Pharmacology Manual - Primary Care Paramedic

Site: Medavie HealthEd
Course: Pharmacology Manual - PCP
Book: Pharmacology Manual - Primary Care Paramedic

Printed by: Xinkai Xue
Date: Tuesday, 12 May 2026, 11:40 AM

Description

Table of contents

1. Acetaminophen*

Name:	• Acetaminophen
Other Names:	• Tylenol, Tempra
Classification:	• Analgesic, antipyretic
Mechanism of Action:	• Inhibits prostaglandin synthesis which produces analgesic effect. Less effect on cyclooxygenase therefore very little anti-inflammatory properties. • Acts on the hypothalamic heat regulating center
Indications:	• Mild to moderate pain associated with: • Headache • Hip or extremity trauma • Musculoskeletal neck or back pain • Fever above 38° Celsius
Contraindications:	• Hypersensitivity • Liver disease • Major burns • Active vomiting • Acetaminophen taken in the past 6 hours
Precautions:	• Patients with/taking: Hypothermia, significant tachydysrhythmias, beta blocking medications • Note: Cannot be given with sodium bicarbonate
Adverse Effects:	• Acetaminophen is commonly seen in cases of overdose and may cause severe hepatic damage
Dose:	
Adult:	• 500 – 1000 mg q 4-6 hours PRN PO
Pediatric:	• 10 - 15 mg/kg q 4-6 hours PRN PO
Routes:	• PO
	• Acetaminophen and ibuprofen should be administered together for pain management whenever possible. • Not appropriate for treatment of hyperthermia with an environmental or toxicological cause. • When using the 80 mg/mL oral suspension for pediatrics, a dose of 15 mg/kg should be used. • If pediatric patient can swallow tablets and appropriate dose is at least 325 mg, acetaminophen tablets can be administered (titrate dose to closest multiple of 325 mg). • More than 600 medications contain acetaminophen. The following lists a few that are commonly purchased over the counter or prescribed: • Tylenol brand products

Special Notes:	◦ Endocet ◦ Fioricet ◦ Percocet ◦ Tylenol with Codeine ◦ Sudafed ◦ Sinutab ◦ Midol ◦ Nyquil ◦ Robitussin ◦ Excedrin ◦ Dayquil ◦ Dristan ◦ Cepacol • Pregnancy category B [if there is a clinical need for it, Category B drugs are considered safe to use]
References:	• Compendium of Pharmaceuticals and Specialties (CPS)

2. Acetylsalicylic Acid*

Name:	• Acetylsalicylic Acid
Other Names:	• ASA
Classification:	• Antiplatelet, NSAID, antipyretic, analgesic, anti-inflammatory
Mechanism of Action:	• Inactivates cyclooxygenase (COX) enzyme which decreases the production of prostaglandins in the tissue, blocking the pain receptors sensitivity and decreases inflammation. Due to this inactivation of COX, thromboxane A2 production is also inhibited, which is responsible for platelet aggregation
Indications:	• Acute Coronary Syndrome • Acute MI • Unstable angina
Contraindications:	• GI bleed • Asthmatics sensitive to ASA • Hypersensitivity
Precautions:	• Patients on other platelet inhibitors
Adverse Effects:	• Indigestion • Gastric bleeding • Urticaria • Anaphylaxis • Nausea and vomiting
Dose:	• 160 mg – 325 mg PO (Chewed)
Routes:	• PO
Special Notes:	• If the patient confirms they have self-administered ASA at the direction of the MCC call taker, additional administration of ASA is not required. • If a patient has taken their prescribed low dose ASA, administer an additional 160 mg of ASA. • Giving ASA to children or teenagers with a viral illness can cause Reye's Syndrome. • Pregnancy category D [potential benefits may warrant use of the drug in pregnant women despite potential risks (e.g., if it is required in a life-threatening situation)].
References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Professional 2nd Edition

3. D50W*

Name:	• $D_{50}W$
Other Names:	• Dextrose 50%
Classification:	• Carbohydrate
Mechanism of Action:	• Increases blood glucose levels • Hypertonic solution producing a transient movement of water from interstitial spaces into the venous system
Indications:	• Hypoglycemia (< 4.0 mmol/L who are unable to take oral glucose)
Contraindications:	• Hyperglycemia
Precautions:	• Tissue necrosis if infiltration occurs • May precipitate severe neurological symptoms in alcoholics (thiamine should be consider prior to administration) • Patients with increased intracranial pressure may worsen cerebral edema
Adverse Effects:	• Phlebitis • Tissue necrosis • Rebound hyperglycemia
Dose:	
Adult:	• 25 g IVP, may repeat once if symptoms do no resolve and glucometer reading remains less than 4.0 mmol/L
Pediatric:	• 0.5 - 1 g/kg slow IVP; dilute 1:1 with sterile water (NS can be used if no sterile water available) forming $D_{25}W$ • May repeat once • Maximum total dose of 25 g
Routes:	• IV
Special Notes:	• To make a $D_{25}W$ solution from $D_{50}W$: ◦ Dispose of 25 mL of the $D_{50}W$ solution from the preloaded syringe and replace with 25 mL of normal saline. OR

	○ Draw 25 mL of the $D_{50}W$ solution from the 50 mL vial using a 50 mL syringe and vial access spike, then add 25 mL of normal saline.
References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Professional 2nd Edition

4. Dimenhydrinate*

Name:	• Dimenhydrinate
Other Names:	• Gravol
Classification:	• Antiemetic; Antihistamine, Anticholinergic
Mechanism of Action:	• Blocks histamine and ACh receptors in the vomiting center as well as blocks the pathway between the inner ear and the vomiting center that can cause nausea and vomiting • Similar chemical composition to that of diphenhydramine
Indications:	• Nausea and vomiting associated with Meniere's disease and other labyrinthine disturbances • Nausea/Vomiting • Vertigo • Motion sickness • Radiation sickness • Postoperative recovery
Contraindications:	• ALOC • Known hypersensitivity
Precautions:	• Pneumonia • Asthmatic attack • Dilute with NS prior to IV administration to avoid vein irritation
Adverse Effects:	• CNS Depression • Headache • Anti-muscarinic (Blurred vision, dry mouth, urinary retention, constipation) • Thickened bronchial secretions • Paradoxical excitation can occur in children
Dose:	
Adult:	• 25 mg diluted in normal saline and administered over 2 minutes IV OR 25-50 mg IM undiluted (according to age and size), repeat x 1 in 20 minutes if symptoms persist.

Pediatric:	• 1 mg/kg (maximum 25 mg) diluted in normal saline and administered over 2-4 minutes IV or 1 mg/kg (maximum 25 mg) IM, repeat x 1 in 20 minutes if symptoms persist.
Routes:	• IV, IM
Special Notes:	• Dimenhydrinate is the antiemetic of choice for nausea and vomiting associated with vertigo or motion sickness; it is more effective than metoclopramide given its mechanism of action. • For pregnancy related nausea and vomiting, dilute in a 100 mL bag of normal saline and administer over 20 minutes. • Pregnancy category B [if there is a clinical need for it, Category B drugs are considered safe to use].
References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Professional 2nd Edition

5. Diphenhydramine*

Name:	• Diphenhydramine
Other Names:	• Benadryl
Classification:	• Antihistamine, Anticholinergic
Mechanism of Action:	• Competes with free histamine for binding and blocks H1 histamine receptors • Antagonizes the effects of histamine on Histamine (HA) receptors, leading to a reduction of the negative symptoms brought on by histamine • CNS depressant • Has antiemetic properties (H2 histamine receptors in the GI System)
Indications:	• Allergic and anaphylactic reactions involving respiratory difficulties, edema or itching, nausea/vomiting/diarrhea
Contraindications:	• Hypersensitivity
Precautions:	• The sedative effects of Benadryl can be potentiated by the administration of CNS depressants, other antihistamines, narcotics and alcohol • Acute asthma as it may thicken secretions
Adverse Effects:	• Drowsiness • Dizziness • Headaches • Excitable state • Thickening of bronchial secretions • Chest tightness • Reflex tachycardia • Hypotension
Dose:	
Adult:	• 25 - 50 mg IV, IM, IO given once. • 25 mg for patients over 60 years of age or for extrapyramidal symptoms.

Pediatric:	• 12 or older ◦ 1mg/kg IV, IM (Max 50mg)
Routes:	• IV, IM
Special Notes:	• Pregnancy category B [if there is a clinical need for it, Category B drugs are considered safe to use]. • It is preferred that pediatrics now receive a 2nd generation antihistamine like Reactine or Claritin if the parents have it on hand following epi.
References:	• Health Canada (healthycanadians.gc.ca) • Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Professional 2nd Edition

6. Epinephrine*

Name:	• Epinephrine
Other Names:	• Adrenaline
Classification:	• Adrenergic agonist, Sympathomimetic

Mechanism of Action:	• Stimulates alpha and beta receptors
	  ◦ increases heart rate
	  ◦ increases AV conduction
	  ◦ increases force of myocardial contractility
	  ◦ increases vasoconstriction (increases SVR)
	• Relaxes bronchial smooth muscle (↓ A/W resistance)
	• Increases coronary and cerebral blood flow

Indications:	• Anaphylaxis • Near death asthma • Croup/Stridor (nebulized)
Contraindications:	• None in emergency setting
Precautions:	• Cardiovascular disease • Elderly patients • Hypertension • Pregnancy
Adverse Effects:	• Anxiety • Headache • Hypertension • Arrhythmias • Palpitations • Tachycardia • Myocardial ischemia • Nausea/vomiting • Tremors
Dose:	

Adult:	• Anaphylaxis:
	  ◦ 0.3-0.5 mg 1:1,000 IM repeated q 3-5 mins PRN
	  ◦ Stridor: 5.0 mg (5ml) of 1:1000 nebulized
	• Near-death asthma
	  ◦ 0.01 mg/kg to a maximum of 0.5 mg of 1 mg/mL (1:1000) IM (lateral thigh), repeated q 5-10 minutes as needed.

	• For anaphylaxis: 0.01 mg/kg (0.01 mL/kg) of 1 mg/mL (1:1000) IM (anterior lateral thigh) (maximum of

Pediatric:

0.5 mg), repeated q 5-10 minutes as needed (see Pediatric IM Anaphylaxis Dosing Guide below). See dosing for near-death anaphylaxis below if patient refractory to 3 IM doses.

Pediatric IM Anaphylaxis Dosing Guide

Weight (kg)	Epinephrine dose (1 mg/mL) amp	Epinephrine Auto-injector Dose
5-10	0.1 mg	0.15 mg (EpiPen Junior)
11-15	0.15 mg	
16-20	0.2 mg	
21-25	0.25 mg	0.3 mg (EpiPen)
26-30	0.3 mg	
31-35	0.35 mg	
36-40	0.4 mg	
41-45	0.45 mg	
≥46	0.5 mg	

- For near-death asthma: 0.01 mg/kg (0.01 mL/kg) of 1 mg/mL (1:1000) IM in anterior lateral thigh (maximum of 0.5 mg), repeated q 3-5 minutes as needed (see Pediatric IM Anaphylaxis Dosing Guide above).
- For Stridor : 0.5 mg/kg (0.5 mL/kg) of 1 mg/mL (1:1000) nebulized (maximum of 5 mg) mixed with normal saline to a maximum of 5 mL total volume, repeat as needed.

Routes:

- IM, NEB

Supplied:

- 1 mg in a 1 mL ampoule (1:1,000 concentration)

Special Notes:

- Most shock patients require fluid administration prior to vasopressors therefore normal saline should be initiated prior to epinephrine administration.
- It is recommended to administer a normal saline infusion by gravity with any epinephrine infusion.
- To do this:
  - A. Initiate a normal saline infusion at a rate appropriate to patient condition via gravity (i.e., not through the pump)
  - B. Connect the epinephrine infusion (via the pump) to the access port of the normal saline infusion line proximal to the patient
  - C. This will help as a driver when volumes of medication being infused are small
- Never give epinephrine 1 mg/mL (1:1,000) formulation via the IV or IO route.
- Pregnancy category C [if the patient will benefit from a Category C drug, it is generally used]

References:

- TREKK.ca
- Compendium of Pharmaceuticals and Specialties (CPS)

7. Glucagon*

Name:	• Glucagon
Classification:	• Pancreatic hormone, Anti-hypoglycemic
Mechanism of Action:	• Stimulates the release of glycogen (gluconeogenesis) from the liver, for glycogenolysis (↑ blood glucose levels) • Smooth muscle relaxation
Indications:	• Hypoglycemia (BGL < 4.0 mmol/L and unable to take oral glucose or IV D50) (PCP Indication) • Esophageal foreign body
Contraindications:	• Hypersensitivity • Pheochromocytoma
Precautions:	• Effective only if there are sufficient stores of glycogen within the liver • Use with caution in patients with cardiovascular or renal disease
Adverse Effects:	• Nausea/vomiting, rebound hyperglycemia, hypotension, tachycardia
Dose:	
Adult:	• 1 mg IM, SQ may repeat in 20 mins if required
Pediatric:	• 0.5 mg IM, SQ (< 20 kg)
Routes:	• IM/SQ
Special Notes:	• Hypoglycemia for non-diabetic children is different. • Neonate < 2.5 mmol/L • Infant/Pediatric < 3.3 mmol/L • Supplementary carbohydrate should be given as soon as possible. • Glucagon is very unlikely to work in a non-diabetic because the hypoglycemia is a result of depleted glucose stores, rather than too much insulin. • Consider consulting the Atlantic Canada Poison Centre in the setting of suspected overdose.

	• Though glucagon can be used as an antidote for beta-blocker overdose, it requires high doses which are most often unavailable in the pre-hospital setting. • Pregnancy category B [if there is a clinical need for it, Category B drugs are considered safe to use]
References:	• Eli Lilly Canada Inc. Product Monograph • Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Professional 2nd Edition

8. Glucose (oral)*

Name:	• Oral Glucose
Other Names:	• Insta-glucose
Classification:	• Sugar
Mechanism of Action:	• Provides glucose content for regular cell metabolism • Usually absorbed through mucus membranes
Indications:	• BGL < 4.0 mmol/L in a conscious patient who can maintain their own airway • Confusion with recorded BGL < 4.0 mmol/L (An altered level of awareness)
Contraindications:	• Unable to maintain their own airway • Altered LOC (Level of consciousness that affects the patient's ability to maintain their own airway)
Precautions:	• None
Adverse Effects:	• None
Dose:	• 1 tube (15 g) orally/buccal PRN
Routes:	• Buccal
References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Professional 2nd Edition

9. Ibuprofen*

Name:	• Ibuprofen
Other Names:	• Advil; Motrin
Classification:	• Nonsteroidal Anti-inflammatory Drug (NSAID)
Mechanism of Action:	• Decreases inflammation, pain and fever though inhibition of cyclooxygenase activity and prostaglandin synthesis
Indications:	• Treatment of mild to moderate pain • Reduction in fever • Anti-inflammatory
Contraindications:	• Hypersensitivity to NSAIDs/salicylates • ASA induced asthma • Late pregnancy (3rd trimester) • CVA or TBI in previous 24 hours • Major burns • Renal failure or solitary kidney • Age under 6 months • GI bleeding, peptic ulcer disease • > 65 years of age
Precautions:	• Renal impairment • History of GI bleeds • CHF
Adverse Effects:	• Dizziness • Drowsiness • Light headedness • Peripheral edema • Diarrhea • Nausea and vomiting
Dose:	
Adult:	• 200 - 600 mg PO q 6 – 8 hr

Pediatric:	• 7.5 mg/kg PO 6 – 8 h (For children over 12 use adult dosing)
Routes:	• PO

Special Notes:	• Consider as second line therapy for management of fever (acetaminophen is the antipyretic of choice in most cases).
	• Not appropriate for treatment of hyperthermia with an environmental or toxicological cause.
	• Ibuprofen and acetaminophen should be administered together for pain management whenever possible.
	• If a pediatric patient can swallow tablets and the appropriate dose is at least 600 mg, ibuprofen tablets can be administered.
	• There are approximately 20 NSAID medications. The following lists a few that are commonly purchased over the counter or prescribed:
	  ◦ ketorolac
	  ◦ celecoxib
	  ◦ naproxen
	  ◦ indomethacin
	  ◦ diclofenac
	  ◦ meloxicam
	• Pregnancy category B [if there is a clinical need for it, Category B drugs are considered safe to use]; it is a D in third trimester [potential benefits may warrant use of the drug in pregnant women despite potential risks (e.g., if it is required in a life-threatening situation)].

References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Professional 2nd Edition

10. Ipratropium Bromide

Name:	• Ipratropium Bromide
Other Names:	• Atrovent
Classification:	• Anticholinergic agent, bronchodilator
Mechanism of Action:	• Binds antagonistically to the muscarinic acetylcholine receptor inhibiting the parasympathetic nervous system in airways leading to bronchodilation and fewer secretions.
Indications:	• Bronchoconstriction
Contraindications:	• Hypersensitivity
Precautions:	• Patients with/taking: Narrow angle glaucoma, Myasthenia Gravis, bladder neck obstruction, prostatic hypertrophy
Adverse Effects:	• Tachycardia, palpitations • Headache • Dizziness • Anxiety • Nausea/vomiting • Blurred vision
Dose:	
Adult:	• MDI: 2-4 puffs q 20 mins PRN • NEB: 250-500 mcg q 20 mins (max 3 doses)
Pediatric:	• MDI: 1-2 puffs q 20 mins PRN • NEB: 125-250 mcg with salbutamol or NS to a max of 2cc
Routes:	• May be given by metered dose inhaler (MDI) • MDI can be administered via CPAP or BVM utilizing either a built in MDI port or an MDI adapter
Supplied:	• Metered dose inhaler (canister with plastic inhaler device) ○ 100 mcg per metered dose (puff)
Special Notes:	• A spacer (holding chamber) should be used when administering by MDI directly to the patient (i.e., when not administered through the MDI adapter or port). • 2 puffs are equivalent to approximately a 250 mcg nebule. • Atrovent is most commonly given in conjunction with a beta-agonist. • If a patient has access to an MDI in the home, use the patient's own supply. • Pregnancy category B [if there is a clinical need for it, Category B drugs are considered safe to use

References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Atrovent HFA drug monograph

11. Ketorolac*

Name:	• Ketorolac
Other Names:	• Toradol
Classification:	• Nonsteroidal Anti-inflammatory Analgesic
Mechanism of Action:	• Inhibits prostaglandin synthesis producing peripherally mediated analgesia, anti-inflammatory, and antipyretic effects • At analgesic doses little anti-inflammatory or antipyretic activity seen • Acts peripherally verses narcotics, which act upon the CNS, therefore, no CNS depression
Indications:	• Treatment of moderate to severe pain

Contraindications:	• Patients < 16 years of age
	• Patients > 65 years of age
	• Patients on anticoagulants
	• Hypersensitivity to ASA or NSAID
	• Asthmatics due to bronchospastic activity
	• Renal impairment/solitary kidney
	• Current active bleeding
	• Pregnancy
	• Pt's at risk for bleeding as ketorolac inhibits platelet function thereby increasing bleeding time
	  ◦ Trauma
	  ◦ GI
	  ◦ CVA/TBI < 24 hrs

Precautions:	• HTN, CHF, Elderly • Hepatic insufficiency • GI tract irritation and hemorrhage with long term use
Adverse Effects:	• Dizziness • Headache • Drowsiness • Bronchospasm • Heartburn • Nausea • Diarrhea • Renal failure • Edema • Rash
Dose:	
Adult:	• 10 mg IM/IV (no repeat) (17 y/o or older)

Pediatric:	• NO DOSAGE GIVEN FOR PEDS
Routes:	• IM, IV

Special Notes:	• Ketorolac can be given in conjunction with opioids and may reduce the amount of opioids a patient requires.
	• Provides an alternative to opioid analgesia in the appropriate context.
	• If the patient can swallow, and they are not vomiting, consider ibuprofen as a potential alternative.
	• There are approximately 20 NSAID medications. The following lists a few that are commonly purchased over the counter or prescribed:
	  ◦ ibuprofen
	  ◦ celecoxib
	  ◦ naproxen
	  ◦ indomethacin
	  ◦ diclofenac
	  ◦ meloxicam
	• Pregnancy category C [if the patient will benefit from a Category C drug, it is generally used]

References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Professional 2nd Edition

12. Metoclopramide*

Name:	• Metoclopramide
Other Names:	• Maxeran
Classification:	• Antiemetic
Mechanism of Action:	• Antagonizes central and peripheral dopamine receptors, as well as 5HT4 receptor agonistic properties, which raises the threshold of activity in the chemoreceptor trigger zone, resulting in Antiemetic effects • Increases the amplitude and tone of gastric contractions, increases peristalsis and causes accelerated gastric emptying and intestinal transit
Indications:	• Treatment of nausea and vomiting • Migraine headaches with without N/V • Biliary colic
Contraindications:	• Known hypersensitivity • When stimulus of gastrointestinal motility might be dangerous (e.g., bowel obstruction or perforation). • Pheochromocytoma • Seizure disorder • Patients receiving medications that put them at risk for extrapyramidal reactions such as haloperidol or other antipsychotic medications.
Precautions:	• Hx of epilepsy or Parkinson's disease (potential for exacerbation of their conditions) • Anticholinergic drugs antagonize the effects of Maxeran on GI motility • Sedative effects of the drug can be potentiated by other CNS depressants • May cause extra pyramidal symptoms, treat with 50 mg diphenhydramine
	• Drowsiness • Fatigue • Sedation

Adverse Effects:	• Dizziness • Mental depression • Hypertension • Hypotension • Tachycardia • Bradycardia • Diarrhea
Dose:	
Adult:	• 10 mg IV/IM/SQ; if given IV mix 10 mg in 100 ml NaCL and run over 10 minutes
Pediatric:	• Not recommended unless written in palliative care plan
Routes:	• IV, IM, SQ
Special Notes:	• Adverse effects tend to abate when medication is discontinued. • Dimenhydrinate is the antiemetic of choice for nausea and vomiting associated with vertigo or motion sickness, it is more effective than metoclopramide given its mechanism of action. • Pregnancy category B [if there is a clinical need for it, Category B drugs are considered safe to use]
References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Provider 2nd Edition

13. Naloxone*

Name:	• Naloxone
Other Names:	• Narcan
Classification:	• Narcotic Antagonist
Mechanism of Action:	• Displaces opioids from receptors, reversing the effects of narcotic overdose
Indications:	• Decreased LOC and respiratory depression in a suspected opioid overdose • Cardiac Arrest when opioid overdose is suspected
Contraindications:	• Allergy or known sensitivity
Precautions:	• Naloxone will displace opioids from opioid receptors thereby inducing abrupt withdrawal which can be very distressful for the patient and cause agitation. • In the spontaneously breathing patient, naloxone should only be used to achieve adequate ventilation at a rate of 12 breaths per minute (i.e., the goal isn't to fully reverse sedation as this will result in profound withdrawal).
Adverse Effects:	• Seizures • Dizziness • Headaches • Tremulousness • Tachycardia • Hypotension • Hypertension • Nausea and vomiting
Dose:	

Adult:	• Cardiac arrest in suspected opioid overdose:
	  ◦ 0.4 mg/dose IV/IM/IN (IV preferred); given every 2-3 minutes.
	• Spontaneously breathing patients:
	  ◦ 0.4 mg IV/IN every 2-3 minutes, titrated to effective ventilation.

Pediatric:	• Cardiac arrest in suspected opioid overdose:
	  ◦ Children >5 years or >20 kg: 0.4 mg/dose IV/IM/IN (IV preferred); given every 2-3 minutes.
	  ◦ Children <5 years or <20kg: 0.1 mg/kg/dose IV/IM/IN (IV preferred) given every 2-3 minutes (max 0.4 mg); .
	• Spontaneously breathing patients:
	  ◦ 0.04 mg IV every 2-3 minutes

Routes:	• IV, IM, IN

Special Notes:	• Naloxone is part of the BLS algorithm in cardiac arrest where opioids are suspected; however, effective compressions, ventilations and defibrillation take priority.
	• For the spontaneously breathing patient, EtCO2 and respiratory rate should guide whether naloxone is required. If required, naloxone should be diluted and administered in 0.04 mg aliquots every 2-3 min until effective ventilations are demonstrated (normal EtCO2 and respiratory rate of 10-12 bpm). Aiming to fully reverse sedation may result in significant withdrawal. For iatrogenic overdoses (i.e., too much opioid has been administered to control pain resulting in respiratory compromise), it is even more important to titrate the opioid reversal slowly as the patient will end up in severe pain if too much is given.
	• Law enforcement and some MFRs will administer naloxone 4 mg IN. IN absorption would be slower than IV and less effective therefore larger doses are usually required by this route.
	• The half-life of naloxone is shorter than most opioids and so the patient may require more naloxone when its effects wear off after approximately 40-60 min; non-transport after naloxone administration is therefore very high risk and consulting MCCP is required. In addition, transport to ED offers the opportunity to connect the patient with treatment and other resources important to preventing future overdose.
	• If no correction in airway or ventilation after multiple doses, consider differential diagnosis.
	• Naloxone is effective against natural, synthetic, or semi-synthetic opioids including:
	  ◦ Codeine
	  ◦ Darvon (propoxyphene)
	  ◦ Demerol (meperidine)
	  ◦ Dilaudid(hydromorphone)
	  ◦ Fentanyl
	  ◦ Heroin
	  ◦ Lomotil
	  ◦ Methadone
	  ◦ Morphine
	  ◦ Nubain (nalbuphine)
	  ◦ Oxycodone
	  ◦ Paregoric (anhydrous morphine)
	  ◦ Percocet (oxycodone and acetaminophen)
	  ◦ Percodan (oxycodone and ASA)
	  ◦ Stadol (butorphanol)
	  ◦ Talwin (pentazocine)
	• Pregnancy category C [if the patient will benefit from a Category C drug, it is generally used].
	• Naloxone is a life-saving medication for both mother and baby. If significant respiratory depression and/or cardiac arrest, naloxone should be administered in conjunction with usual cardiac arrest care for all patients of suspected opioid overdose including pregnant patients.
	• Neonates born to opioid-dependent mothers can develop opioid withdrawal syndrome after birth and supportive care should be provided. For babies born to non-opioid dependent mothers who received

	large doses of opioids during labor, it would be appropriate to administer naloxone if respiratory depression or significant sedation.
References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Provider 2nd Edition

14. Nitroglycerin*

Name:	• Nitroglycerin
Other Names:	• Nitro-Dur
Classification:	• Anti-angina, vascular smooth muscle relaxer, vasodilator
Mechanism of Action:	• Relaxes vascular smooth muscle, there by dilating the veins and arterioles (at higher doses), causing blood pooling, which reduces the preload thus decreasing workload of the heart muscle • Reduces left ventricular systolic wall tension, which decreases afterload

Indications:	• Possible ischemia due to ACS:
	  ◦ Unstable angina
	  ◦ AMI
	• Pulmonary edema/CHF

Contraindications:	• Hypotension (< 90 mmHg)
	• Severe bradycardia/tachycardia (< 50 or > 150 bpm)
	• Increase ICP or intracranial hemorrhage
	• Patients taking erectile dysfunction medications
	  ◦ Viagra within 24 hours
	  ◦ Cialis, Levitin, Staxyn within 36 hours

Precautions:	• Administration to Right Ventricular Infarction patients, due to preload dependency, can result in hypotension
Adverse Effects:	• Headaches • Hypotension • Bradycardia • Postural syncope • Weakness • Dizziness • Nausea/vomiting • Reflex tachycardia
Dose:	• 0.4 mg SL q 3 - 5 min
Routes:	• SL

Special Notes:	• Nitroglycerin is not contraindicated for all inferior STEMIs, only inferior STEMIs with right ventricular involvement. Anytime ST elevation is noted in any one of the inferior leads (II, III or aVF), the V4 electrode should be moved to the 5th intercostal space on the patients' right side to become V4R. After acquiring a modified 12 lead, if 1mm or more of ST elevation is noted in V4R nitroglycerin should not be administered. • It is important to check a blood pressure before and after nitroglycerin administration. • Hypotension may be more pronounced in a patient who has not previously taken nitroglycerin. • Pregnancy category C [if the patient will benefit from a Category C drug, it is generally used]
References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Provider 2nd Edition

15. Nitrous Oxide*

Name:	• Nitrous Oxide
Other Names:	• Nitronox; Entonox
Classification:	• Analgesic gas
Mechanism of Action:	• Blended mixture of 50% O2 and 50% N2O that has potent analgesic effects • CNS depressant with analgesic properties • Effects last only 2 - 5 minutes after administration ceases
Indications:	• Acute pain associated with MSK injury, ACS, Renal colic, perinatal, burns and ABD pain • Temporary relief of mild to moderate pain from painful procedures (splinting, etc) • Acute anxiety

Contraindications:	• Patients that cannot comprehend verbal instructions or who are intoxicated
	• Gas trapping conditions
	  ◦ Possible bowel obstruction
	  ◦ Air embolism
	  ◦ Pneumothorax
	  ◦ Middle ear infection
	  ◦ Decompression sickness
	• COPD or signs of respiratory distress including SaO2 < 90%
	• Head injury
	• Altered mental status

Precautions:	• Use in well-ventilated area (Inhalation by provider possible) • Anytime > 50 % oxygen is required • Gases may separate at -6 degrees Celsius
Adverse Effects:	• Dizziness • Light headiness • Altered mental status • Hallucinations • Apnea • N/V
Dose:	• Self-administered
Routes:	• Inhaled

References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Provider 2nd Edition

16. Ondansetron*

Name:	• Ondansetron
Other Names:	• Zofran
Classification:	• Antiemetic, serotonin 5-HT3 receptor antagonist
Mechanism of Action:	• Affects both peripheral and central nerves • Reduces the activity of the vagus nerve, which deactivates the vomiting center in the medulla oblongata • Blocks serotonin receptors in the chemoreceptor trigger zone • Has no effect on dopamine receptors and therefore does not cause extrapyramidal symptoms
Indications:	• Chemotherapy-induced nausea and vomiting • Nausea and vomiting
Contraindications:	• Hypersensitivity • Prolonged QTc
Adverse Effects:	• Headache • Dizziness • Constipation • Diarrhea • Blurred vision
Dose:	
Adult:	• 4.0 mg IV slow IVP over 2 minutes, may repeat once after 10 minutes • 4.0 mg IM, may repeat once after 10 minutes
Pediatric:	• 0.1 mg/kg IV/IM to max of 4.0 mg, only once
Routes:	• IV, M
Special Notes:	• QT Prolongation and Torsade de Pointes: A life-threatening arrhythmia. • Serotonin Syndrome: A potentially fatal condition caused by excessive serotonin. • Stevens-Johnson Syndrome (SJS) and Toxic Epidermal Necrolysis (TEN): Severe, rare skin reactions.
	• Compendium of Pharmaceuticals and Specialties (CPS)

References:	• Pharmacology for the Prehospital Provider 2nd Edition

17. Oxygen

Name:	• Oxygen
Other Names:	• O2
Classification:	• Elemental gas
Mechanism of Action:	• Increases the arterial pressure of oxygen therefore improving gas exchange and oxygen delivery to tissues provided that there are functional alveolar units.
Indications:	• Hypoxia • Respiratory distress • Carbon monoxide poisoning • Acute coronary syndrome • ROSC • Stroke • Major trauma
Contraindications:	• None
Precautions:	• Caution with CO2 retainers
Adverse Effects:	• Light-headedness • Respiratory failure in a small number of patients who are CO2 retainers
Dose:	

	• SpO2 Ranges:
	  ◦ Ischemic chest pain: 94-99%
	  ◦ ROSC: 94-99%
	  ◦ Sepsis: 100%
	  ◦ Stroke: 92-99%
	  ◦ Major trauma: 100%
	  ◦ Respiratory distress: >92%
	  ◦ Patient with COPD: 88-92%

Supplied:	• Oxygen tanks of 3 sizes:
	  ◦ M = 3000 L volume (tank factor 1.56)
	  ◦ E = 660 L volume (tank factor 0.28)
	  ◦ D = 400 L volume (tank factor 0.16)
	• Note: Calculation for time remaining in tank equals = ([Pressure on gauge – 200 psi] x tank factor)/Flow rate (lpm)

	• If patients are within their targeted oxygen saturation, it is not necessary to administer supplemental

Special Notes:	oxygen.
References:	• Compendium of Pharmaceuticals and Specialties (CPS)

18. Salbutamol

Name:	• Salbutamol
Other Names:	• Ventolin, Albuterol, Airomir, Apo-salvent
Classification:	• Bronchodilator, beta-2 adrenergic agonist
Mechanism of Action:	• Binds to beta 2-adrenergic receptors on airway smooth muscle activating adenyl cyclase and leading to an increase in intracellular cyclic-3',5'-adeosine monophosphate (cAMP). This increase leads to activation of protein kinase A which inhibits the phosphorylation of myosin and lowers intracellular ionic calcium causing smooth muscle relaxation.
Indications:	• Bronchoconstriction
Contraindications:	• Hypersensitivity • Chest pain of ischemic origin
Precautions:	• Patients with/taking: Tachycardia, cardiovascular disorders, cardiac ischemia or infarction • May cause: Hypertension
Adverse Effects:	• Tachycardia, palpitations • Arrhythmia • Hypertension • Tremor • Headache • Muscle cramps
Dose:	

Adult:	• Bronchoconstriction:
	  ◦ MDI: 4-6 puffs PRN (400 – 600 mcg, 1 puff q 30 sec)
	  ◦ NEB: 2.5-5.0 mg PRN

Pediatric:	• 10-30kg:
	  ◦ MDI: 200-300 mcg (2-3 puffs 1 puff q 30 sec)
	  ◦ NEB: 2.5 mg aerosolized
	• <10kg:
	  ◦ NEB: 1.25 mg aerosolized

Routes:	• May be given by metered dose inhaler (MDI) • MDI can be administered via CPAP or BVM utilizing either a built in MDI port or an MDI adapter.
Supplied:	• Metered dose inhaler (canister with plastic inhaler device) ◦ 100 mcg per metered dose (puff)

Special Notes:	• A spacer (holding chamber) should be used when administering by MDI directly to the patient (i.e., when not administering through the MDI adapter or port). • Salbutamol works to reduce bronchoconstriction in the lower airways; it is not indicated for patients with stridor, which is a sign of upper airway pathology. • When a patient has severe shortness of breath with hypoxia due to signs of bronchoconstriction (e.g., wheezing, or decreased air entry), there is no maximum dose of salbutamol. • Salbutamol may be used when a patient is wheezing with anaphylaxis AFTER the epinephrine is given. • Salbutamol often does not work in infants who are less than 1 year of age and should not be trialed unless the patient has life threatening distress. • If a patient has access to an MDI in the home, use the patient's own supply. • Pregnancy category C [if the patient will benefit from a Category C drug, it is generally used]
References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Translating Emergency Knowledge for Kids (TREKK) Asthma Pediatric Packages • Salbutamol HFA drug monograph

19. Tetracaine*

Name:	• Tetracaine
Classification:	• Topical anesthetic
Mechanism of Action:	• Topical ophthalmic anesthetic to allow for flushing of an eye by removing the blink reflex
Indications:	• To facilitate eye flushing
Contraindications:	• Hypersensitivity to local anesthetics (caine family) • Possible penetrating eye injury
Precautions:	• May cause blurred vision • As tetracaine removes the patient's blink reflex, they may not be able to protect from other debris.
Adverse Effects:	• May briefly increase irritation
Dose:	• 2-3 drops in the affected eye(s)
Routes:	• Administered directly onto the eye.
References:	• Compendium of Pharmaceuticals and Specialties (CPS) • Pharmacology for the Prehospital Professional 2nd Edition