RESPIRATORY PHARMACOLOGY DOSAGES - 2011

1. epinephrine (+)
2. metaproterenol (+)
3. terbutaline (+)
4. albuterol (*)
5. pirbuterol(*)
6. levalbuterol (*)
7. salmeterol (*)
8. formoterol (*)
9. arformoterol tartrate (*)
10. racemic epinephrine/racepinphrine (*)
11. phenylephrine (+)
12. atropine sulfate (+)
13. ipratropium bromide (*)
14. tiotropium bromide (*)
15. albuterol + ipratropium bromide (*)
16. salmeterol + fluticasone (*)
17. formoterol + budesonide (*)
18. formoterol + mometasone (*)
19. theophylline (+)
20. acetylcysteine (*)
21. dornase alfa (*)
22. cromolyn sodium (*)
23. zileuton (+)
24. zarfirlukast (+)
25. montelukast (+)
26. tobramycin (*)
27. colistimethate (+)
28. ribavirin (+)
29. pentamadine (+)
30. methacholne (+)
31. lidocaine (+)
32. beractant (+)
33. calfactant (+)
34. poractant alfa (+)
35. ethyl alcohol (+)
36. beclomethasone (+)
37. flunisolide (+)
38. fluticasone (*)
39. dexamethasone (*)
40. budesonide (*)
41. mometasone furoate (+)
42. NaCl solutions (hypertonic, hypotonic, isotonic)
43. nicotine (+)
44. varenicline (+)
45. iloprost

DO DRUG CARDS ON ITEMS MARKED WITH *
*: KNOW TRADE NAMES, HOW SUPPLIED, DRUG DOSES & FREQUENCIES, ROUTES OF ADMINISTRATION
+: KNOW TRADE NAMES & CLASS

RESPIRATORY PHARMACOLOGY

I. SYMPATHOMIMETICS (FRONT DOOR BRONCHODILATORS)

A. Catecholamines
   1. epinephrine – Adrenalin (IV), Primatene Mist, Medihaler-Epi, Bronkaid Mist, Brontin Mist

B. Resorcinol
   1. metaproterenol - Alupent, Metaprel
   2. terbutaline – Oral tablets and injection only

C. Saligenin

   1. albuterol - Proventil, Ventolin

D. Other

   1. pirbuterol - Maxair Autohaler
   2. levalbuterol - Xopenex
   3. salmeterol – Serevent
   4. formoterol – Foradil, Perforomist
   5. aformoterol - Brovana

II. SYMPATHOMIMETIC DECONGESTANTS

A. phenylephrine -Neo-Synephrine, Coricidin (alpha adrenergic nasal decongestant)
B. racepinephrine – S_2,
C. racemic epinephrine -Vaponephrine

III. PARASYMPATHOLYTICS; ANTICHOLINERGICS, ANTIMUSCARINICS (BACK DOOR BRONCHODILATORS)

A. atropine
B. ipratropium bromide - Atrovent
C. tiotropium bromide - Spiriva

IV. COMBINATION BRONCHODILATOR THERAPY

A. albuterol and ipratropium bromide -Combivent

V. **METHYLXANTHINES (SIDE DOOR BRONCHODILATORS)**

A. theobromine
B. theophylline -Aminophylline, Theo-Dur
C. caffeine

VI. **MUCOLYTIC**

A. acetylcysteine – Formerly: Mucomyst or Mucosil (now generic only)
B. dornase alfa -Pulmozyme
C. sodium bicarbonate

VII. **MAST CELL STALIZERSIMEDIATOR ANTAGONISTS**

A. cromolyn sodium –Generic (formerly Intal and Aarane), Nasalcrom

VIII. **ANTI-LEUKOTRIENE**

A. zileuton (Zyflo)
B. zafirlukast (Accolate)
C. montelukast (Singular)

IX. **ANTIVIRAL**

A. ribavirin -Virazole
B. respiGam

X. **ANTI-PROTOZOAL, ANTI-PNECTMOCYSTIC AGENT**

A. pentamidine -Pentarn 300, Nebupent
B. TMP-SMX -Bactrim

XI. **ANTIBIOTICS**

A. tobramycin -TOBI
B. nystatin -Fungal Infections
C. Amphotericin B -Fungal Infections

XII. **CHOLINERGIC, PARASYMPATHOMIMETIC**

A. Methacholine -Provocholine

XIII. **SURFACTANT AGENTS**

A. ethyl alcohol -Ethanol
B. beractant -Survanta
C. calfactant – Infasurf
D. poractant alfa - Curosurf

XIV. **STEROIDS**

beclomethasone:	QVAR 40, QVAR 80
	Nasal Spray: Beconase AQ
dexamethasone:	Decadron
	Aerobid, Aerospan HFA
flunisolide:	Genercic Nasal Spray
fluticasone:	Flovent
budesonide:	Pulmicort
mometasone furoate:	Asmanex

XV. **COMBINATION BRONCHODILATOR/STEROIDS**

A. salmeterol & fluticasone – Advair
B. formoterol & budesonide – Symbicort
C. formoterol & mometasone - Dulera

XVI. **WETTING SOLUTIONS; DILUENTS**

A. Sterile Water
B. Hypertonic Solutions
C. Isotonic Saline
D. Hypotonic Solutions

XVII. **TOPICAL ANESTHEICS**

A. Lidocaine -Xylocaine

XVIII. **NICOTINE REPLACEMENT THERAPY**

A. Nicotine Polacrailex gum -Nicorette
B. Nicotine Transdermal System -Nicoderm, Habitrol, Nicotrol, Prostep
C. Nicotine Nasal Spray -Nicotrol NS

epinephrine

Adrenaline; Primatene Mist; Bronitin Mist

ROUTE OF ADMINISTRATION	• Inhalation • Subcutaneous • Direct instillation down an endotracheal tube
INDICATIONS	• Bronchospasm • Anaphylactic (allergic) Reactions • Cardiac Arrest • Administered through the ET tube to control pulmonary hemorrhage
ACTIONS	Sympathomimetic • Bronchodilation • Vasoconstriction • Cardiac Stimulation Chemical Structure: **Catecholamine** • Rapid onset • Short acting • Stimulates α and β receptor sites • Relaxes bronchial smooth muscle resulting in bronchodilation. • Vasoconstrictor properties result in decreased mucosal edema.
ADVERSE REACTIONS	• Palpitations • Tachycardia • Changes in blood pressure • Arrhythmias • Nausea and vomiting • Tremors • Paradoxical bronchospasm • CNS Effects: Headache, nervousness, anxiety, insomnia irritability, and dizziness. • Tolerance may develop with repeated use. • May contain sulfites; consult product information.
DOSAGE	SVN Solution • 1% solution (1:100); 0.25 - .5 ml diluted with • NS, every 4 hours or as ordered Metered Dose Inhaler (Primatene Mist, Bronitin Mist): • Discontinued December 31, 2011 • 0.2 mg/inhalation; 1-2 inhalations, QID • 0.3 mg/inhalation; 1-2 inhalations, QID Subcutaneous • Indicated in the emergency treatment of acute asthma not responsive to aerosolized β_2 agonists. • Children: 1:1000 solution (1 mg/mL); 0.01mg/kg up to .3 mg every 20 minutes for 3 doses • Adults: 1:1000 solhhution (1 mg/mL); .3 mg every 15-20 minutes up to 1 mL for 3 doses. • Through an ET tube: 1:10,000 solution; 1 ml or as ordered.

metaproterenol
(formerly Alupent, Metaprel)

ROUTE OF ADMINISTRATION	• Inhalation • Oral
INDICATIONS	• Bronchospasm
ACTIONS	Sympathomimetic • Bronchodilation Chemical Structure: **Resorcinol** • Rapid onset • Short acting • Stimulates β_1 and β_2 receptor sites • Relaxes bronchial smooth muscle and vascular smooth muscle resulting in bronchodilation and vasodilatation.
ADVERSE REACTIONS	• Palpitations • Tachycardia • Changes in blood pressure • Tremor • Throat irritation • Nausea and vomiting • Gastric distress • Cough • Paradoxical bronchospasm. • CNS Effects: headache, dizziness, anxiety, insomnia, nervousness, and irritability. • May contain sulfites; consult product information
DOSAGE	Unit Dose Solution: 0.4% and 0.6% unit dose • 0.4% solution is premixed with NS and contains .2 mL Alupent in 2.3 mL NS for a total volume of 2.5 mL, QID • 0.6% solution is premixed with NS and contains .3 mL Alupent in 2.2 mL NS for a total volume of 2.5 mL, QID

terbutaline

ROUTE OF ADMINISTRATION	• Inhalation • Tablets • Subcutaneous injection • May be given by continuous nebulization
INDICATIONS	• Bronchospasm;
ACTIONS	Sympathomimetic • Bronchodilation Chemical Structure: **Resorcinol** • Longer lasting than catecholamines • Stimulates β_1 and β_2 receptor sites • Relaxes bronchial smooth muscle and vascular smooth muscle resulting in bronchodilation and vasodilatation.
ADVERSE REACTIONS	• Palpitations • Tachycardia • Changes in blood pressure • Arrhythmias • Nausea and vomiting • Gastric distress • Sweating • Muscle cramps • Throat irritation • Dyspnea • Drowsiness • Paradoxical bronchospasm • Tremor • CNS Effects: headache, dizziness, anxiety, insomnia, nervousness, and irritability
DOSAGE	SVN Solution • Not approved by the FDA (off-label use) o The solution for subcutaneous injection is currently used for aerosol administration. • Available as a 0.1% solution (1 mg/mL); 0.25 - 0.5 ml with diluent every 4 - 6 hours. Consult department policy and procedure manual.

albuterol or (Europe: **salbutamo**l)
Proventil, Ventolin, AccuNeb, Pro-Air

ROUTE OF ADMINISTRATION	• Solution for Inhalation • Tablets • Syrup • May be given by continuous nebulization
INDICATIONS	• Bronchospasm
ACTIONS	Sympathomimetic • Bronchodilation Chemical Structure: **Saligenin** • Longer lasting than catecholamines • Stimulates β_1 and β_2 receptor sites • Relaxes bronchial smooth muscle and vascular smooth muscle resulting in bronchodilation and vasodilatation.
ADVERSE REACTIONS	• Palpitations • Tachycardia • Arrhythmias • Changes in blood pressure • Tremor • Nausea and vomiting • Dizziness • Urticaria • Angioedema • Rash • Throat irritation • Cough • Dyspnea • Paradoxical bronchospasm • CNS Effects: headache, dizziness, anxiety, insomnia, nervousness, and irritability.

albuterol or (Europe: **salbutamol**)
Proventil, Ventolin, AccuNeb, Pro-Air

DOSAGE	SVN Solution • 0.5% solution; 0.5 ml (2.5 mg) with diluent every 4-6 hours. Unit Dose (Accuneb) • Pediatric Dosing (AccuNeb); 2-12 years of age o 0.63 mg in 3.0 mL NS unit dose solution (equivalent to 0.75 mg - ¼ adult strength) o 1.25 mg in 3.0 mL NS unit dose solution (equivalent to 0.75 mg - ½ adult strength) • Adult Dosing (albuterol sulfate) o 0.083% solution o Each vial is premixed with NS and contains 2.5 mg of albuterol. The total volume is 3 mL, administer every 4-6 hours. Metered Dose Inhaler (Proventil-HFA, Ventolin-HFA, ProAir-HFA) • 90 mcg per inhalation • 2 inhalations every 4-6 hours • 200 inhalations/canister

pirbuterol acetate
Maxair Autohaler

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Bronchospasm
ACTIONS	Sympathomimetic; • Bronchodilator Chemical Structure: **Saligenin** • Stimulates β_2 receptor sites resulting in bronchodilation
ADVERSE REACTIONS	• Palpitations • Tachycardia • Nausea and vomiting • Cough • CNS Effects: nervousness, tremor, headache, dizziness, and weakness.
DOSAGE	Breath Actuated Inhaler (BAI) • 200 mcg per inhalation; 1 to 2 inhalations every 4-6 hours • 80 or 400 actuations/canister (depending on canister size) • **Note**: To be discontinued January 2014.

levalbuterol HCl

Xopenex, Xopenex HFA

Route of Administration	• Inhalation
Indication	• Indicated for the treatment and prevention of bronchospasm in adults and adolescents 12 years of age and older.
Action	Sympathomimetic • Bronchodilator Chemical Structure: **Saligenin** • Single-isomer β_2 agonist. • May last up to 8 hours.
Adverse Reaction	• Flu syndrome • Pain • Tachycardia • Nervousness • Viral infection • Rhinitis • Sinusitis • Nasal congestion • Slight decrease in plasma K^+ and slight increases in plasma glucose • Paradoxical bronchospasm • Drug interactions with β blockers, diuretics, digoxin and Monoamine Oxidase (MAO) inhibitors or tri-cyclic antidepressants.
Dosage	Unit Dose Solutions: • 3 mL vials of 0.31, 0.63 mg and 1.25 mg in 3.0 mL of NS • Administer TID MDI Dosage • 90 mcg per inhalation; 1-2 inhalations every 4 to 6 hours. • 200 actuations/canister

salmeterol xinafoate
Serevent

ROUTE OF ADMINISTRATION	• Inhalation via Dry Powder Inhaler
INDICATIONS	• Bronchospasm • Asthma • Exercise-induced bronchospasm; • **NOTE:** Not to be used to treat acute symptoms. Acute symptoms should be treated with a shorter acting bronchodilator.
ACTIONS	Sympathomimetic • Bronchodilator Chemical Structure: **Saligenin** (?) • Long-Acting β-agonist (LABA) • Stimulates β_2 receptor sites resulting in bronchodilation
ADVERSE REACTIONS	• Palpitations • Tachycardia • Dry mouth • Rash • Bronchospasm • CNS Effects: Headache, tremor, and nervousness.
DOSAGE	Dry Powder Inhaler (Aerolizer Inhaler): • 50 mcg per inhalation • Adults and children over 4 years of age:1 inhalation every 12 hours • Blister packs of 28 (institutional) or 60 capsules

formoterol fumarate
Foradil, Perforomist

ROUTE OF ADMINISTRATION	• Inhalation via Dry Powder Inhaler (Foradil) • Inhalation via nebulization of aqueous solution (Performist)
INDICATIONS	• Bronchospasm • Asthma (Foradil) • Exercise-induced bronchospasm (Foradil) • **NOTE:** Not to be used to treat acute symptoms. Acute symptoms should be treated with a shorter acting bronchodilator.
ACTIONS	Sympathomimetic • Bronchodilator Chemical Structure: • Long-Acting β-agonist (LABA) • Stimulates β_2 receptor sites resulting in bronchodilation
ADVERSE REACTIONS	• Palpitations • Tachycardia • Urticaria • Rash • Bronchospasm • CNS Effects: Headache, tremor, and nervousness.
DOSAGE	Foradil: Dry Powder Inhaler (Aerolizer): • 12 mcg per inhalation • 1 inhalation every 12 hours • Supplied in blister-packs of 12 or 60 capsules Perforomist: Unit Dose Solution • Vial containing 20 mcg in 2 mL of solution • 1 vial every 12 hours • Packaged as 60 unit doses per carton.

arformoterol tartrate
Brovana

ROUTE OF ADMINISTRATION	• Inhalation via nebulization of aqueous solution.
INDICATIONS	• Bronchospasm associated with COPD • **NOTE:** Not to be used to treat acute symptoms. Acute symptoms should be treated with a shorter acting bronchodilator.
ACTIONS	Sympathomimetic • Bronchodilator Chemical Structure: • Long-Acting β-agonist (LABA) • Stimulates β_2 receptor sites resulting in bronchodilation
ADVERSE REACTIONS	• Palpitations • Tachycardia • Urticaria • Rash • Bronchospasm • CNS Effects: Headache, tremor, and nervousness.
DOSAGE	Unit Dose Solution: • Vial containing 15 mcg in 2 mL of solution • 1 vial every 12 hours • **NOTE:** Brovana should not be mixed with other medications in a nebulizer. • Packaged as 30 or 60 unit doses per carton.

racemic epinephrine

Vaponephrine, Racepinephrine, S_2, Micronefrin

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Upper Airway Edema (Croup, Post-extubation stridor)
ACTIONS	Sympathomimetic Decongestant • Mucosal Vasoconstrictor Chemical Structure: **Catecholamine** • Rapid onset • Short acting • Stimulates α and β receptor sites o Relaxes bronchial smooth muscle. o Vasoconstrictor properties result in decreased mucosal edema. • **NOTE**: IS GIVEN PRIMARILY AS A DECONGESTANT AND NOT FOR ITS BRONCHODILATING EFFECTS
ADVERSE REACTION	• Palpitations • Tachycardia • Changes in blood pressure • Tremors • Nausea and vomiting • Arrhythmias • Wheezing • CNS effects: Headache, nervousness, anxiety, insomnia, irritability, and dizziness. • Tolerance may develop with repeated use. • May contain sulfites; consult product information.
DOSAGE	SVN Solution • 2.25% solution; 0.25 - 0.5 ml, dilute with NS, QID;

phenylephrine

Neo-Synephrine , Coricidin

INDICATIONS	• Mucosal Edema
ACTIONS	Sympathomimetic Decongestant • Mucosal Vasoconstrictor • Pure α stimulant • α stimulation causes vasoconstriction that results in reduced mucosal edema due to decreased blood flow to the area.
ADVERSE REACTIONS	• Repeated application of these sprays or drops can cause rebound nasal congestion; should be used for short periods of a day or so only.

atropine

ROUTE OF ADMINISTRATION	• Inhalation • Intramuscular • Intravenous • Subcutaneous
INDICATIONS	• Bronchospasm associated with chronic bronchitis and emphysema • Given parenterally as a pre-anesthetic medication to decrease salivation and bronchial secretions • Used to treat symptomatic bradycardia, heart block and asystole. • Used as an antidote for drugs used to treat myasthenia gravis (anti-cholinesterase drugs) during a cholinergic crisis;
ACTIONS	<u>Anticholinergic (Parasympatholytic or Anti-muscarinic)</u> • Bronchodilator (referred to as a back door bronchodilator and may be given in combination with sympathomimetics) • Increases heart rate and improves conduction of heart through the AV node. • Pupillary Dilatation (mydriasis)
ADVERSE REACTIONS	• Adverse reactions are dose dependent and depend on route of administration. • When given by aerosol: o Drying of secretions o Decreased ciliary activity and transport o Tachycardia o Dry mouth o Blurred vision o Cough • Should not be given to asthmatics or patients with retained/dried secretions.
DOSAGE	<u>Unit Dose Solution:</u> • <u>Adult Dosage</u>: o Supplied as 0.1 mg/1 mL; 0.025 mg/kg, TID or QID • <u>Child Dosage</u>: o Supplied as 0.5mg/1 mL; .025 to .05 mg/kg, TID or QID

ipratropium bromide
Atrovent-HFA

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Bronchospasm associated with Chronic Bronchitis and Emphysema. • In patients who have stable asthma, an additive effect of an anti-muscarinic used in conjunction with β-agonists has been observed in clinical studies.
ACTIONS	Anticholinergic (Parasympatholytic or Anti-muscarinic) • Bronchodilator (referred to as a back door bronchodilator and may be given in combination with sympathomimetics)
ADVERSE REACTIONS	• Side Effects are less frequent than with Atropine because of its poor systemic absorption • Palpitations • Nervousness • Dizziness • Headache • Rash • Nausea • Blurred vision • Dry mouth and oropharynx • Cough • Exacerbation of symptoms
DOSAGE	Metered Dose Inhaler • 17 mcg per inhalation • 2 inhalations QID • 200 inhalations/canister • **CAUTION**: A prior version of the MDI (**not** the HFA version) contained soy lecithin and was contraindicated in patients with peanut allergies. It is no longer available.

tiotropium bromide

Spiriva

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Bronchospasm associated with Chronic Bronchitis and Emphysema. • In patients who have stable asthma, an additive effect of an anti-muscarinic used in conjunction with β-agonists has been observed in clinical studies.
ACTIONS	Anticholinergic (Parasympatholytic or Anti-muscarinic) • Bronchodilator (referred to as a back door bronchodilator and may be given in combination with sympathomimetics)
ADVERSE REACTIONS	• Side Effects are less frequent than with Atropine because of its poor systemic absorption • Palpitations • Nervousness • Dizziness • Headache • Rash • Nausea • Blurred vision • Dry mouth and oropharynx • Cough • Exacerbation of symptoms
DOSAGE	Dry Powder Inhaler • 18 mcg per inhalation • 1 inhalation once a day. • Blister packs contain 6 or 30 capsules

ipratropium bromide and albuterol

Combivent and DuoNeb

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Bronchospasm
ACTIONS	Sympathomimetic and Anticholinergic • Bronchodilator • Onset of action 15 minutes • Peaks in 1-2 hours and has a duration of 4-6 hours j
SIDE EFFECTS	• See ipratropium bromide and albuterol above
DOSAGE	SVN Solution (Duo Neb) • One 3 ml pre-mixed vial (0.5 mg of a .017% ipratropium bromide solution & 2.5 mg of a 0.083% solution of albuterol) QID Metered Dose Inhaler (Combivent) • ipratropium 18 mcg/puff and albuterol 103 mcg/puff • 2 inhalations QID • To be discontinued January 2014.

theophylline

Elixophylline, Theo-24, Theocron, Theolair, Uniphyl, Aminophylline

ROUTE OF ADMINISTRATION	• Tablets • Elixirs • IV
INDICATIONS	• Bronchospasm • Stimulate respirations in newborns
ACTIONS	Methylxanthines; Phosphodiesterase Inhibitors • Bronchodilator (referred to as side door bronchodilators and may be given in combination with sympathomimetics or anticholinergics). • Prevents the breakdown of cAMP to an inactive state, 5'-AMP.
ADVERSE REACTIONS	• Gastric irritation • Cerebral over-stimulation • Changes in blood pressure • Anorexia • Nausea and vomiting • Insomnia • Headache • Dizziness • Hyperventilation • Myocardial • Irritation • Seizures
DOSAGE	• Xanthine preparations are not administered by inhalation. • Oral or parenteral administration is used in the treatment of asthma. • Safe therapeutic blood level of theophylline is 5-15 mcg/ml and should be monitored.

acetylcysteine

ROUTE OF ADMINISTRATION	• Inhalation • Direct Instillation down the ET tube; • IV
INDICATIONS	• Abnormally viscid, or inspissated secretions o For example: cystic fibrosis, bronchiectasis, pulmonary abscess, bronchitis. • IV administration (Acetadote) is used as an antidote to acetaminophen (Tylenol) overdose.
ACTIONS	Mucolytic • Reduces viscosity of mucus by breaking disulfide bonds • To prevent bronchospasm, administer with a rapid acting bronchodilator.
ADVERSE REACTIONS	• Bronchospasm • Stomatitis • Nausea and vomiting • Gastric disorders • Rhinorrhea • Rash • Fever • Drowsiness • Tracheal and bronchial irritation • Not compatible when mixed with antibiotics. • Should be used within 96 hours after opening.
DOSAGE	SVN Solution • Available in a 10% and 20% solution • 10% solution o 6-10 mL TID or QID • 20% solution o 3-5 mL, TID or QID • Maximal Dose: o 10% solution: 2 - 20 ml every 2-6 hours o 20% solution: 1 - 10 ml every 2-6 hours • Supplied in 4 mL, 10 mL and 30 mL vials Direct Instillation • 10% or 20% solution: 1-2 mL every hour

dornase alfa
Pulmozyme

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	Cystic Fibrosis
ACTIONS	Mucolytic • Enzyme used to break down DNA • Purulent pulmonary secretions contain very high concentrations of extra-cellular DNA released by degenerating leukocytes that accumulate in response to infection. • Pulmozyme hydrolyzes the DNA in sputum of CF patients and reduces sputum viscosity. • Used daily in conjunction with standard therapy for CF patients, Pulmozyme will help reduce the frequency of respiratory infections and improve pulmonary function.
ADVERSE REACTIONS	• Voice alterations • Pharyngitis • Laryngitis • Rash • Chest pain • Conjunctivitis
DOSAGE	Single-use Ampules: • 1.0 mg/ml (0.1% solution) • Each ampule contains 2.5 ml of solution • Administer one 2.5 mg single-use ampule once a day. • Store drug under refrigeration. • Ampules should be protected from light. • Do not use beyond expiration date stamped on the ampule. • Do NOT dilute or mix with other drugs.

cromolyn sodium

Available only as generic for inhalation (Formerly Intal and Aarane), Intranasal: Nasalcrom (OTC)

ROUTE OF ADMINISTRATION	• Inhalation • Intranasal
INDICATIONS	• Prophylactic treatment of bronchial asthma. • Prevention of exercise-induced asthma. • Prevention of bronchospasm induced by environmental allergens and pollutants • Allergic rhinitis
ACTIONS	Mast Cell Stabilizer; Anti-asthmatic Drug • When administered regularly, it has been shown to reduce the response of the airway to histamine in asthmatics. • The prolonged use of this drug has led to a reduction in the use of sympathomimetics and corticosteroid therapy. • Maximum effect seen after 4 weeks of continuous use
ADVERSE REACTIONS	• Throat irritation and dryness • Bad taste • Cough • Wheezing • Nausea • Nasal congestion • Bronchospasm • Anaphylaxis • Angioedema • Dizziness • Joint swelling and pain • Headache • Rash • Dysuria • Swollen parotid gland
DOSAGE	SVN Solution • 1% Solution - 20 mg/2 ml ampule; 1 ampule QID NASAL SPRAY • 5.2 mg/spray • 200 sprays/canister • Available over-the-counter

ANTI-LEUKOTRIENES

NAME	AGE	DOSAGE	FREQUENCY	INTERACTIONS	SIDE EFFECTS
zileuton (Zyflo)	12 years older	**600 mg** Available as 300 mg and 600 mg tablets and as a 600 mg extended release tablet.	QID	• Warfarin • Seldane • Theophylline • Propranolol	• Increased liver enzymes
zafirlukast (Accolate, generic)	12 years older	**10 and 20 mg** tablets	BID	• Warfarin Theophylline	• Possible increase in liver enzymes
montelukast (Singular, generics pending)	6 years older	**4 mg** (6 months to 5 years) **5 mg** tablet child **10 mg** tablet adult	QD	• None	• None

tobramycin

TOBI

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Cystic Fibrosis patients with pseudomonas aeruginosa colonization
ACTIONS	• Antibiotic
ADVERSE REACTIONS	• Hearing impairment • Hepatotoxicity • Acoustic nerve damage • Nephrotoxicity • Resistance to Pseudomonas infections
DOSAGE	SVN Solution: • Supplied as 300mg/5 mL vial • 300 mg BID; 28 days on, 28 days off • Requires use special nebulizers designed for this medication. • (Pari LC Nebulizer) and flowrates of 10-12 L/min

colistimethate

Colomycin, Coly-mycin, Colistin

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Cystic Fibrosis patients with pseudomonas aeruginosa colonization resistant to Tobi.
ACTIONS	• Antibiotic
ADVERSE REACTIONS	• Neurotoxicity • Nephrotoxicity • Bronchospasm
DOSAGE	SVN Solution: • Supplied as 150 mg/vial that has to be reconstituted daily. • 2.5 to 5 mg/kg/day in 2 to 4 equal doses. • Requires use special nebulizers designed for this medication.

ribavirin
Virazole

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Treatment of Bronchiolitis; infections caused by Respiratory Syncytial Virus (RSV) o **NOTE**: This therapy is not commonly used as a first-line therapy. • Treatment of viral infections in Bone Marrow Transplant patients.
ACTIONS	• Anti-Viral Agent • Effective against RSV and possibly influenza type A and B virus. • Administer with the SPAG nebulizer (Small Particle Aerosol Generator) for 12- 18 hours/day for 3-7 days. • Delivered via an infant oxyhood, tent or face tent. • Inhibits the intracellular protein synthesis needed for viral reassembly and reproduction.
ADVERSE REACTIONS	• Deterioration of pulmonary function • Dyspnea • Chest soreness • Bacterial pneumonia • Apnea • Cardiac arrest • Hypertension • Pneumothorax • Digitalis toxicity • Rash • Conjunctivitis • Reticulocytosis • **Check hospital policy before administering Ribavirin during mechanical ventilation
DOSAGE	Solution for Nebulization • Supplied as 6 grams of lyophilized powder in 100 mL vial to be reconstituted with 300 mL of sterile water. • When 6 grams is reconstituted with 300 mL the solution will contain 20 mg/mL of Ribavirin (2% solution) • Given for 12-18 hours/day for 3-7 days

pentamidine

Generic, Pentam, NebuPent

ROUTE OF ADMINISTRATION	• Inhalation • Intramuscular • Intravenous
INDICATIONS	• Pneumocystis Carinii Pneumonia
ACTIONS	Anti-protozoal Agent • Anti-pneumocystis Agent
ADVERSE REACTIONS	• Cough • Bronchospasm • Fatigue • Bad taste • Dyspnea • Decreased • Appetite • Dizziness • Rash • Nausea and vomiting • Pharyngitis • Chest pain • Chills
DOSAGE	• To prevent bronchospasm, a bronchodilator should be administered prior to administering pentamidine. Solution for Nebulization • Supplied as a dry powder; 300 mg in single dose vials. • The dosage is reconstituted with 6 mL of sterile water. • Inject 6 mL into each vial and nebulize until the chamber is empty. • Administer with the Respirgard II Nebulizer

methacholine
Provocholine

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Methacholine Challenge Test (Bronchoprovocation Test) • To diagnose bronchial airway hyperreactivity in subjects who do not have clinically apparent asthma
ACTIONS	Cholinergic Agent (Parasympathomimetic) • Bronchoconstriction
ADVERSE REACTIONS	• Headache • Throat irritation • Lightheadedness • Itching **Contraindications**: • Clinically apparent asthma • Wheezing or very low baseline pulmonary function tests;
DOSAGE	SVN Solution: • Concentrations vary and are constituted by the pharmacy. • Refer to the department policy and procedure manual.

lidocaine
Xylocaine

ROUTE OF ADMINISTRATION	• Inhalation • Nasal Spray • Jelly • Ointment
INDICATIONS	• Bronchoscopy • Intubations • Cardiac dysrhythmias such as premature ventricular, Contractions, Ventricular Tachycardia, and Ventricular Fibrillation
ACTIONS	• Local Anesthetic • Antiarrhythmic
ADVERSE REACTIONS	• Nebulization may cause an increase in airway resistance and decreased PaO_2.
DOSAGE	SVN Solution for Bronchoscopy; • 2% & 4% solutions • 2% solution (20 mg/mL) o 10 mL ampule; QS; 3-7 mL total volume • 4% solution (40 mg/mL) o 5 mL ampule; QS; 3-7 mL total volume Topical Anesthesia: • Available as a 2% jelly and nasal spray; used for anesthetizing the nasal passages prior to intubation and for lubrication of ET tubes.

beractant
Survanta

ROUTE OF ADMINISTRATION	• Intratracheal suspension (direct instillation down an ET tube)
INDICATIONS	• Prevention and Treatment of RDS in premature infants
ACTIONS	Modified Natural Surfactant • Decreases surface tension and improves lung compliance
ADVERSE REACTIONS	• Bradycardia • Oxygen desaturation • Reflux • ET tube obstruction/blockage
DOSAGE	Direct Tracheal Instillation. • 25 mg/ml (Supplied in a 8 mL vial) • Administer at 4 mL/kg • Repeat dosage at least 6 hours after the preceding dose if the infant remains intubated and requires an FIO_2 or 30% or more to maintain a PaO_2 of less than 80 mm Hg.

calfactant
Infasurf

ROUTE OF ADMINISTRATION	• Intratracheal suspension (direct instillation down an ET tube)
INDICATIONS	• Prevention and Treatment of RDS in premature infants
ACTIONS	Modified Natural Surfactant • Calf lung surfactant • Decreases surface tension and improves lung compliance
ADVERSE REACTIONS	• Cyanosis • Airway Obstruction • Bradycardia • Reflux of surfactant into endotracheal tube. • Requirement for manual ventilation • Reintubation
DOSAGE	Direct Tracheal Instillation. • 35 mg/mL (Supplied in a 6 mL vial) • Administer at 3 mL/kg • Administer every 12 hours for at total of up to 3 doses. • Do not shake container prior to administration. • Visible flecks and foaming are normal for Infasurf.

poractant alfa
Curosurf

ROUTE OF ADMINISTRATION	• Intratracheal suspension (direct instillation down an ET tube)
INDICATIONS	• Prevention and Treatment of RDS in premature infants
ACTIONS	Modified Natural Surfactant • Decreases surface tension and improves lung compliance. • Pig lung surfactant
ADVERSE REACTIONS	• Bradycardia • Decreased oxygen saturation • Reflux of surfactant into endotracheal tube • Airway Obstruction
DOSAGE	Direct Tracheal Instillation. • 80 mg/mL (Supplied in a 1.5 mL or 3.0 mL vials) • Administer at 2.5 mL/kg • Up to two repeat doses of 1.25 mL/kg birth weight each may be administered. • Repeat doses should be administered, at approximately 12-hour intervals, in infants who remain intubated and in whom RDS is considered responsible for their persisting or deteriorating respiratory status. • The maximum recommended total dose (sum of the initial and up to two repeat doses) is 5 mL/kg. • **CAUTION:** Protect from light. Do not shake. Vials are for single use only. After opening the vial discard the unused portion of the drug.

ethyl alcohol
Ethanol

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Pulmonary Edema
ACTION	Surface-active agent Anti-foaming agent • Decreases surface tension of edema fluid
ADVERSE REACTIONS	• Local airway irritation • Bleeding • Bronchospasm
DOSAGE	SVN Solution • 30-50% solution • 3-5 ml of a 40% solution, PRN

beclomethasone

Beconase AQ, QVAR

ROUTE OF ADMINISTRATION	• Inhalation • Intranasal
INDICATIONS	• Moderate to severe bronchial asthma. • May be administered by aerosol, orally, or parenterally. • In severe asthma in which the patient is not responding to aerosol or oral administration, steroids can be given by intravenous administration.
ACTIONS	Corticosteroid; Anti-inflammatory Agent; • Patients receiving bronchodilators by inhalation should be advised to use their bronchodilator prior to the administration of a steroid. • Steroids prevent inflammation by inhibiting the release of chemical mediators from the mast cells; they are also effective in restoring the responsiveness to beta-adrenergic receptors.
ADVERSE REACTIONS	• Systemic adverse effects are infrequent with aerosol administration at doses currently approved in the US. • Deaths due to adrenal insufficiency have occurred in asthmatic patients during and after transfer from systemic corticosteroids. • Adverse reactions for aerosol administration may include: o Throat irritation o Dysphonia, o Dry throat o Hoarseness o Cough o Wheezing o Headache o Facial edema o Rash o Bronchospasm o Fungal infections with Candida Albicans or Aspergillus niger in the mouth, pharynx, and larynx. PATIENTS SHOULD BE INSTRUCTED TO RINSE AND GARGLE FOLLOWING AEROSOL STEROID ADMINISTRATION.
DOSAGE	Metered Dose Inhaler • QVAR o 40 mcg or 80 mcg per inhalation o 1-2 inhalations BID o 100 actuations/canister

flunisolide

Aerobid, Aerospan HFA, Generic Nasal Spray

ROUTE OF ADMINISTRATION	• Inhalation • Intranasal
INDICATIONS	• Moderate to severe bronchial asthma. • May be administered by aerosol, orally, or parenterally. • In severe asthma in which the patient is not responding to aerosol or oral administration, steroids can be given by intravenous administration.
ACTIONS	Corticosteroid; Anti-inflammatory Agent • Patients receiving bronchodilators by inhalation should be advised to use their bronchodilator prior to the administration of a steroid. • Steroids prevent inflammation by inhibiting the release of chemical mediators from the mast cells; they are also effective in restoring the responsiveness to beta-adrenergic
ADVERSE REACTIONS	• Systemic adverse effects are infrequent with aerosol administration at doses currently approved in the US. • Deaths due to adrenal insufficiency have occurred in asthmatic patients during and after transfer from systemic corticosteroids. • Adverse reactions for aerosol administration may include: o Throat irritation o Dysphonia, o Dry throat o Hoarseness o Cough o Wheezing o Headache o Facial edema o Rash o Bronchospasm o Fungal infections with Candida Albicans or Aspergillus niger in the mouth, pharynx, and larynx. PATIENTS SHOULD BE INSTRUCTED TO RINSE AND GARGLE FOLLOWING AEROSOL STEROID ADMINISTRATION.

flunisolide

Aerobid, Aerospan HFA, Generic Nasal Spray

DOSAGE	Metered Dose Inhaler
	• Aerobid
	  o 250 mcg per inhalation
	  o 2 inhalations BID
	• Aerospan HFA
	  o 80 mcg per inhalation
	  o 2 inhalations BID
	  o 60 or 120 inhalations/ canister
	• Nasal Spray (Generic)
	  o 25 or 29 mcg per spray
	  o 2 sprays in each nostril BID

fluticasone

Flovent HFA, Flovent Diskus, Flonase

ROUTE OF ADMINISTRATION	• Inhalation • Intra-nasal
INDICATIONS	• Moderate to severe bronchial asthma. • May be administered by aerosol, orally, or parenterally. • In severe asthma in which the patient is not responding to aerosol or oral administration, steroids can be given by intravenous administration.
ACTIONS	Corticosteroid; Anti-inflammatory Agent • Patients receiving bronchodilators by inhalation should be advised to use their bronchodilator prior to the administration of a steroid. • Steroids prevent inflammation by inhibiting the release of chemical mediators from the mast cells; they are also effective in restoring the responsiveness to beta-adrenergic receptors.
ADVERSE REACTIONS	• Systemic adverse effects are infrequent with aerosol administration at doses currently approved in the US. • Deaths due to adrenal insufficiency have occurred in asthmatic patients during and after transfer from systemic corticosteroids. • Adverse reactions for aerosol administration may include: o Throat irritation o Dysphonia, o Dry throat o Hoarseness o Cough o Wheezing o Headache o Facial edema o Rash o Bronchospasm o Fungal infections with Candida Albicans or Aspergillus niger in the mouth, pharynx, and larynx. PATIENTS SHOULD BE INSTRUCTED TO RINSE AND GARGLE FOLLOWING AEROSOL STEROID ADMINISTRATION.
DOSAGE	Metered Dose Inhaler (Flovent HFA) • Three dosages available: o 44 mcg per inhalation, 2 inhalations BID (starting dose) o 110 mcg per inhalation, 1-4 inhalations BID (if on inhaled steroids previously) o 220 mcg per inhalation, 1-4 inhalations BID (if on inhaled steroids previously) • Each canister holds 120 inhalations. Dry Powder Inhaler (Flovent Diskus) • Three dosages available: o 50 mcg per inhalation, BID o 100 mcg per inhalation, BID o 250 mcg per inhalation, BID Nasal Spray (Flonase) • 50 mcg/activation (120 activations/bottle) • 2 sprays in each nostril once a day.

fluticasone and salmeterol

Advair Diskus, Advair-HFA

ROUTE OF ADMINISTRATION	• Inhalation via Dry Powder Inhaler • Inhalation via MDI
INDICATIONS	• Moderate to severe bronchial asthma. • Exercise-induced bronchospasm; • **NOTE:** Not to be used to treat acute symptoms. Acute symptoms should be treated with a shorter acting bronchodilator.
ACTIONS	Combination Drug: Corticosteroid; Anti-inflammatory Agent and Sympathomimetic • Steroids prevent inflammation by inhibiting the release of chemical mediators from the mast cells; they are also effective in restoring the responsiveness to beta-adrenergic receptors. • Long-Acting β-agonist (LABA) • Stimulates β_2 receptor sites resulting in bronchodilation
ADVERSE REACTIONS	• Systemic adverse effects are infrequent with aerosol administration at doses currently approved in the US. • Deaths due to adrenal insufficiency have occurred in asthmatic patients during and after transfer from systemic corticosteroids. • Adverse reactions for aerosol administration may include: o Throat irritation o Dysphonia, o Dry throat o Hoarseness o Cough o Wheezing o Headache o Facial edema o Rash o Bronchospasm o Fungal infections with Candida Albicans or Aspergillus niger in the mouth, pharynx, and larynx. PATIENTS SHOULD BE INSTRUCTED TO RINSE AND GARGLE FOLLOWING AEROSOL STEROID ADMINISTRATION. o Palpitations o Tachycardia o Urticaria o CNS Effects: Headache, tremor, and nervousness.

fluticasone and salmeterol

Advair Diskus, Advair-HFA

DOSAGE	Dry Powder Inhaler (Diskus Inhaler):
	• Three combinations:
	  o 100 mcg fluticasone and 50 mcg salmeterol per inhalation
	  o 250 mcg fluticasone and 50 mcg salmeterol per inhalation
	  o 500 mcg fluticasone and 50 mcg salmeterol per inhalation
	• 1 inhalation every 12 hours
	• 28 or 60 actuations/Diskus
	MDI
	• Three combinations
	  o 45 mcg fluticasone and 21 mcg salmeterol per inhalation
	  o 115 mcg fluticasone and 21 mcg salmeterol per inhalation
	  o 230 mcg fluticasone and 21 mcg salmeterol per inhalation.
	• 1 inhalation every 12 hours
	• 120 actuations/Diskus

dexamethasone sodium phosphate

ROUTE OF ADMINISTRATION	• Inhalation • Intranasal
INDICATIONS	• Moderate to severe bronchial asthma. • May be administered by aerosol, orally, or parenterally. • In severe asthma in which the patient is not responding to aerosol or oral administration, steroids can be given by intravenous administration.
ACTIONS	Corticosteroid; Anti-inflammatory Agent; • Patients receiving bronchodilators by inhalation should be advised to use their bronchodilator prior to the administration of a steroid. • Steroids prevent inflammation by inhibiting the release of chemical mediators from the mast cells; they are also effective in restoring the responsiveness to beta-adrenergic receptors.
ADVERSE REACTIONS	• Systemic adverse effects are infrequent with aerosol administration at doses currently approved in the US. • Deaths due to adrenal insufficiency have occurred in asthmatic patients during and after transfer from systemic corticosteroids. • Adverse reactions for aerosol administration may include: o Throat irritation o Dysphonia, o Dry throat o Hoarseness o Cough o Wheezing o Headache o Facial edema o Rash o Bronchospasm o Fungal infections with Candida Albicans or Aspergillus niger in the mouth, pharynx, and larynx. PATIENTS SHOULD BE INSTRUCTED TO RINSE AND GARGLE FOLLOWING AEROSOL STEROID ADMINISTRATION.
DOSAGE	SVN Solution: • 4 mg/ml (0.4% solution) • Supplied as 1 mL vial • Administer 1 - 4 mg (0.25 -1 cc) QID

budesonide

Pulmicort, Rhinocort

ROUTE OF ADMINISTRATION	• Inhalation • Nasal Spray
INDICATIONS	• Moderate to severe bronchial asthma. • May be administered by aerosol, orally, or parenterally. • In severe asthma in which the patient is not responding to aerosol or oral administration, steroids can be given by intravenous administration.
ACTIONS	Corticosteroid; Anti-inflammatory Agent; • Patients receiving bronchodilators by inhalation should be advised to use their bronchodilator prior to the administration of a steroid. • Steroids prevent inflammation by inhibiting the release of chemical mediators from the mast cells; they are also effective in restoring the responsiveness to beta-adrenergic receptors.
ADVERSE REACTIONS	• Systemic adverse effects are infrequent with aerosol administration at doses currently approved in the US. • Deaths due to adrenal insufficiency have occurred in asthmatic patients during and after transfer from systemic corticosteroids. • Adverse reactions for aerosol administration may include: o Throat irritation o Dysphonia, o Dry throat o Hoarseness o Cough o Wheezing o Headache o Facial edema o Rash o Bronchospasm o Fungal infections with Candida Albicans or Aspergillus niger in the mouth, pharynx, and larynx. PATIENTS SHOULD BE INSTRUCTED TO RINSE AND GARGLE FOLLOWING AEROSOL STEROID ADMINISTRATION.
DOSAGE	<u>SVN Solution</u> • Three dosages available o 0.25 mg/2 mL, once to twice a day o 0.5 mg/2 mL, once to twice a day o 1 mg/2 mL, once to twice a day o 30 respules/carton <u>Dry Powder Flexhaler</u> • 80 (child), 160 (adult) mcg per inhalation • 1-2 inhalations BID • 200 doses per canister <u>Dry Powder Turbuhaler</u> (Pulmicort) • 1-2 inhalations BID • 160 or 320 mcg per inhalation • 200 doses per canister <u>Nasal Spray</u> (Rhinocort) • 32 mcg/activation, one activation, once daily

budesonide and formoterol

Symbicort

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Maintenance management of moderate to severe bronchial asthma. • In severe asthma in which the patient is not responding to aerosol or oral administration, steroids can be given by intravenous administration.
ACTIONS	Corticosteroid; Anti-inflammatory Agent • Patients receiving bronchodilators by inhalation should be advised to use their bronchodilator prior to the administration of a steroid. • Steroids prevent inflammation by inhibiting the release of chemical mediators from the mast cells; they are also effective in restoring the responsiveness to beta-adrenergic receptors.
ADVERSE REACTIONS	• Adverse reactions for aerosol administration may include: o Headache o Allergic Rhinitis o Throat irritation o Upper Respiratory Infection o Sinusitis o Fungal infections with Candida Albicans or Aspergillus niger in the mouth, pharynx, and larynx. PATIENTS SHOULD BE INSTRUCTED TO RINSE AND GARGLE FOLLOWING AEROSOL STEROID ADMINISTRATION o Dysmenorrhea o Musculoskeletal pain o Back pain o Dyspepsia o Myalgia o Nausea
DOSAGE	Metered Dose Inhaler • Two strengths: o 80 mcg budesonide and 4.5 mcg Formoterol o 160 mcg budesonide and 4.5 mcg Formoterol • 2 inhalation BID • Each canister holds 60 or 120 inhalations.

mometasone furoate

Asthmanex

ROUTE OF ADMINISTRATION	• Inhalation • Nasal Spray
INDICATIONS	• Maintenance management of moderate to severe bronchial asthma. • In severe asthma in which the patient is not responding to aerosol or oral administration, steroids can be given by intravenous administration.
ACTIONS	Corticosteroid; Anti-inflammatory Agent • Patients receiving bronchodilators by inhalation should be advised to use their bronchodilator prior to the administration of a steroid. • Steroids prevent inflammation by inhibiting the release of chemical mediators from the mast cells; they are also effective in restoring the responsiveness to beta-adrenergic receptors.
ADVERSE REACTIONS	• Adverse reactions for aerosol administration may include: o Headache o Allergic Rhinitis o Throat irritation o Upper Respiratory Infection o Sinusitis o Fungal infections with Candida Albicans or Aspergillus niger in the mouth, pharynx, and larynx. PATIENTS SHOULD BE INSTRUCTED TO RINSE AND GARGLE FOLLOWING AEROSOL STEROID ADMINISTRATION o Dysmenorrhea o Musculoskeletal pain o Back pain o Dyspepsia o Myalgia o Nausea
DOSAGE	Metered Dose Inhaler • 110 or 220 mcg/inhalation • 1 inhalation once a day • Each canister holds 14, 60 or 120 inhalations. Nasal Spray • 50 mcg/activation, 1-2 sprays each nostril daily

mometasone and formoterol

Dulera

ROUTE OF ADMINISTRATION	• Inhalation
INDICATIONS	• Maintenance management of moderate to severe bronchial asthma. • In severe asthma in which the patient is not responding to aerosol or oral administration, steroids can be given by intravenous administration.
ACTIONS	Corticosteroid; Anti-inflammatory Agent • Patients receiving bronchodilators by inhalation should be advised to use their bronchodilator prior to the administration of a steroid. • Steroids prevent inflammation by inhibiting the release of chemical mediators from the mast cells; they are also effective in restoring the responsiveness to beta-adrenergic receptors.
ADVERSE REACTIONS	• Adverse reactions for aerosol administration may include: o Headache o Allergic Rhinitis o Throat irritation o Upper Respiratory Infection o Sinusitis o Fungal infections with Candida Albicans or Aspergillus niger in the mouth, pharynx, and larynx. PATIENTS SHOULD BE INSTRUCTED TO RINSE AND GARGLE FOLLOWING AEROSOL STEROID ADMINISTRATION o Dysmenorrhea o Musculoskeletal/ pain o Back pain o Dyspepsia o Myalgia o Nausea
DOSAGE	Metered Dose Inhaler • Two strengths: o 100 mcg mometasone and 5 mcg Formoterol o 200 mcg mometasone and 5 mcg Formoterol • 2 inhalation BID • Each canister holds 120 inhalations.

WETTING SOLUTIONS

Water, Saline Solutions

Wetting Solutions are used to liquefy secretions and as diluents for medications

Water	• Given orally is the best mucolytic. • Sterile distilled water given by aerosol can be very irritating and may result in bronchospasm. • Hypotonic compared to body fluids.
Hypotonic Solution	• Less than 0.9% saline solution. • Irritating to the airway.
Isotonic Solution	• 0.9% saline solution. • Most physiologic aerosol and diluent for medication delivery.
Hypertonic Solution	• Greater than 0.9% solution. • Usually used to induce sputum specimens in a range of 1.8 to 15% solutions.

NICOTINE REPLACEMENT THERAPY

nicotine polacrilex

Generic, Commit, Nicorette, Thrive

ROUTE OF ADMINISTRATION	• Gum or mint (nicotine is absorbed through the oral mucosa)
INDICATIONS	• Used as an aid to smoking cessation for the relief of nicotine withdrawal
ACTIONS	• Nicotine replacement therapy is used to replace the nicotine in cigarettes with pharmacologic nicotine. • Weaning from nicotine is more effective than either an abrupt withdrawal or a gradual reduction in cigarette smoking. • Should be used with a multifaceted program involving behavior modification.
ADVERSE REACTIONS	• Excess salivation • Insomnia • Dizziness • Irritability • Headache • Indigestion • Nausea • Vomiting • Mouth or jaw • Soreness • Anorexia • Hiccups • Cardiac irritability • Hypertension • Do not use beyond 3 months. • Dependency on the gum may occur. • Patients must give up smoking completely or more severe adverse reactions may occur.
DOSAGE	• 2 or 4 mg chewing pieces or lozenges; a gradual weaning process is necessary.

nicotine TRANSDERMAL SYSTEM
Habitrol, Nicoderm, Nicotrol, Prostep

ROUTE OF ADMINISTRATION	• Transdermal patch • Oral or nasal spray
INDICATIONS	• Used as an aid to smoking cessation for the relief of nicotine withdrawal
ACTIONS	• Nicotine replacement therapy is used to replace the nicotine in cigarettes with pharmacologic nicotine. • Weaning from nicotine is more effective than either an abrupt withdrawal or a gradual reduction in cigarette smoking. • Should be used with a multifaceted program involving behavior modification.
ADVERSE EFFECTS	• Local skin irritation and/or reactions • Allergic reactions • Erythema • Pruritus • Edema • Urticaria (hives) • Rash • Burning • Other adverse reactions include: o Mouth/tooth disorders o Dry mouth o Arthralgia o Myalgia o Abnormal dreams o Insomnia o Nervousness o Diarrhea o Dyspepsia • Nicotine can be toxic and addictive • Patients should be urged to stop smoking completely when initiating therapy. • Usage beyond 3 months is discouraged.
DOSAGE	• Depends on manufacturer. • Typical dosing regimen: o 21 mg/day patch (30 cm^2); first 6 weeks o 14 mg/day patch (20 cm^2); next 2 weeks o 7 mg/day patch (10 cm^2); last 2 weeks • This program allows for gradual weaning

varenicline

Chantix

ROUTE OF ADMINISTRATAION	• Oral
INDICATIONS	• Used as an aid to smoking cessation for the relief of nicotine withdrawal
ACTIONS	• Varenicline binds to neuronal nicotinic receptors producing an agonist effect while blocking nicotine from binding with the site. • Weaning from nicotine is more effective than either an abrupt withdrawal or a gradual reduction in cigarette smoking. • Should be used with a multifaceted program involving behavior modification.
ADVERSE EFFECTS	• GI: Nausea and vomiting, abdominal pain, flatulence, dyspepsia, constipation, and dry mouth. • Psychiatric disorders: Insomnia, abnormal dreams, sleep disorders, nightmares. • CNS: Headache, dysgeusia, somnolence, lethargy. • Pulmonary: Rhinorrhea • Rash • Pruritis • Increased appetite
DOSAGE	• Supplied as 0.5 mg and 1.0 mg tablets • Day 1 – 3: 0.5 mg once per day • Day 4 – 7: 0.5 mg BID • Day 8 – End of treatment: 1 mg BID • 56 tablets per bottle.

isoloprost

Ventavis

ROUTE OF ADMINISTRATAION	• Inhalation
INDICATIONS	• Synthetic analog of prostacyclin indicated for the treatment of pulmonary arterial hypertension (WHO Group I) in patients with NYHA Class III or IV symptoms.
ACTIONS	• Iloprost dilates systemic and pulmonary arterial vascular beds. • The half-life of iloprost is 20 to 30 minutes.
ADVERSE EFFECTS	• Cardiovascular: Vasodilation (flushing), Hypotension, Palpitations, Syncope • Pulmonary: Increased cough • Neurological: Headache, Trismus, Insomnia • GI: Nausea, Vomiting, Flu syndrome • Metabolic: Increase in alkaline phosphate • Other: Back pain, Tongue pain, Muscle cramps, Hemoptysis
DOSAGE	• Supplied in 1 mL ampules in two concentrations: o 10 mcg/mL o 20 mcg/mL • Ventavis is intended to be inhaled using either of two pulmonary drug delivery devices: the I-nebR AADR System or the ProdoseR AADR System. • The first inhaled dose should be 2.5 mcg (as delivered at the mouthpiece). If this dose is well tolerated, dosing should be increased to 5.0 mcg and maintained at that dose; otherwise maintain the dose at 2.5 mcg. • Ventavis should be taken 6 to 9 times per day (no more than once every 2 hours) during waking hours, according to individual need and tolerability. • The maximum daily dose evaluated in clinical studies was 45 mcg (5 mcg 9 times per day).

SUMMARY

1. Actual dosages in each clinic may vary. Consult the Department Policy and Procedure Manual

2. Not all adverse reactions are listed. Consult product information.

3. SYMPATHOMIMETICS (β–Adrenergic Agonists)

   A. Indications For Bronchodilators

      i. Airflow obstruction secondary to bronchospasm

      ii. Inflammatory response

      iii. Secretions

   B. DO NOT USE medication if solution is pinkish to brown in color, cloudy or contains a precipitate.

   C. Sulfite Sensitivity:

      i. An increasing problem for those patients with hyperactive airways is sensitivity to sulfite preservatives resulting in bronchospasm.

      ii. Sulfites are used as antioxidants for bronchodilator solutions to prevent degradation and inactivation.

      iii. Sulfites include sodium or potassium sulfite, bisulfite and metabisulfite.

      iv. Solutions of Isuprel, Vaponephrine and Alupent all contain sulfites.

      v. Unit dose vials, ampoules and metered dose inhalers are sulfite free.

   D. Contraindications:

      i. Contraindications for any drug are a history of hypersensitivity to the drug.

      ii. β-adrenergic agonists should be administered with caution to patients being treated with monoamine-oxidase (MAO) inhibitors or tri-cyclic antidepressants.

E. Monitoring

i. Vital Signs

ii. Breath Sounds

iii. Work of Breathing (subjective data)

iv. Peak Expiratory Flow Rate (PEFR) or bedside spirometry (FEV_1)

v. Arterial Blood-Gas values and pulse oximetry

vi. Blood glucose and potassium levels

4. MIXING BRONCHODILATORS

A. Bronchodilators of the same type (sympathomimetics or “front-door”) should not be mixed together (e.g. metaproterenol, terbutaline, albuterol). The exception is a short-acting agent (albuterol) being used with a long-acting agent (salmeterol).

B. Bronchodilators that work by a different mechanism may be given together such as giving a sympathomimetic (front-door) with an anticholinergic (back-door) or an anticholinergic with a methylxanthine (side-door).

C. See table at end of document.

5. DRUG REACTIONS

A. If you suspect a drug reaction, REMEMBER:

i. Stop the treatment

ii. Monitor vital signs

iii. Stay with the patient until vital signs are stable

iv. Assure patient safety

v. Call the nurse, your supervisor and the physician

vi. Document thoroughly

- Include adverse reactions and actions taken

6. DRUG CALCULATIONS

   A. 1 gram = 1,000 mg

   B. 1 mg = 1,000 **mcg** (μg)

   C. 10% w/v solution means 10 **grams** in 100 mL of solution.

   D. 20% w/v solution means 20 **grams** in 100 mL of solution.

   E. 30% w/v solution means 30 **grams** in 100 ml of solution.

   F. 1:100 solution means 1 gram in 100 ml of solution = 1% solution

   G. 1:200 solution means 1 gram in 200 ml of solution = 0.5% solution

   H. 1:400 solution means 1 gram in 400 ml of solution = 0.25% solution

7. UNIVERSAL FORMULA

   A. % x cc x 10 = mg

8. DILUTION PROBLEMS

   A. $V_1 \times C_1 = V_2 \times C_2$

9. DRUGS GIVEN DOWN THE ENDOTRACHEAL TUBE

   A. The endotracheal tube can be used as a substitute for vascular delivery of medication if antecubital or intraosseous access is not available.

   B. “ALIEN MV”

   C. A - ATROPINE

   D. L – LIDOCAINE

   E. I - ISOPROTERENOL (should not be used as a direct instillation in ACLS)

   F. E - EPINEPHRINE

   G. N - NALOXINE - Narcan

   H. M – MUCOMYST

   I. V –Versed (?)

10. IDENTIFICATION OF DRUG BY DRUG **SUFFIX**

A. -phylline: methylxanthine bronchodiator

B. -cone or -lone: steroids

C. –cain(e): local anesthetics

D. -stigmine: anti-cholinesterase drugs

E. -ine: narcotics

F. -barbital: barbiturates

G. -olam or -pam: benzodiazepam

11. IDENTIFICATION OF DRUG BY DRUG **PREFIX**

A. Dig- cardiac glycoside

Figure 1. Compatibility guide for commonly used inhalation solutions and suspensions. Dark green shading with corresponding letter C indicates that there is evidence in the form of clinical studies confirming the stability and compatibility of the particular admixture. Light green shading with corresponding letter C indicates that there is evidence from manufacturers' reports confirming the stability and compatibility of a particular admixture[3]; in many instances, these studies were unavailable for review and were confirmed either by reference in the package insert or direct communication with the manufacturer. Red shading with corresponding letter X indicates that there is evidence confirming or suggesting that a particular admixture is not compatible. Yellow shading with corresponding letters NI indicates that there is insufficient evidence to evaluate compatibility and should be avoided unless future evidence becomes available. Blue shading with corresponding letters CD indicates that there are conflicting data regarding compatibility of the combination. The following information should be considered when determining the feasibility of preparing drug combinations for inhalation: (1) all admixtures should be prepared from formulations that do not contain preservatives, (2) The *United States Pharmacopeia* requirements state that the particle size of the delivered drug must be carefully controlled and the average diameter must be <5 µm, (3) physical and chemical compatibilities do not describe possible effects on aerodynamic behavior, (4) decreases in temperature can occur in certain nebulizers, and the effect of such decreases on compatibility has not been studied, (5) mixing solutions or suspensions increases total volume, and the relationship between the volume fill, total mass output, and inhaled mass of nebulized drug must be considered, and (6) if admixtures are to be stored, sterility issues must be addressed. References should be consulted to verify drug concentrations are compatible.

	Albuterol	Arformoterol[a]	Epinephrine[b]	Formoterol	Levalbuterol[c]	Metaproterenol[d]	Budesonide	Cromolyn[e]	Ipratropium	Acetylcysteine[f]	Colistimethate[g]	Tobramycin[h]	Sodium Chloride Solutions	Dornase Alfa
Albuterol		NI	NI	NI	NI	NI	C[3]	C[3,i]	C[3,i,j]	NI	C[3,k]	C[3]	NI	X[3]
Arformoterol	NI		NI	NI	NI	NI	C[a]	NI	C[a]	C[a]	NI	NI	NI	X[3]
Epinephrine	NI	NI		NI	NI	NI	NI	C[11]	NI	NI	NI	NI	NI	X[3]
Formoterol	NI	NI	NI		NI	NI	C[13]	NI	NI	NI	NI	NI	NI	X[3]
Levalbuterol	NI	NI	NI	NI		NI	C[3,c]	C[c]	C[c]	NI	NI	NI	NI	X[3]
Metaproterenol	NI	NI	NI	NI	NI		NI	C[11]	C[3]	NI	NI	NI	NI	X[3]
Budesonide	C[3]	C[a]	NI	C[13]	C[c]	NI		C[3,l]	C[3]	C[3]	NI	X[3]	NI	X[3]
Cromolyn	C[3,i]	NI	C[11]	NI	C[c]	C[11]	C[3,l]		C[3,m]	C[3,11]	NI	X[3]	NI	X[3]
Ipratropium	C[3,i,j]	C[a]	NI	NI	C[c]	C[3]	C[3]	C[3,m]		C[14]	NI	C[3]	NI	X[3]
Acetylcysteine	NI	C[a]	NI	NI	NI	NI	C[3]	C[3,11]	C[14]		C[3,n]	NI	NI	X[3]
Colistimethate	C[3,k]	NI	NI	NI	NI	NI	NI	NI	NI	C[3,n]		CD[3]	NI	X[3]
Tobramycin	C[3]	NI	NI	NI	NI	NI	X[3]	X[3]	C[3]	NI	CD[3]		NI	X[3]
Sodium Chloride Solutions	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI		X[3]
Dornase Alfa	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	

[a]No safety and efficacy studies available for admixtures of arformoterol with other drugs; physical and chemical compatibility studies with acetylcysteine, ipratropium, budesonide, and tiotropium have indicated compatibility of concentrations studied (Quon CL, Sepracor, personal communication, 2009 Sep 24).

[b]Epinephrine is readily destroyed by oxidizing agents or alkali (e.g., sodium bicarbonate, halogens, permanganates, chromates, nitrates, nitrites) and salts of easily reducible metals (e.g., iron, copper, zinc).[7]

[c]No safety and efficacy studies available for admixtures of levalbuterol with other drugs; physical and chemical compatibility studies with budesonide, cromolyn, and ipratropium have indicated compatibility of concentrations studied (Quon CL, Sepracor, personal communication, 2009 Sep 24).

[d]No safety and efficacy studies available for admixtures of metaproterenol with other drugs available from manufacturer (Lee S, Dey Laboratories, personal communication, 2009 Sep 24).

[e]Compatibility of cromolyn (Intal, King Pharmaceuticals) with albuterol (Ventolin, GlaxoSmithKline), fenoterol (Berotec, Boehringer Ingelheim), metaproterenol (Alupent, Dey Laboratories), and terbutaline (Bricanyl, AstraZeneca) confirmed by manufacturer.[3]

[f]Acetylcysteine (Mucomyst, Sandoz Pharmaceuticals) has been reported to be compatible with netilmicin or betamethasone.[3] The manufacturer reports that acetylcysteine is incompatible with amphotericin B, tetracyclines, erythromycin, or ampicillin; also incompatible with any oxidizing agent, iodized oil, trypsin, chymotrypsin, and hydrogen peroxide.[8]

[g]Colistimethate sodium (available as an injectable formulation in the United States; dosage expressed in terms of colistin) is not approved for inhalation via a nebulizer; a case of acute respiratory failure and subsequent death of a cystic fibrosis patient who received premixed colistimethate sodium via nebulization has been reported.[9] The prescribing information for a formulation available outside of the United States (Colistin, Grunenthal) states that precipitation may occur in admixtures with other nebulized antibiotics.[3]

[h]Tobramycin solution for oral inhalation should not be diluted or mixed with other drugs in the nebulizer. Based on protocols used in clinical studies evaluating tobramycin solution for oral inhalation in cystic fibrosis patients, it has been recommended that patients receive doses of inhaled bronchodilators first, then dornase alfa, then chest physiotherapy, and then tobramycin.[10]

[i]Admixtures of albuterol, cromolyn, and ipratropium appear to be stable, with ipratropium as the limiting component.[3]

[j]Albuterol and ipratropium are available as a combination solution for nebulization (Duoneb, Dey Laboratories, Napa, CA).

[k]Albuterol containing benzalkonium chloride (1 mL) mixed with 1 mL colistin (Coly-Mycin M Parenteral, 33.3 mg/mL, King Pharmaceuticals) resulted in immediate cloudiness, which was believed to be due to interaction of benzalkonium chloride with colistin (effect on aerodynamics unknown); colistin mixed with preservative-free unit-dose albuterol inhalation solution was chemically stable for one hour.[3] No additional information available from manufacturer (Guinto A, JHP Pharmaceuticals, personal communication, 2009 Sep 24).

[l]Manufacturer of budesonide (Pulmicort, Astra Zeneca GmbH, Wedel, Germany) stated that cloudiness occurred in mixtures of budesonide with cromolyn (Intal), but information is not included in the prescribing information or corroborated by studies.[3]

[m]Prescribing information for ipratropium (Atrovent, Boehringer Ingelheim) states that it should not be mixed with cromolyn because precipitation can occur. It has been reported that cromolyn mixed with ipratropium instantly produced cloudiness, which was attributed to the effect of an unknown excipient in the cromolyn formulation; the manufacturer attributed the cloudiness to benzalkonium chloride in the formulation. However, ipratropium mixed in a nebulizer with cromolyn sodium solution for oral inhalation also has been reported to be stable for one hour.[3]

[n]Acetylcysteine sodium solution (10%) for oral inhalation and colistin 37.5 mg/mL have been reported to be compatible, with immediate use recommended.[3]

Figure 1: Reprinted from Mixing and compatibility guide for commonly used aerosolized medications. David K. Burchett, William Darko, James Zahra, John Noviasky, Luke Probst, and Adrienne Smith. Am J Health-Syst Pharm. 2010; 67:227-30