

PHARMACOLOGY NOTES

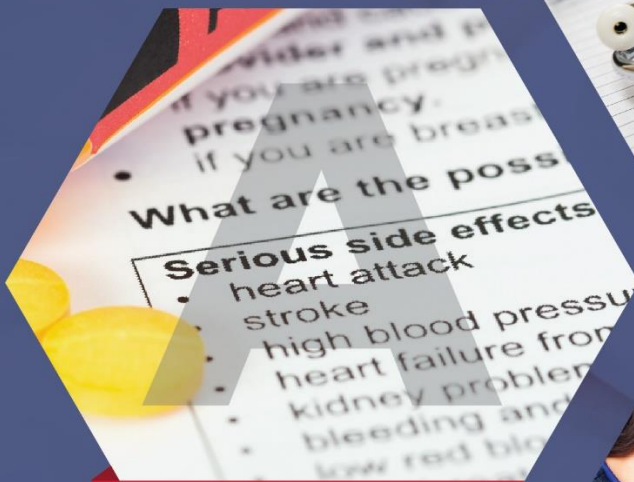
NURSING IMPLICATIONS FOR
CLINICAL PRACTICE



Administration



Therapeutic Effects



Adverse Effects



Teaching

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PHARMACOLOGY NOTES

NURSING IMPLICATIONS FOR CLINICAL PRACTICE

Overview

There are currently nine (9) units comprising this *Pharmacology Notes* resource. Units are broken down by body system and published individually for ease of retrieval:

Unit A: Autonomic Nervous System (ANS) Pharmacology

Unit B: Cardiovascular (CV) System Pharmacology

Unit C: Hematological System Pharmacology

Unit D: Central Nervous System (CNS) Pharmacology

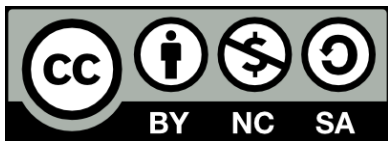
Unit E: Skeletal System: Bone and Joint Pharmacology

Unit F: Immune System Pharmacology

Unit G: Digestive System Pharmacology

Unit H: Endocrine System Pharmacology

Unit I: Respiratory System Pharmacology



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UNIT I

RESPIRATORY SYSTEM PHARMACOLOGY

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(MC) Major Class or Therapeutic Class (SC) Subclass or Pharmacologic Class (SSC) Selective Subclass – more specific action within Subclass

Upper Respiratory Drugs

(MC) Antihistamine

(MC) Decongestant

(MC) Antitussives

(MC) Expectorants

(MC) Corticosteroids

Lower Respiratory Drugs

(MC) Bronchodilators

(SC) Sympathomimetics/adrenergics

(SC) Parasympatholytics/anticholinergics

(SC) Methylxanthines

(MC) Corticosteroids

(MC) Mucolytics

(MC) Antiasthmatics (other)

(SC) Leukotriene Modifiers

(SSC) Leukotriene receptor antagonists

(SSC) Leukotriene synthesis inhibitors

(SC) Mast Cell Stabilizers

(SC) Anti-eosinophil/monoclonal anti-IgE antibodies

Respiratory System Pharmacology

I. ANATOMY AND PHYSIOLOGY/PATHOPHYSIOLOGY REVIEW

A. Upper Respiratory Tract (RT)

1. Structures: nose, nasal cavity, pharynx, paranasal sinuses
2. Functions: warm, humidity, filter air before it enters lower respiratory tract

B. Lower Respiratory Tract (RT)

1. Structures: trachea, bronchi, lungs
2. Functions: ventilation or gas exchange

C. Common Respiratory Disorders

1. Upper RT:
 - a. Rhinitis – **inflammation** of upper airways: nasal mucous membranes, throat:
 - 1) Types/Causes:
 - a) allergic – allergen → histamine release
 - b) acute (common cold) – virus
 - 2) S/sx – upper **airway obstruction**:
 - a) swelling of airways → nasal congestion
 - b) ↑ secretions → nasal discharge
2. Lower RT:
 - a. Asthma – chronic **inflammatory** disorder of the airways characterized by hyperresponsiveness → bronchospasms and airway edema
 - 1) Types/Causes (triggers): intrinsic, extrinsic
 - 2) S/sx – intermittent lower **airway obstruction**:
 - a) swelling
 - b) smooth muscle contractions → bronchospasms
 - c) ↑ secretions → productive cough
 - b. COPD – chronic slowly progressive respiratory disorder characterized by stable phases increasingly interrupted by worsening sx (acute exacerbations) of **airflow limitation**
 - 1) Types/Causes: genetic factors, environmental → smoking, air pollution
 - 2) S/sx – continuous lower **airway limitation/obstruction**:
 - a) swelling
 - b) smooth muscle contraction → bronchoconstriction
 - c) ↑ secretions → productive cough

II. PHARMACOLOGY

A. Pharmacologic Connections for Respiratory Drugs

1. When managing respiratory disorders, often agents are given to relieve **airway obstructions**:
 - a. Treat underlying **cause(s)**:
e.g. rhinitis → infection
pneumonia → infection
 - b. Manage **effect** = s/sx of ↓ airflow or ↓ oxygenation
2. **Goals** of Drug Therapy ⇒ ↓ **airway obstruction** by:
 - a. ↓ inflammation
 - b. ↓ secretions
 - c. Relax airway smooth muscle walls
3. Outcomes:
 - a. ↑ airflow
 - b. ↑ oxygenation
4. General Principles of Respiratory Agents:
 - a. Multiple drug regimens are more effective → by using smaller doses of multiple classes to:
 - 1) Maximize desired effects
 - 2) Minimize adverse effects
 - b. **Local** over systemic administration preferred to ↓ adverse effects:
 - 1) Metered dose inhalers (MDIs)
 - 2) Nebulized mist treatments (NMTs)
 - 3) Dry-powder inhalers (DPIs)

Nursing Implications: Respiratory Pharmacology: Drugs Used to Treat Upper Respiratory Conditions

Major Class/ Subclass	MOA	Prototype – generic	Prototype – trade	A – Admin	T – ✓ Therapeutic Effects – General (MC)	A – ✓ Adverse Effects – Specific (MC)	T – Teaching – General (MC)
Antihistamine 1 st generation 2 nd generation	Blocks effects of histamine (at H ₁ receptors): • Blocks constriction of bronchials • Suppresses exocrine gland secretions • Suppresses cough	diphenhydramine hydroxyzine loratadine cetirizine	Benadryl Vistaril Claritin Zyrtec	Route: PO/IN/IM/IV	• ↓allergy s/sx	• Sedation • 2 nd generation – non-sedating • Anticholinergic effects • GI: N/V/A • Paradoxical excitation in children	• Take as directed • Avoid allergens • Ø alcohol, CNS depressants • Safety 2 ^o sedation
Decongestant ("Decrease" congestion)	Sympathomimetic (↑ NE): • Constricts arterioles → ↓ blood flow → ↓ edema to nasal mucosa	oxymetazoline phenylephrine ephedrine pseudoephedrine	Afrin Neo-Synephrine Akovaz Sudafed	Route: IN Route: IN Route: IN Route: PO Contraindications: CVR disease	• ↓nasal congestion • ↓nasal discharge	• "sympathomimetic" ○ ↑ blood flow of vital organs – CVR stimulation ○ ↓ blood flow of non-vital organs – GI/ GU • Rebound congestion w/ IN route	• IN administration (drops, sprays) • Avoid prolonged use > 7 days • Use w/ caution: CVR disease • Hydration
Antitussives (cough suppressants)	• Centrally acting: suppresses cough center • Peripherally-acting: suppresses cough receptors in throat, trachea, lungs	Opioid: codeine		Route: PO	• ↓coughing • ↑rest	• Refer to CNS Part 2: Narcotics- ○ CNS depression ○ GI: N/V/C	• Take as directed w/ meals • Ø alcohol, CNS depressants • Safety • Use w/ caution: patients w/ respiratory disease
		Nonopioid: dextromethorphan	Delsym Robitussin DM	Route: PO/syrup		• CNS: sedation, dizziness; mild GI effects	
Expectorants ("helps secretions exit")	• ↓ mucous adhesiveness & surface tension	guaifenesin	Mucinex	Route: PO/syrup	• ↑productive cough	• ↑ drowsiness in large doses • GI: N/V/D	• Ø eating, drinking ~30 min. after syrup • C & DB • Hydration • Activity
Corticosteroids	Anti-inflammatory • ↓ nasal mucosal swelling • ↓ nasal secretion	fluticasone flunisolide	Flonase, Sensimist Aerobid	Route: IN – local Freq: 1-2x/day	• ↓allergy sx • ↓nasal congestion • ↓nasal discharge	• Nasal burning • Nasal bleeding	• Proper IN spray administration • May take several wks to achieve full effect

Nursing Implications: Respiratory Pharmacology: Drugs Used to Treat Lower Respiratory Conditions

Major Class/Subclass	MOA	Prototype – generic	Prototype – trade	A – Admin	T – ✓ Therapeutic Effects – General (MC)	A – ✓ Adverse Effects – Specific (SC)	T – Teaching – General (MC)
Bronchodilators/ • Sympathomimetics (or adrenergic)	Relaxes airways by stimulating beta ¹ receptors in the smooth muscle of bronchi & bronchioles	albuterol epinephrine	Ventolin, Proventil, Vospire EpiPen	Route: IH – "rescue" inhaler • Fast action	Improve resp. status (acute SOB): • rate/character • ↑ O ₂ level • lung sounds: clear • ↓ anxiety, restlessness • ↓ incidence of bronchospasms • + specific to theophylline: ○ therapeutic blood level	• CNS stimulation • CV stimulation	• Proper use of MDI, DPI, NMTs • Take as directed • ✓ HR before NMT • Smoking cessation • Limit caffeine • Ø OTC meds
• Parasympatholytics (or anticholinergic)	Relaxes airways by blocking action of Ach in bronchial smooth muscle	ipratropium tiotropium atropine	Atrovent Spiriva	Route: IH – long-term mgmt. of pulm. dz • Slower onset of action		• Cough • (Limited systemic absorption)	
• Methylxanthines	• Inhibits endogenous catecholamines (similar to caffeine) • Inhibits Ca ⁺⁺ movement into smooth muscle • Inhibits prostaglandin synthesis & release • Inhibits release of bronchoconstrictive substances	theophylline aminophylline	Theolair, Theo-24, Theo-Dur Truphylline	Route: PO/IV – 2 nd line drug Timing: take w/ meals		• GI: N/V • CNS: stimulation • CV: stimulation	• As above • + specific to theophylline: ○ Report persistent GI s/sx ○ ✓ blood level • Consider use of antiulcer agents • Watch for signs of toxicity due to narrow therapeutic range
Corticosteroids	Anti-inflammatory: • ↓ airway swelling • ↓ mucous secretion • ↑ # /sensitivity of β-adrenergic receptors	beclomethasone budesonide prednisone methylprednisolone	QVAR, Beconase Pulmicort Deltasone Solu-Medrol	Route: IH/IN Route: PO – systemic Timing: take w/ meals IV – Systemic		• Oral thrush • Throat irritation, hoarseness • Refer to Endocrine Pharm – Cushing's syndrome (dose & duration-dependent)	• Do <u>not</u> overuse • Rinse mouth after IH • IH: B before C • Refer to Endocrine Pharm • Ø abruptly stop

Major Class/Subclass	MOA	Prototype – generic	Prototype – trade	A – Admin	T – ✓ Therapeutic Effects – General (MC)	A – ✓ Adverse Effects – Specific (SC)	T – Teaching – General (MC)
Mucolytics ("lysis mucous")	↓ viscosity of resp. secretions by altering molecular composition of mucous	acetylcysteine	Mucomyst, Acetadote	Route: IH (other uses: PO)	<ul style="list-style-type: none"> • Secretions thinner • ↑ease in mobilizing secretions • Treats acetaminophen (Tylenol) overdose • ↑renal clearance of contrast dye 	<ul style="list-style-type: none"> • GI: nausea 2° "rotten egg" odor • ↑secretions – difficult to mobilize unless has strong cough 	<ul style="list-style-type: none"> • C & DB • Hydration • Activity • Often given w/ bronchodilator
Antiasthmatics (other): • Leukotriene modifiers (antileukotriene)	Leukotriene receptor antagonist - blocks leukotriene receptors → ↓ inflammation	monel luk ast zafir luk ast	Singulair Accolate	Route: PO Delayed onset of action	Long-term control of asthma: • ↓frequency of asthma attacks	<ul style="list-style-type: none"> • HA, cough, nasal congestion • GI: nausea; hepatotoxicity 	<ul style="list-style-type: none"> • Use as directed – <u>not</u> to be used as "rescue" med. • May take several weeks to achieve full therapeutic effects • Contraindicated during pregnancy • Eliminating asthma triggers
	Leukotriene synthesis inhibitors	zileuton	Zyflo SR	Route: PO Freq: after meals		<ul style="list-style-type: none"> • HA, nose and throat irritation, pain or fullness in the face • GI: heartburn, diarrhea • Muscle pain 	
• Mast cell stabilizers	Inhibits mast cells from releasing histamine & other chemical mediators of inflammation	cromolyn sodium nedocromil	Intal Alocril, Tilade	Route: IH Delayed onset of action		<ul style="list-style-type: none"> • Local: nasal stinging/burning; nasal congestion, throat irritation 	

Major Class/Subclass	MOA	Prototype – generic	Prototype – trade	A – Admin	T – ✓ Therapeutic Effects – General (MC)	A – ✓ Adverse Effects – Specific (SC)	T – Teaching – General (MC)
<ul style="list-style-type: none"> • Anti-eosinophil - monoclonal anti-IgE antibodies 	<p>Binds directly at the surface of the eosinophil → ↓ sensitivity to allergens</p> <p>Indications: moderate to severe persistent asthma w/ + skin test or in vitro reactivity to a perennial aeroallergen; when sx are inadequately controlled with inhaled corticosteroids.</p>	omalizumab	Xolair	<p>Route: SC every 2-4 wks. (reconstituted powder)</p> <p>Dosing frequency: based on serum total IgE level (IU/mL) measured before the start of treatment, and by body weight (kg).</p>	<p>Long-term control of asthma: ↓ frequency of asthma attacks</p>	<ul style="list-style-type: none"> • Local: injection site reaction • Infections: viral upper respiratory tract infection, sinusitis, pharyngitis • HA • Anaphylaxis • Malignancies 	<ul style="list-style-type: none"> • Use as directed – <u>not</u> to be used as "rescue" med. • May take several weeks to achieve full therapeutic effects • Contraindicated during pregnancy • Eliminating asthma triggers