 6 – 8 liters of Oxygen. Do not repeat

ONSET:
5 - 15 minutes

DURATION:
4 - 6 hours

IPRATROPIUM

SIDE EFFECTS	
• Palpitations • Cough, dry mouth • Blurred vision • Anxiety, nervousness	• Dizziness • Headache • Rash • Nausea & vomiting

INTERACTIONS:

None

PEARLS:

1. The nebulizer system can be adapted to accommodate a mask if the patient is too fatigued or working too hard to hold the nebulizer. It can also be adapted to ET administration. Both ET and mask nebulizer treatments should have an O_2 flow rate of 8 - 10 L / minute.
2. The medication chamber should be kept upright to ensure efficient medication administration, patients have a tendency to tilt the chamber, recheck it often. "*Tap*" the container toward the end of the treatment to ensure complete administration.
3. All patients receiving nebulizer beta agonists and / or anti-cholinergics should be observed for at least one (1) hour after treatment.
4. Patients, when appropriate, should have a cardiac monitor and have venous access established along with bronchodilator treatment.
5. Monitor for dramatic increase in heart rate, development of frequent ventricular ectopy, or development of serious CNS symptoms.
6. Atrovent has some immediate effects, but peak effects are delayed. Therefore, Atrovent is more appropriate for maintenance treatment than for acute bronchospasm. Thus, administration of Atrovent alone is not useful in our setting. In combination with Albuterol, Atrovent promotes more effective, maintainable bronchodilation than Albuterol alone.

SECTION: Medication Reference

PROTOCOL TITLE: Lorazepam

REVISED: 06/2015

Medication
13-20

LORAZEPAM

DRUG NAME: Lorazepam

TRADE NAME: Ativan

DRUG CLASS:
1. Benzodiazepine
2. Anticonvulsant
3. Schedule IV Controlled Substance

MECHANISM OF ACTION:
Lorazepam acts at the level of the limbic, thalamic, and hypothalamic regions of the Central Nervous System (CNS) by enhancing effects the neurotransmitter GABA (inhibitory neurotransmitter). Lorazepam also decreases nerve cell activity in all regions of CNS. As an anticonvulsant, lorazepam augments pre-synaptic inhibitions of neurons, limiting the spread of electrical activity. However, lorazepam does not alter the electrical activity of the seizure's focus.

INDICATIONS:
1. Major motor seizures
2. Status epilepticus
3. Sedation maintenance for mechanically ventilated patients
4. Sedation prior to cardioversion
5. Acute anxiety
6. Management of alcohol withdrawal symptoms

CONTRAINDICATIONS:
1. Shock
2. Coma
3. Respiratory depression
4. Current substance abuse (relative)
5. Hypersensitivity
6. Pregnancy (D)
7. Closed angle glaucoma

PRECAUTIONS:
1. Reduce dose for geriatrics
2. Hepatic dysfunction
3. Renal insufficiency
4. History of drug addiction
5. Parkinson's Disease
6. Myasthenia gravis

Medication
13-20
Continued

LORAZEPAM

DOSAGE:

Adults:

Status Epilepticus

- 2.0 mg - 4.0 slow IVP / IM. Dose may be repeated once. Maximum total dose of 10.0 mg

Cardioversion/ Pacing/ Sedation

- 1.0 – 2.0 mg IVP. Dose may be repeated once.

Behavioral Emergency

- 1.0 – 2.0 mg IVP / IM. Dose may be repeated once.

Sedation Maintenance

- 0.05 mg / kg slow IVP, every 30 minutes as needed, maximum single dose 1.0 mg.

Pediatrics:

Status Epilepticus

- 0.1 mg / kg slow IVP/ IM. Dose may be repeated once in 5 - 10 minutes to a maximum dose of 2.0 mg.

Cardioversion/ Pacing/ Sedation

- 0.05 – 0.1 mg / kg slow IVP. Maximum total dose of 2.0 mg.

ONSET:

IV: 5 - 15 minutes
IM: 20 - 30 minutes (highly variable)

DURATION:

IV: 6 - 8 hours
IM: 24 - 48 hours

SIDE EFFECTS	
Minor	**Major**
• CNS depression • Dizziness • Drowsiness • Lethargy • Ataxia	• Respiratory depression • Apnea • Hypotension • Paradoxical CNS stimulation • Bradycardia • Cardiac arrest

INTERACTIONS:

Additive with other CNS depressants

PEARLS:

1. Stocked by ODEMSA only when diazepam is unavailable.
2. Inadvertent intra-arterial injection may produce arteriospasms, resulting in gangrene that may require amputation.
3. Lorazepam expires in six weeks when not refrigerated. Do not use if discolored or if solution contains precipitate.
4. To avoid patient discomfort, Lorazepam should be injected into a large muscle or large vein.
5. As a dosing guideline, 2 mg of Lorazepam is roughly equivalent to 5 mg of diazepam.

LORAZEPAM

LORAZEPAM

This page intentionally
left blank.

SECTION: Medication Reference

PROTOCOL TITLE: Magnesium Sulfate

REVISED: 06/2015

Medication
13-21

MAGNESIUM SULFATE

DRUG NAME: Magnesium Sulfate

TRADE NAME: Mag, Mag Sulfate, $MgSO_4$, Mg^{++}

DRUG CLASS:
1. Antidysrhythmic
2. Anticonvulsant
3. CNS Depressant

MECHANISM OF ACTION:
As an antidysrhythmic, magnesium sulfate is a physiological calcium channel blocker that reduces SA node impulse formation and prolongs conduction time in the myocardium. Magnesium sulfate is a skeletal and smooth muscle relaxer by blocking neurotransmitter release at the neuromuscular junction.

INDICATIONS:
1. Torsades de Pointes
2. Refractory V-Fib or V-Tachycardia (with or without pulse) with suspected hypomagnesemia
3. Seizure prevention and control in preeclampsia and eclampsia
4. Status asthmaticus unresponsive to β agonists or anticholinergics

CONTRAINDICATIONS:
1. Heart block
2. Myocardial infarction
3. Hypermagnesemia

PRECAUTIONS:
Renal insufficiency

DOSAGE:

Adults:

Refractory VT, VF, and Torsades de Pointe
- 1.0 - 2.0 gm in 50 cc Normal Saline over 5 - 10 minutes.

Refractory bronchospasm
- 1.0 - 2.0 gm in 50 cc Normal Saline over 5 - 10 minutes.

Eclampsia
- 2.0 gm in 250 ml Normal Saline over 5 - 10 minutes.

Pediatrics:

Refractory VT, VF, and Torsades de Pointe
- 25 - 50 mg / kg in 50 cc over 5 - 10 minutes. Max dose 2 gm.

Refractory bronchospasm
- 25 - 50 mg / kg in 50 cc over 5 - 10 minutes. Max dose 2 gm.

MAGNESIUM SULFATE

ONSET:
IV: Immediate
IM: 3 - 4 hours

DURATION:
IV: 30 - 60 minutes
IM: 3 - 4 hours

SIDE EFFECTS	
• Flushing, diaphoresis • Itching, rash • Hypothermia • Drowsiness • Respiratory depression / Failure • Bradycardia, AV heart block	• Cardiac arrest • Circulatory collapse • Complete heart block • Flaccid paralysis • Absence of knee jerk • Hypotension

INTERACTIONS:
1. Incompatible with alcohol, salicylates, and sodium bicarbonate
2. Additive effects can occur with other CNS depressants
3. Concurrent use with nifedepine in the treatment of maternal hypertension can cause increased hypotension or pronounced muscle weakness and may harm the fetus.
4. Can cause cardiac conduction abnormalities when used in conjunction with cardiac glycosides.

IV Infusion for Refractory VT / VF, Torsades de Pointe, or Bronchospasm (25 - 50 mg / kg [Pediatric] or 1.0 -2 .0 gm [Adult] over 10 minutes)
Add Magnesium Sulfate to 50 ml Normal Saline and attach 10 gtts IV tubing. Run at 50 gtts / min.

IV Infusion for Eclampsia (2.0-4.0 gm over 5 - 10 minutes)
Add 2.0 gm of Magnesium Sulfate in 250 ml Normal Saline and attach 10 gtts IV tubing. Run wide open or at 250 gtts / min if attached to infusion pump.

PEARLS:
1. In some cases of Torsades de Pointes, 5.0 - 9.0 gm of magnesium sulfate has been required.
2. As a smooth muscle relaxant, magnesium sulfate is also a potentially effective second line intervention in cases of severe, refractory bronchospasm secondary to Asthma.
3. Use magnesium sulfate aggressively in the setting of eclampsia. If eclamptic seizures are refractory to magnesium sulfate, then proceed to benzodiazepines.

SECTION: Medication Reference

PROTOCOL TITLE: Metoprolol

REVISED: 06/2015

Medication
13-22

METOPROLOL

DRUG NAME: Metoprolol Tartrate

TRADE NAME: Lopressor, Toprol XL

DRUG CLASS:
1. Beta-adrenergic blocking agent
2. Anti-hypertensive selective β_1-blocker

MECHANISM OF ACTION:
Metoprolol blocks the action of the sympathetic nervous system, a portion of the involuntary nervous system, by blocking beta receptors on sympathetic nerves.

INDICATIONS:
ST elevation myocardial infarction

CONTRAINDICATIONS:
1. Heart rate less than 70 / minute
2. Systolic blood pressure less than 120 mmHg
3. 2nd or 3rd degree heart block
4. Cardiogenic shock
5. Decompensated cardiac failure
6. Sick sinus syndrome
7. Hypersensitivity
8. Asthma
9. Erectile dysfunction medication use

PRECAUTIONS:
1. Liver dysfunction
2. Renal dysfunction
3. Pulmonary disease
4. Diabetes mellitus
5. MAOI use within past 14 days
6. Concurrent administration with Diltiazem (may cause severe hypotension)
7. Pregnancy (C)

DOSAGE:

Adults:
- 5 mg IV over 5 minutes. Repeat once after 5 minutes. Maximum dose: 15 mg

Pediatrics:
- Not recommended

ONSET:
IV: Immediate

Medication
13-22
Continued

METOPROLOL

DURATION:
IV: 5 - 8 hours

SIDE EFFECTS	
• Abdominal cramping • Nausea & vomiting • Lightheadedness • Bradycardia • Hypotension	• Shortness of breath • Asthma exacerbation • Fever • Fatigue

INTERACTIONS:
Patients may require an adjustment of their insulin dosage, due to the drugs ability to increase blood glucose levels.

SECTION: Medication Reference

PROTOCOL TITLE: Midazolam

REVISED: 06/2015

Medication
13-23

MIDAZOLAM

DRUG NAME: Midazolam

TRADE NAME: Versed

DRUG CLASS:
1. Benzodiazepine (non-barbiturate sedative-hypnotic agent)
2. Schedule IV controlled substance

MECHANISM OF ACTION:
Midazolam acts at the level of the limbic, thalamic, and hypothalamic regions of the Central Nervous System (CNS) by enhancing effects the neurotransmitter GABA (inhibitory neurotransmitter). Midazolam also decreases nerve cell activity in all regions of CNS. As an anticonvulsant, midazolam augments pre-synaptic inhibitions of neurons, limiting the spread of electrical activity. However, midazolam does not alter the electrical activity of the seizure's focus.

INDICATIONS:
1. Sedation prior to cardioversion
2. Sedation maintenance in mechanically ventilated patients
3. Seizure control

CONTRAINDICATIONS:
1. Shock
2. Coma
3. Hypersensitivity
4. Closed angle glaucoma
5. Pregnancy (D)

PRECAUTIONS:
1. Patients with respiratory insufficiency (asthma, COPD, etc.) are more susceptible to respiratory depression
2. Effects are enhanced by other CNS depressants
3. Elderly
4. Hypotension
5. Use caution when administering to patients with:
   - Hepatic dysfunction
   - Renal insufficiency
   - History of drug addiction
   - Parkinson's disease
   - Myasthenia gravis

DOSAGE:

Adults:

Status epilepticus, Cardioversion and pacing
- 2.5 mg IVP, every 5 minutes as needed, maximum total dose of 20.0 mg.

MIDAZOLAM

- 0.2 mg / kg INTRANASAL (max single dose 10 mg)

Sedation

- 0.1 mg / kg slow IVP, every 20 - 30 minutes as needed, maximum single dose 5.0 mg.

Pediatrics:

- 0.05-0.1 mg/kg slow IVP
- 0.2 mg/kg INTRANASAL (max 10 mg half dose per nostril)

ONSET:
IN: 1 - 3 minutes
IV: 1 - 3 minutes
IM: 5 - 15 minutes

DURATION:
2 hours (dose dependant)

SIDE EFFECTS	
Minor	**Major**
• Nausea & vomiting • Headache • Drowsiness • Lethargy • Cough • Hiccups	• Respiratory depression • Apnea • Hypotension • Paradoxical CNS stimulation (i.e., Valium rage) • Cardiac arrest

INTERACTIONS:
Additive with other CNS depressants

PEARLS:

1. Premedication with an opiate may potentiate Midazolam, reducing the dose 30 - 50% is suggested.
2. Can cause phlebitis and pain at the IM injection sight.
3. Has more potential than other benzodiazepines to cause respiratory depression and arrest. Slower administration may reduce the respiratory depressant potential. Use with extreme caution in pediatrics.
4. Elderly, debilitated, or patients under the influence of other CNS depressants require reduced dosages.
5. Midazolam is preferred over other benzodiazepines in cases without IV access due to more rapid IM absorption; however it may have more profound respiratory depression.

SECTION: Medication Reference

PROTOCOL TITLE: Morphine Sulfate

REVISED: 06/2015

Medication
13-24

MORPHINE SULFATE

DRUG NAME: Morphine Sulfate

TRADE NAME: Duramorph, Morphine, MS, MSO_4

DRUG CLASS:
1. Narcotic analgesic
2. Opiate
3. Schedule II controlled substance

MECHANISM OF ACTION:
Morphine Sulfate interacts with opiate receptors which decreases pain impulse transmission at the spinal cord level and higher in the central nervous system (CNS). Morphine, being a potent μ-opiate receptor agonist, also causes peripheral vasodilation. This vasodilation increases venous capacity and decreases venous return (chemical phlebotomy) by depressing the responsiveness of alpha-adrenergic receptors. Since it decreases both preload and afterload it may decrease myocardial oxygen demand.

INDICATIONS:
1. Moderate to severe pain
2. Pulmonary edema
3. MI with ST elevation
4. Sedation maintenance in mechanically ventilated patients

CONTRAINDICATIONS:
1. Hypovolemia
2. Hypotension
3. Hypersensitivity
4. Head injury
5. Patients who have taken MAOIs within 14 days

PRECAUTIONS:
1. Respiratory depression
2. Severe heart disease
3. May worsen bradycardia or heart block in inferior MI (vagotonic effect)
4. Geriatrics
5. Hepatic / renal disease
6. Pregnancy (C), increases to (D) if used for prolonged periods of high doses in patients close to full term

MORPHINE SULFATE

DOSAGE:

Adults:

Pain management, STEMI, Pulmonary edema

- 2.5 - 5.0 mg IVP or 5.0 - 10.0 mg IM. Dosage may be repeated every 5 - 10 minutes as needed
- Contact **Medical Control** for orders to exceed 10 mg total administration

Sedation

- 1.0 – 3.0 mg slow IVP, every 30 - 45 minutes as needed

Pediatrics:

- 0.1 - 0.2 mg / kg IVP. Dosage may be repeated every 5 - 10 minutes
- Contact **Medical Control** for orders to exceed 10 mg total administration

ONSET:

IV: 3 - 5 minutes
IM: 15 - 60 minutes

DURATION:

3 - 7 hours

SIDE EFFECTS	
• Dizziness	• Lightheadedness
• Altered level of consciousness	• Bradycardia
• Hallucinations	• Tachycardia
• Euphoria	• Nausea & vomiting
• Mental impairment	• CNS depression
• Hypotension	• Respiratory depression

INTERACTIONS:

1. CNS depressants may enhance effects (antihistamines, anti-emetics, sedatives, hypnotics, barbiturates, and alcohol).
2. MAOIs may cause paradoxical excitation.

MORPHINE SULFATE

PEARLS:

1. Morphine in RSI / MAI: Morphine has both a longer duration of action and a longer onset time than Fentanyl. It takes as much as 3 - 5 minutes for morphine to adequately sedate a patient. In addition, morphine may not blunt the rise in ICP, tachycardia or hypertension as well as Fentanyl.
2. Give the medication time to work and reduce the normal dose during administration to elderly patients. Repeated doses without giving the initial dose a chance to work may result in profound CNS depression, hypotension, etc.
3. Be judicious in your use of narcotic analgesics, the relief of pain and suffering is one of medicines primary goals, however don't "*snow*" people.
4. Opiate analgesics can cause spasm of the sphincter of Oddi. The sphincter of Oddi is the muscular valve surrounding the exit of the bile duct and pancreatic duct into the duodenum, at the papilla of Vater. In addition similar effects are believed to be true in renal tract. This is not a contraindication for the administration of morphine in these situations, simply a consideration.
5. Narcotic analgesia used to be considered contraindicated in the pre-hospital setting for abdominal pain of unknown etiology. It was thought that analgesia would hinder the ER physician or surgeon's evaluation of abdominal pain. It is now becoming widely recognized that severe pain actually confounds physical assessment of the abdomen and that narcotic analgesia rarely diminishes all of the pain related to the abdominal pathology. It would seem to be both prudent & humane to "*take the edge off of the pain*" in this situation, with the goal of reducing, not necessarily eliminating the discomfort. Additionally, in the practice of modern medicine the exact diagnosis of the etiology of abdominal pain is rarely made on physical examination alone, but also includes laboratory tests, x-ray, ultrasound, and CT scan, essential in the diagnosis of abdominal pain.

MORPHINE SULFATE

This page intentionally left blank.

SECTION: Medication Reference

PROTOCOL TITLE: Naloxone

REVISED: 06/2015

Medication
13-25

NALOXONE

DRUG NAME: Naloxone

TRADE NAME: Narcan

DRUG CLASS:
Narcotic antagonist

MECHANISM OF ACTION:
Naloxone binds competitively to opiate receptor sites, displacing narcotics and synthetic narcotics. Naloxone also antagonizes all actions of narcotics.

INDICATIONS:
1. Complete or partial reversal of depression caused by narcotics or synthetic narcotics
2. Coma of unknown etiology

CONTRAINDICATIONS:
Known hypersensitivity

PRECAUTIONS:
1. Pre-existing cardiac disease
2. Patients who have received cardio-toxic drugs
3. Pregnancy (B)
4. Abrupt and complete reversal can cause withdrawal-type effects
5. Use caution in poly-pharmaceutical overdoses

DOSAGE:

Adults:
- BLS: 2 mg (one vial) INTRANASAL. Divide full dose between nostrils.
- ALS: 0.2 mg / kg INTRANASAL (max 2 mg). Dose may be repeated as necessary.
- ALS: 0.5 mg – 2.0 mg Slow IVP to maintain good spontaneous respiratory effort. Dose may be repeated as needed. Failure to obtain reversal after 10 mg usually indicates another disease process or overdose on non-opioid drugs.

Pediatrics:
- 0.2 mg / kg INTRANASAL (max 2mg). Dose may be repeated as necessary.
- 0.1 mg / kg IVP. Dosage may be repeated as needed.

ONSET:
IN: 1 – 2 minutes
IV: 1 - 2 minutes
IM: 2 - 8 minutes

NALOXONE

DURATION:
30 - 60 minutes

SIDE EFFECTS	
• Tachycardia	• Dysrhythmias
• Hypotension	• Nausea & vomiting
• Hypertension	• Diaphoresis

INTERACTIONS:
Incompatible with alkaline drugs

PEARLS:
1. Many opiates have a longer bioavailability than Naloxone, therefore assess for re-sedation and repeat administration as needed.
2. Failure to obtain reversal after 10 mg usually indicates another disease process or overdose on non-opioid drugs.
3. Use with caution in poly-pharmaceutical overdoses, reversal of opiate may result in an extremely hyperdynamic patient (i.e. "*speedball*").
4. Use just enough Naloxone to reverse severe signs and symptoms (i.e., respiratory depression, loss of airway control, and hypotension). We don't need to completely wake these people up in the field! Doing so may create a situation where a patient may become combative, belligerent, and refuse transport requiring law enforcement intervention.
5. If patient has obviously aspirated, consider bypassing Naloxone administration and transport the patient. Intubate as required.
6. If pushed too rapidly, this medication will induce vomiting.
7. Osterwalder, et al notes that "*In 1000 clinically diagnosed intoxications with heroin or heroin mixtures, from 4 to 30 serious complications can be expected. Such a high incidence of complications is unacceptable and could theoretically be reduced by artificial respiration with a bag valve device (hyperventilation) as well as by administering Naloxone in minimal divided doses, injected slowly.*" This is supported by other studies and case reports as well. It is recommended that a couple of minutes of careful ventilation with a BVM (with Sellick's maneuver) be performed prior to Naloxone administration to decrease the incidence of uncommon, but serious, complications.

SECTION: Medication Reference

PROTOCOL TITLE: Nitroglycerin

REVISED: 06/2015

Medication
13-26

NITROGLYCERIN

DRUG NAME: Nitroglycerin

TRADE NAME: NitroStat, Nitrol, Nitrolingual, Nitro-Bid Ointment, Tridil, Nitro, NTG

DRUG CLASS:
1. Anti-anginal agent
2. Nitrate
3. Vasodilator

MECHANISM OF ACTION:
Nitroglycerin works by relaxing smooth muscle in vessel walls. This causes peripheral vasodilation, which decreases venous return to the heart (reduces preload) and reduces afterload. These actions reduce the workload on the myocardium. Additionally, nitroglycerin causes vasodilation of the coronary arteries, which increase perfusion to ischemic myocardium.

INDICATIONS:
1. Angina or ischemic chest pain
2. Myocardial infarction with ST elevation
3. Acute pulmonary edema

CONTRAINDICATIONS:
1. Head injury
2. Increased intracranial pressure
3. Cerebral hemorrhage
4. Hypotension
5. Hypovolemia
6. Hypersensitivity to nitrates
7. Constrictive Pericarditis
8. Pericardial effusion
9. Recent erectile dysfunction medication use in past 24 hours, Cialis® (Tadalafil), Viagra® (Sildenafil), Levitra® (Vardenafil HCl)
10. Severe anemia (causes oxidation of hemoglobin to methemoglobin and could exacerbate anemia)

PRECAUTIONS:
1. Nitroglycerin deteriorates rapidly after bottle is opened, bottle should be opened and dated, and also protected from light
2. Use with caution in patients with closed-angle glaucoma, may increase intraocular pressure
3. Elderly may be more susceptible to the effect of nitrates
4. Hepatic disease (metabolism may be impaired and lead to increased risk of Methemoglobinemia)
5. Postural hypotension
6. Pregnancy (C)

Medication
13-26
Continued

NITROGLYCERIN

DOSAGE:

Adults:

Tablet:

- One tablet (0.4 mg) sublingual, may be repeated every 3 - 5 minutes (up to 3 SL) for chest pain
- Two tablets (0.4 mg) SL, repeated every 5 minutes for HF

Ointment:

- 1.0 inch of ointment (15 mg)

IV infusion:

- Begin administration at 5 mcg / min. Infusion may be increased 5 – 10 mcg / min every 5 minutes, max dose of 200 mcg / min

Pediatrics:

- Not normally recommended for pre-hospital use

ONSET:

Tablet: 1 - 3 minutes
Ointment: 20 - 60 minutes
IV: Immediate

DURATION:

Tablet: Up to 30 minutes
Ointment: 4 - 8 hours
IV: Several minutes, dose dependent

SIDE EFFECTS	
• Headache, due to vasodilation • Hypotension • Dizziness • Nausea and vomiting • Xerostomia (dry mouth) • Reflex tachycardia • Skin rash	• Flushing • Anxiety • Agitation • Methemoglobinemia (rare, usually with high doses of the IV formulation, but can be seen with normal therapeutic doses)

INTERACTIONS:

1. Alcohol may produce additive hypotension.
2. Aspirin results in increased serum nitrate concentrations.
3. Additive interaction: Calcium channel blockers and beta-blockers can result in symptomatic orthostatic hypotension.
4. Sympathomimetics may antagonize the effects of nitroglycerin.
5. Nitroglycerin may compromise the efficacy of alteplase, TPA when administered concomitantly.

NITROGLYCERIN

PEARLS:

1. Sublingual tablets: Place tablet under the tongue or in the buccal pouch and allow the tablet(s) to dissolve. Advise patient not to swallow sublingual (intrabuccal) tablets.
2. Apply the nitroglycerin ointment with gloves and to a hair-free region of the torso. Cover with the dose-measuring application paper (may tape in place). Do not rub or massage the ointment as this will cause rapid absorption and interfere with the sustained action.
3. Wear gloves when applying paste. If you get ointment or IV Tridil on your skin, sit down quickly!
4. Orthostatic hypotension, xerostomia (dry mouth), & headache are probably the most common side effects associated with nitroglycerin administration, warn your patient.

NITROGLYCERIN

This page intentionally
left blank.

SECTION: Medication Reference

PROTOCOL TITLE: Levophed

REVISED: 06/2015

Medication
13-27

LEVOPHED

DRUG NAME: Norepinephrine Bitartrate

TRADE NAME: Levophed™, Novaplus®

DRUG CLASS:

1. Positive Ionotrope
2. Sympathomimetic
3. Alpha-adrenergic agonist

MECHANISM OF ACTION:

Norepinephrine functions as a peripheral vasoconstrictor (alpha$_1$-adrenergic agonist) which increases blood pressure and coronary artery blood flow and an inotropic stimulator of the heart (beta$_1$-adrenergic agonist) thereby increasing the force of the contraction.

INDICATIONS:

1. Cardiogenic shock
2. Cardiogenic shock with pulmonary edema (HF)
3. Hypovolemic shock / hypotension (after fluid resuscitation)
4. Neurogenic shock
5. Septic shock

CONTRAINDICATIONS:

1. Hypertension
2. Sulfite allergy
3. Tachydysrhythmias
4. Ventricular fibrillation
5. Ventricular tachycardia
6. Uncorrected hypovolemia
7. Patients with known heochromocytoma

PRECAUTIONS:

1. Use with extreme caution in patients taking (MAOI) or TCA antidepressants because severe, prolonged hypertension may result.
2. May cause necrosis, sloughing at infusion site through extravasation, watch for blanching at site that may indicate this.
3. Pregnancy (C)

Medication
13-27
Continued

LEVOPHED

DOSAGE:

Adults:

- 0.1 – 0.5 mcg / kg / minute, titrated to effect. Infusion is made by adding 4mg of Norepinephrine to 100 mL crystalloid solution (NaCl), yielding 40 mcg/mL concentration.

Pediatrics:

- 0.05 – 0.1 mcg / kg / minute, titrated to effect. Infusion is made by adding 4mg of Norepinephrine to 100 mL crystalloid solution (NaCl), yielding 40 mcg/mL concentration.

ONSET:
Rapid

DURATION:
1 – 2 minutes

SIDE EFFECTS:	
• Dysrhythmias, including ventricular fibrillation and ventricular tachycardia • Hypertension • Headache / Dizziness • Nausea and vomiting • Ischemic injury	• Tremors • Tachycardia • Flushing • Angina, AMI • Ectopy • Stabbing chest pain

INTERACTIONS:

1. Potentiating effects – TCAs, MAOIs
2. May cause hypotension when used concomitantly with MAOIs and TCAs.

PEARLS:

1. Can cause tissue necrosis and sloughing. Take care to avoid infiltration, use central intravenous access or the large veins of the arm.
2. The dose should be titrated to patient's (desired) hemodynamic response.
3. Never leave the patient alone when administering norepinephrine.
4. Use a large vein whenever possible to reduce the risk of extravasation.

60
gtts/mL set

Norepinephrine

4 mg in 100 mL → 40 mcg/mL

Drip rate using 60 gtts set – DROPS per MINUTE

Desired Drip Rate:		mcg/kg/min				
lbs	kg	0.1 mcg/kg/min	0.2 mcg/kg/min	0.3 mcg/kg/min	0.4 mcg/kg/min	0.5 mcg/kg/min
5	2.3	0	1	1	1	2
10	4.5	1	1	2	3	3
15	6.8	1	2	3	4	5
20	9.1	1	3	4	5	7
25	11.4	2	3	5	7	9
30	13.6	2	4	6	8	10
35	15.9	2	5	7	10	12
40	18.2	3	5	8	11	14
45	20.5	3	6	9	12	15
50	22.7	3	7	10	14	17
55	25.0	4	8	11	15	19
60	27.3	4	8	12	16	20
65	29.5	4	9	13	18	22
70	31.8	5	10	14	19	24
75	34.1	5	10	15	20	26
80	36.4	5	11	16	22	27
85	38.6	6	12	17	23	29
90	40.9	6	12	18	25	31
95	43.2	6	13	19	26	32
100	45.5	7	14	20	27	34
125	56.8	9	17	26	34	43
150	68.2	10	20	31	41	51
175	79.5	12	24	36	48	60
200	90.9	14	27	41	55	68
225	102.3	15	31	46	61	77
250	113.6	17	34	51	68	85
275	125.0	19	38	56	75	94
300	136.4	20	41	61	82	102
325	147.7	22	44	66	89	111
350	159.1	24	48	72	95	119

LEVOPHED

LEVOPHED

This page intentionally
left blank.

SECTION: Medication Reference

PROTOCOL TITLE: Ondansetron (Zofran)

REVISED: 01/2018

Medication
13-28

ONDANSETRON (ZOFRAN)

DRUG NAME: Ondansetron

TRADE NAME: Zofran, Zofran ODT

DRUG CLASS:
1. Anti-emetic
2. Selective serotonin (5-ht_3) receptor antagonist

MECHANISM OF ACTION:
Ondansetron reduces the activity of the vagus nerve, which activates the vomiting center in the medulla oblongata, and also blocks serotonin receptors in the chemoreceptor trigger zone. Ondansetron has little effect on vomiting caused by motion sickness.

INDICATIONS:
Moderate to severe nausea and vomiting

CONTRAINDICATIONS:
1. Hypersensitivity
2. Prolonged QT syndrome
3. Concurrent use of Apomorphine (Apokyn), an anti-parkinsonian drug

PRECAUTIONS:
1. Not well studied in children less than 2 years of age
2. Use with caution with patients concurrently using drugs which effect QT interval (i.e., procainamide, amiodarone, tricyclic anti-depressants, and haldol)
3. Use with caution with patients suffering from hepatic impairment (consider prolonging dosage intervals or decreasing dose)

DOSAGE:

Adults:
- 0.1 mg / kg slow IVP over 2 - 5 minutes, max 4.0 mg per dose. If no effect, initial dose may be repeated after 5 minutes.
- 4 mg Orally Disintegrating Tablet. If no effect, dose may be repeated once after 5 minutes.

Pediatrics:
- 0.1 mg / kg slow IVP over 2 - 5 minutes, max 4.0 mg per dose. If no effect, initial dose may be repeated after 5 minutes.

ONSET:
IV/IM: Rapid, with peak effect in 15 - 30 minutes
ODT: Rapid, with peak effect in 1-2 hours

DURATION:
IV: 2 - 4 hours
ODT: 12 – 24 hours

ONDANSETRON (ZOFRAN)

SIDE EFFECTS	
• Sedation • Hypotension • Tachycardia • Angina	• Extra-pyramidal side effects (rare) • Torsades de Pointe (rare) • Constipation

INTERACTIONS:

1. Additive effects with medications that prolong QT interval.
2. Additive CNS depressant effects.

PEARLS:

1. Pregnancy Class B - Usually safe but benefits must outweigh the risks. Ondansetron showed no benefit over the antiemetic Promethazine (Phenergan) (Pregnancy Class C) for Hyper-emesis Gravida (HEG) in a double blinded randomized study. It may be used for cases refractory to other treatments/drugs.
2. The rate of IV administration should not be less than 30 seconds and preferably over 2 - 5 minutes.
3. Avoid use with Apomorphine (Apokyn, Uprima). Apokyn is used to treat Parkinson's disorders, and Uprima is used to treat erectile dysfunction. This is important to note because both of these compositions may promote nausea in some patients.
4. Ondansetron (Zofran) may not be as effective for vertigo and labyrinthitis related nausea and vomiting.
5. Ondansetron (Zofran) is safe and effective for nausea and vomiting in trauma patients and can be used in conjunction with pain management.

Age	Term	6 months	1 year	3 years	6 years	8 years	10 years	12 years	14 years
Weight (lb / kg)	6.6 lb 3 kg	17.6 lb 8 kg	22 lb 10 kg	30.8 lb 14 kg	44 lb 20 kg	55 lb 25 kg	75 lb 34 kg	88 lb 40 kg	110 lb 50 kg
Ondansetron 0.1 mg / kg			1.0 mg	1.4 mg	2.0 mg	2.5 mg	3.5 mg	4.0 mg	4.0 mg

SECTION: Medication Reference

PROTOCOL TITLE: Oxygen

REVISED: 06/2015

Medication
13-29

OXYGEN

DRUG NAME: Oxygen

TRADE NAME: Oxygen

DRUG CLASS:
Medical gas

MECHANISM OF ACTION:
Oxygen is transported to the cells via the hemoglobin found in red blood cells. It breaks down glucose into a usable energy form.

INDICATIONS:
Suspected or possible hypoxia due to trauma or medical emergencies

CONTRAINDICATIONS:
There are no contraindications in the field. Never deprive a patient of oxygen

PRECAUTIONS:
1. Monitor patients with a history of COPD
2. Prolonged administration of high flow may cause damage to neonate eyes - retrolental fibroplasia (RLF)

DOSAGE:

Adults and pediatrics: Titrate dosages to maintain SPO_2 > 94% but < 100%

- 2 - 4 LPM Nasal Cannula
- 10 - 15 LPM non-rebreather mask
- 15 LPM bag-valve-mask

ONSET:
Immediate

DURATION:
Therapeutic effects probable as long as delivery is continued

SIDE EFFECTS	
Minor	
• Drying of mucous membranes • Nasal Irritation	• Epistaxis

OXYGEN

This page intentionally
left blank.

SECTION: Medication Reference

PROTOCOL TITLE: Prednisone

REVISED: 06/2015

Medication
13-30

PREDNISONE

DRUG NAME: Prednisone

TRADE NAME: Deltasone, Meticortem, Orasone, Steripred

DRUG CLASS: Corticosteroid

MECHANISM OF ACTION:
Prednisone's mechanism of action is not clearly defined although it is known that it decreases inflammation. This is accomplished mainly by its ability to stabilize leukocyte lysosomal membranes and suppress immune response.

INDICATIONS:
1. Severe exacerbation of asthma
2. Allergic reaction / anaphylaxis

CONTRAINDICATIONS:
1. Hypersensitivity
2. Children less than 3 years of age

PRECAUTIONS:
1. Recent myocardial infarction
2. Gastrointestinal ulcers
3. Renal disease
4. Diabetes mellitus
5. Hypertension
6. Cirrhosis
7. Hypothyroidism
8. Heart failure
9. Pregnancy (C)

DOSAGE:

Adults:
- 60 mg PO

Pediatrics:
- 1.0 - 2.0 mg / kg PO

ONSET:
Variable

DURATION:
Variable

Medication
13-30
Continued

PREDNISONE

SIDE EFFECTS	
• Hypertension • Pulmonary edema	• Hypokalemia • Hypocalcemia

INTERACTIONS:

1. May increase glucose and cholesterol levels.
2. May cause false-negative results in nitroblue tetrazolium test for systemic bacterial infections.

Medication
13-31

SECTION: Medication Reference

PROTOCOL TITLE: Sodium Bicarbonate

REVISED: 06/2015

SODIUM BICARBONATE

DRUG NAME: Sodium Bicarbonate

TRADE NAME: Bicarb, $NaHCO_3$

DRUG CLASS: Alkalinizing agent

MECHANISM OF ACTION:
In the presence of hydrogen ions, sodium bicarbonate dissociates to sodium and carbonic acid, the carbonic acid picks up a hydrogen ion changing to bicarbonate and then dissociates into water and CO_2, functioning as an effective buffer and alkalinizing the blood. In summary, increases plasma bicarbonate, which can buffer metabolic acids and move tricyclic anti-depressants and phenobarbital off receptor sites and back into circulation.

INDICATIONS:
1. Pre-existing metabolic acidosis (severe hypoxia, extended cardiac arrest).
2. Hyperkalemia
3. Tricyclic or phenobarbital overdose
4. Crush injury / entrapment

CONTRAINDICATIONS:
1. None when used in severe hypoxia and extended cardiac arrest
2. Metabolic alkalosis
3. Respiratory alkalosis
4. Hypokalemia
5. Hypocalcemia
6. Hypernatremia (administration of sodium may be detrimental)
7. Severe pulmonary edema (administration of sodium may be detrimental)

PRECAUTIONS:
1. Bicarbonate administration produces CO_2, which crosses cell membranes more rapidly than the bicarbonate itself, potentially worsening intracellular acidosis
2. Heart failure (may worsen)
3. Pregnancy (C)
4. Infiltration can cause tissue necrosis
5. Renal disease

DOSAGE:

Adults:
- 1.0 mEq / kg IV bolus, may repeat ½ dose 10 minutes thereafter, as needed.

SODIUM BICARBONATE

Pediatrics:

- 1.0 mEq / kg IV bolus, may repeat ½ dose 10 minutes thereafter, as needed.

ONSET:
IV: 2 - 10 minutes

DURATION:
30 - 60 minutes

SIDE EFFECTS:

- Alkalosis
- Hyper-irritability
- Seizures
- Tetany (electrolyte imbalance)
- Hypernatremia
- Hyperosmolality
- Lowering of serum K^+
- Cardiac and respiratory arrest
- Increased binding of calcium to serum proteins
- Decreased fibrillation threshold
- Sodium and water overload
- Inhibition of oxygen release to tissue

INTERACTIONS:
Most sympathomimetics will be deactivated by alkaline solutions. Be sure to flush IV line before & after administration to avoid inactivating sympathomimetics and precipitating with Calcium Chloride.

PEARLS:

1. Few calcium salts will form a precipitate and clog the IV line.
2. Use relatively early in the setting of confirmed TCA overdoses. Tachycardia (even before QRS widening) and CNS depression are symptomatic enough to initiate alkalinization. By the time hypotension develops, the patient is often close to the seizure threshold and may be too late to benefit from sodium bicarbonate.
3. Ensure IV is patent to avoid tissue sloughing at the injection site.

SECTION: Medication Reference

PROTOCOL TITLE: Toradol

REVISED: 07/2017

Medication
13-32

TORADOL

DRUG NAME: Ketorolac tromethamine

TRADE NAME: Toradol

DRUG CLASS:
1. Nonsteroidal anti-inflammatory

MECHANISM OF ACTION:
Anti-inflammatory, antipyretic, and analgesic effects from the inhibition of protsaglandin syntheses by competitive blocking of the enzyme cyclooxygenase (COX). Ketorolac is a non-selective COX inhibitor. Unlike opioids, does not depress respiratory drive.

INDICATIONS:
Short-term management of moderately severe acute pain requiring analgesia at the opioid level.

CONTRAINDICATIONS:
1. Peptic ulcer disease
2. Recent gastrointestinal bleeding or perforation
3. Advanced renal impairment and those at risk for renal failure
4. Confirmed cerebrovascular bleeding or other known bleeds
5. People on blood thinners and/or aspirin therapy
6. Pregnancy/nursing mothers
7. Alcohol intolerance
8. NSAID hypersensitivity/allergy

PRECAUTIONS:
1. May cause peptic ulcers, gastrointestinal bleeding and/or perforation of the stomach or intestines
2. Elderly are at increased risk for developing complications
3. May increase the risk of thrombotic events

DOSAGE:

Adults:
- 15 mg IV or 30 mg IM every 6 hours, not to exceed 60 mg/day

Pediatrics:
- 0.5 mg/kg – 1 mg/kg IM/IV every 6 hours, not to exceed 30 mg/dose

Medication
13-32
Continued

TORADOL

ONSET:
Approximately 30 minutes with peak at 1-2 hours

DURATION:
5 – 6 hours

SIDE EFFECTS		
• ringing in the ears • mild heartburn • diarrhea • Headache	• Bloating/gas • Facial swelling • Dizziness • Lightheadedness	• Bruising • Nausea / Vomiting • Diaphoresis • Vomiting

INTERACTIONS:
1. Potentiating effects: anticoagulants (warfarin, xarelto, eloquis)
2. Potentiating effects: corticosteroids (solumedrol, dexamethasone)

SECTION: Medication Reference

PROTOCOL TITLE: Vasopressin

REVISED: 06/2015

Medication
13-32

VASOPRESSIN

DRUG NAME: Vasopressin, ADH

TRADE NAME: Pitressin

DRUG CLASS: Exogenous, parenteral form of anti-diuretic hormone (ADH)

MECHANISM OF ACTION:
Vasopressin provides direct stimulation of smooth muscle V1 receptors, causing intense peripheral vasoconstriction of skin, skeletal muscle, intestine, and fat with less constriction of coronary and renal vascular beds. In unnaturally high doses, vasopressin also acts as a non-adrenergic peripheral vasoconstrictor. Vasopressin produces no skeletal muscle vasodilation or increased myocardial oxygen demand during CPR because it has no beta-adrenergic activity.

INDICATIONS:
Cardiac arrest

CONTRAINDICATIONS:
None in the arrest setting

PRECAUTIONS:
1. Epilepsy
2. Heart failure
3. Asthma
4. Coronary artery disease
5. Pregnancy class (C)

DOSAGE:

Adults:
- 40 units *once* in place of the first or second epinephrine

Pediatrics:
- Not recommended

ONSET:
Immediate

DURATION:
Variable

SIDE EFFECTS	
Possible post-resuscitation:	
• Ischemic chest pain • Abdominal distress • Nausea and vomiting	• Sweating • Tremors • Bronchial constriction

INTERACTIONS:
None significant

VASOPRESSIN

This page intentionally
left blank.

SECTION: Medication Reference

PROTOCOL TITLE: Ziprasidone

REVISED: 06/2015

Medication
13-33

ZIPRASIDONE

DRUG NAME: Ziprasidone

TRADE NAME: Geodon, Zeldox

DRUG CLASS: Anti-psychotic agent

MECHANISM OF ACTION:
Ziprasidone is a benzylisothiazolylpiperazine antipsychotic. The exact mechanism of action is unknown. However, it is known that Ziprasidone functions as an antagonist at the D_2, 5-HT_{2A}, and 5-HT_{1D} receptors and as an agonist at the 5-HT_{1A} receptor. Ziprasidone has a high affinity for dopamine, serotonin, and alpha-adrenergic receptors and a moderate affinity for histamine receptors, where it is believed to act as an antagonist. Ziprasidone also displays some inhibition of synaptic reuptake of serotonin and norepinephrine, although the clinical significance of this is unknown.

INDICATIONS:
Acute agitation, anxiety, tension, or hostility

CONTRAINDICATIONS:
1. Recent history of cardiac arrhythmia
2. Recent MI
3. Severe heart failure
4. Dysrhythmias
5. Elderly patients with dementia-related psychosis

PRECAUTIONS:
1. Cardiovascular disease
2. Hypotension
3. Acute renal disease
4. Cerebrovascular disease
5. Patients taking anti-hypertensive medications
6. Hypovolemia
7. Pregnancy (C)

DOSAGE:

Adults:
- 10.0 - 20.0 mg IM. Maximum dose 40 mg / day.
- Add 1.2 ml of sterile water to vial and shake vigorously until the entire drug is dissolved. 20 mg single dose vial in 1.0 ml of reconstituted solution.

Pediatrics:
- Not recommended.

ONSET:
IM: 10 - 30 minutes, with peak effect at 60 minutes

Medication
13-33
Continued

ZIPRASIDONE

DURATION:
IM: 2 - 5 hours

SIDE EFFECTS	
• Orthostatic hypotension • Dizziness • Syncope	• Torsades de Pointe • QT prolongation

INTERACTIONS:
1. Patients taking Carbamazepine may need higher than normal doses of Ziprasidone to be effective.

SECTION: Medication Reference

PROTOCOL TITLE: Lidocaine

REVISED: 06/2015

Medication
13-34

LIDOCAINE

RSI DRUG BOX

DRUG NAME: Lidocaine

TRADE NAME: Xylocaine

DRUG CLASS:
1. Antiarrhythmic
2. Analgesic

MECHANISM OF ACTION:
Lidocaine is indicated for patients with suspected head injury to manage increased intracranial pressure. Lidocaine has been shown to blunt the cardiovascular response to the stimulation of the airway. It also decreases the likelihood of tachycardia and hypertension. Lidocaine decreases intracranial and intraocular pressure that can be associated with RSI.

INDICATIONS:
RSI in patients with suspected head injury

CONTRAINDICATIONS:
1. Heart block
2. Severe hypovolemia
3. HF
4. Bradycardia

PRECAUTIONS:
1. Patients with known hypersensitivity.
2. Reduce dose by 50% in the elderly
3. Use caution when administering to patients with:
   - Hepatic dysfunction
   - Renal insufficiency
   - History of drug addiction
   - Parkinson's disease
   - Myasthenia gravis

DOSAGE:

Adults and Pediatrics:

RSI Pre-medications

- 1.0 - 2.0 mg / kg IV (max. dose 150 mg), 2 - 5 minutes prior to laryngoscopy. Maximum efficiency is 3 - 5 minutes after dosing.

ONSET:
IV: 1 - 3 minutes

LIDOCAINE

DURATION:
2 - 6 hours (dose dependant)

SIDE EFFECTS	
Minor	**Major**
• Drowsiness • Confusion • Nausea & Vomiting	• Seizures • Bradycardia • Hypotension • Heart blocks • Cardiac / respiratory arrest

INTERACTIONS:
Additive with other CNS depressants

PEARLS:
1. Illegal use has been noted with cocaine. Cocaine numbs the gums and lidocaine potentiates this numbing.
2. Lidocaine is used in digitalis overdoses.
3. The mechanism of action of lidocaine when used during AMI is not well documented and according to recent studies, is no longer recommended as prophylaxis during stabilizing and resuscitation efforts.
4. Lidocaine has also been efficient in refractory cases of status epilepticus.
5. ODEMSA Drug Box: **Lidocaine is used as a premedication in the RSI box, and is not available in the ODEMSA drug box.**

SECTION: Medication Reference

PROTOCOL TITLE: Succinylcholine

REVISED: 06/2015

Medication
13-36

SUCCINYLCHOLINE

RSI DRUG BOX

DRUG NAME: Succinylcholine

TRADE NAME: Anectine

DRUG CLASS: Depolarizing neuromuscular blockade

MECHANISM OF ACTION:
Succinylcholine is an ultra-short acting, depolarizing-type, skeletal muscle relaxant. It is well suited for RSI but does have some potentially life-threatening side effects in certain patient populations. Succinylcholine has an onset of action of 45 seconds with an initial dose. Its duration of action is from five (5) to ten (10) minutes. In normal skeletal muscle, following depolarization, acetylcholine dissociates from the receptor and is rapidly hydrolyzed by acetylcholinesterase and the muscle cell is ready for the next signal. Succinylcholine has a longer duration of effect than acetylcholine and is not hydrolyzed by acetylcholinesterase. By maintaining the membrane potential above threshold, it does not allow the muscle cell to repolarize. When acetylcholine binds to an already depolarized receptor it cannot cause further depolarization. Calcium is removed from the muscle cell cytoplasm independent of repolarization (depolarization signaling and muscle contraction are independent processes). As the calcium is taken up by the sarcoplasmic reticulum, the muscle relaxes. This explains muscle flaccidity rather than Tetany following fasciculation.

INDICATIONS:
Succinylcholine is a paralytic agent used to facilitate rapid sequence intubation in patients meeting RSI criteria.

CONTRAINDICATIONS:
1. Muscular dystrophy
2. Myopathies
3. Hyperkalemia
4. Stroke
5. Spinal cord injury
6. Prolonged immobilization
7. Denervation syndromes

PRECAUTIONS:
Patients with recent history of burns or crush injury due to elevated potassium levels

DOSAGE:

Adults:
- 1.5 mg / kg may repeat in two to three minutes to achieve paralysis

Pediatrics:
- 2.0 mg / kg infants
- 3.0 mg / kg infants

Medication
13-36
Continued

SUCCINYLCHOLINE

ONSET:
IV: 30 seconds

DURATION:
5 - 10 minutes

SIDE EFFECTS	
• Fasciculation's	• Hyperkalemia
• Increased IOP (intraocular pressure)	• Increased ICP (intracranial pressure)
• Bradycardia	• Cardiac dysrhythmias
• Malignant hyperthermia	• Rhabdomyolysis

INTERACTIONS:
Several penicillin based antibiotics are known to have adverse reactions with Succinylcholine. In general, the respiratory depression effect is potentiated.

PEARLS:
1. The side effect of hyperkalemia happens because the acetylcholine receptor is propped open, allowing continued flow of potassium ions into the extracellular fluid.
2. Succinylcholine does not produce unconsciousness or anesthesia, and its effects may cause considerable psychological distress while simultaneously making it impossible for a patient to communicate.
3. Malignant hyperthermia can result from Succinylcholine administration where a drastic and uncontrolled increase in skeletal muscle oxidative metabolism occurs. This overwhelms the body's capacity to supply oxygen, remove carbon dioxide, and regulate body temperature, eventually leading to circulatory collapse and death if not treated quickly.
4. ODEMSA Drug box: **Succinylcholine is a neuromuscular paralytic in the RSI box, and is not available in the ODEMSA drug box.**

SECTION: Medication Reference

PROTOCOL TITLE: Etomidate

REVISED: 06/2015

Medication
13-35

ETOMIDATE

RSI DRUG BOX

DRUG NAME: Etomidate

TRADE NAME: Amidate

DRUG CLASS:
1. Sedative / amnestic
2. Amnesic

MECHANISM OF ACTION:
Etomidate is an anxiolytic sedative and hypnotic agent; with an onset of action of 30 seconds, and duration of action from five (5) to (10) minutes. It is well suited as an induction agent for RSI because its pharmacokinetic profile closely matches that of Succinylcholine and it has minimal cardiovascular side effects. The transient suppression of cortisol synthesis is of no clinical significance with a single dose.

INDICATIONS:
Sedatives must be administered prior to administration of a neuromuscular blocking agent to eliminate the sensation of paralysis.

CONTRAINDICATIONS:
1. Adrenal insufficiency
2. Known hypersensivity
3. Patients with evidence of septic shock

PRECAUTIONS:
Use caution when administering to patients with:
- Adrenal insufficiency
- Patient's already on narcotic pain management or benzodiazepines

DOSAGE:

Adults and Pediatrics:

0.3 mg / kg
- Consider dose reduction in the elderly because of age related differences in kinetic parameters and increased risk for cardiac depression in older hypertensive patients.

ONSET:
IV: 30 seconds

DURATION:
5 - 10 minutes

Medication
13-35
Continued

ETOMIDATE

SIDE EFFECTS

- Clinically significant adrenal insufficiency has been noted with prolonged infusions.

INTERACTIONS:
Potentiated effects with concurrent administrations of opiates and benzodiazepines

PEARLS:

1. Etomidate has anesthetic and amnestic properties, but has no analgesic properties.
2. Etomidate has a rapid onset of action and a low cardiovascular risk profile, and therefore is less likely to cause a significant drop in blood pressure than other induction agents.
3. Etomidate is unlikely to cause hypotension and so is ideal to use as an induction agent with critically ill patients, such as patients with sepsis, without negative effects from transient worsening of low blood pressure
4. At the typical dose, anesthesia is induced for about 5 - 10 minutes even though the half-life of drug metabolism is approximately 75 minutes. This is because Etomidate is redistributed from the plasma to other tissues.
5. ODEMSA Drug box: **Etomidate is used as a sedative in the RSI box, and is not available in the ODEMSA drug box.**

SECTION: Medication Reference

PROTOCOL TITLE: Vecuronium Bromide

REVISED: 06/2015

Medication
13-37

VECURONIUM BROMIDE

RSI DRUG BOX

DRUG NAME: Vecuronium Bromide

TRADE NAME: Norcuron

DRUG CLASS: Non-depolarizing neuromuscular blockade

MECHANISM OF ACTION:

Vecuronium acts by competing for cholinergic receptors at the motor end-plate. The antagonism to acetylcholine is inhibited and neuromuscular block is reversed by acetylcholinesterase inhibitors. Vecuronium is about 1/3 more potent than pancuronium however; the duration of neuromuscular blockade produced by Vecuronium bromide is shorter than that of pancuronium at initially equipotent doses; the time to onset of paralysis decreases and the duration of maximum effect increases with increasing Vecuronium bromide doses.

INDICATIONS:

Vecuronium is a paralytic agent used to facilitate rapid sequence intubation in patients meeting RSI criteria

CONTRAINDICATIONS:

Patient's with known hypersensitivity

PRECAUTIONS:

1. Patients who have had Succinylcholine administered prior to Vecuronium will need less medication to produce the full paralytic effect or Vecuronium
2. Use caution when administering to patients with:
   - Parkinson's disease
   - Hepatic disease
   - Myasthenia gravis

DOSAGE:

Adults:

Previously sedated with Succinylcholine may consider:

- 0.04 - 0.06 mg / kg
- 0.1 mg / kg IV Push (up to a maximum initial dose of 10mg). Then 1/2 initial dose IV Push may be repeated 20 minutes after initial dose as indicated.

Medication
13-37
Continued

VECURONIUM BROMIDE

ONSET:
IV: 30 seconds – 60 seconds

DURATION:
25 - 40 minutes

SIDE EFFECTS	
• Fasciculation's	• Hyperkalemia
• Increased IOP (intraocular pressure)	• Increased ICP (intracranial pressure)
• Bradycardia	• Cardiac dysrhythmias
• Malignant hyperthermia	• Rhabdomyolysis

INTERACTIONS:
Magnesium sulfate may enhance neuromuscular blockade

PEARLS:
1. Vecuronium has no known effect on consciousness, the pain threshold.
2. In late pregnancy, elimination half-life may be shortened to approximately 35 - 40 minutes.
3. Unlike other nondepolarizing skeletal muscle relaxants, Vecuronium has no clinically significant effects on hemodynamic parameters.
4. Severe anaphylactic reactions to neuromuscular blocking agents, including Vecuronium bromide, have been reported.
5. Patients with cirrhosis have revealed prolonged recovery time in keeping with the role the liver plays in Vecuronium metabolism and excretion.
6. ODEMSA Drug box: **Vecuronium bromide is a neuromuscular paralytic in the RSI box, and is not available in the ODEMSA drug box.**