

Respiratory agents: A nutshell

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Upper Respiratory Infections: Otitis Media and Otitis Externa

Viral Upper Respiratory Infections

- Rhinovirus most common virus
 - Adenovirus
 - RSV
 - Coronavirus
 - Enteroviruses
- Children get 6 to 8 colds a year
 - More if in daycare
- Adults average 2.5 URIs per year
- Last 7-9 days
- Significant runny nose and cough on days 1 to 4 predictive for viral origin

URI Symptoms

- Nasal congestion
- Rhinorrhea
- Malaise
- Scratchy or sore throat
- The nasal discharge typically starts out thin and clear and then thickens and progresses to a green or yellow color
- Generalized muscle aches
- Adults usually don't have a fever
- Children may have low-grade fever

URI Treatment

- Symptomatic care
 - Fluids, antipyretics
 - Nasal bulb suctioning in infants
 - Decongestants in older children and adults
- No antibiotics
 - No difference in clinical outcomes

Decongestants

- Systemic Sympathomimetics
 - Pseudoephedrine
 - Phenylephrine
- Topical decongestants
 - Phenylephrine (Neosynephrine)
 - Oxymetazoline (Afrin)

Oral Decongestants

- Action: vasoconstriction of capillary vessels, theoretically decreasing congestion
- ADRs
 - Tachycardia
 - Hypertension
 - Anxiety/restlessness/irritability
- There is no evidence for the efficacy of either systemic decongestant in the treatment of URI in children
- Use may be hazardous
 - In 2004-05 1,519 children aged <2 years were treated in U.S. emergency departments for adverse events from cough/cold medications
 - Deaths in infants and young children

Cough Suppressants

- Dextromethorphan
- Codeine
- Action: centrally acting cough suppressant
- Evidence:
 - Codeine no more effective than DM or placebo
 - Little efficacy in cough d/t URI
 - Approximately 5-10% of Caucasians are poor DXM metabolizers
 - DXM + antidepressants may induce serotonergic syndrome
- Potential for abuse

Expectorants

- Guiafenesin (Robitussin)
- Action: stimulates respiratory tract secretions, decreases viscosity of respiratory secretion
- Evidence:
 - No evidence for efficacy in chronic cough or cough d/t URI

Sinusitis

- Bacteria isolated in 70% of patients with sinusitis
 - Strict criteria: persistent, not improving for at least 10 days
- Common pathogens
 - *S. pneumoniae* 30%
 - *H. flu* 20%
 - *Moraxella catarrhalis* 20%
 - rarely, *Staphylococcus*

Sinusitis: Goals of Treatment

- Absence of infection
- Resolution of all symptoms

Antibiotic choices for Sinusitis

- Amoxicillin first line
 - Dose at 80-90 mg/kg/day in high-risk children
 - 45 mg/kg/day in low risk children
 - Adults 500 mg TID
 - Or high-dose Augmentin
 - For PCN allergic patients
 - Children: cefdinir, cefuroxime, or cefpodoxime
 - Adults: doxycycline or respiratory fluoroquinolone (levofloxacin)
- Sinusitis: Worsening after 72 hrs
- Consider bacterial resistance
 - Switch to Augmentin if amoxicillin was first choice
 - If started on Augmentin:
 - Adults: consider respiratory fluoroquinolone (levofloxacin)
 - Children: cefdinir, cefuroxime, cefpodoxime

Acute Otitis Media (AOM)

- Caused by eustachian tube dysfunction
 - Negative pressure causes reflux of bacteria into middle ear
- Pathogens
 - *S. pneumoniae*
 - Nontypeable *H. influenzae*
 - *M. catarrhalis*
 - Microbiology is changing due to PCV vaccine
 - *H. flu* increasing, *S. pneumoniae* decreasing
 - Respiratory viruses account for 40 to 75% of AOM cases in children

AOM Diagnosis

- Diagnosis of AOM requires
 1. Moderate to severe bulging of TM or new onset of otorrhea
 2. Mild bulging of TM and < 48 hrs of ear pain or intense erythema of TM
- Bullous myringitis
 - thin-walled bulla

AAP/AAFP Guidelines for AOM in Children

- Initial observation without antibiotics for 48 to 72 hours in children > 2 years with non-severe illness
- If treating AOM with antibiotics, amoxicillin dosed at 80 to 90 mg /kg/day is first choice

Criteria for Initial Antibacterial-Agent Treatment or Observation in Children With AOM (AAP, 2013)

	Otorrhea with AOM	Unilateral or bilateral AOM with Severe Symptoms	Bilateral AOM without otorrhea	Unilateral AOM without Otorrhea
6 mo to 2 yr	Antibiotic therapy	Antibiotic therapy	Antibiotic therapy	Antibiotic therapy or additional observation
≥ 2 yrs	Antibiotic therapy	Antibiotic therapy	Antibiotic therapy or additional observation	Antibiotic therapy or additional observation

AOM Antibiotic Choices

- Amoxicillin is first choice
- Or
amoxicillin/clavulanate
90mg/kg/day of
amoxicillin

AOM antibiotics for PCN Allergic

- cefdinir (14 mg/kg per day in 1 or 2 doses)
- cefpodoxime (10 mg/kg per day, once daily)
- cefuroxime (30 mg/kg per day in 2 divided doses)
- Ceftriaxone 50 mg IM 1 day or x 3 days

AOM Initial observation for 48 hrs

- Low risk patient
 - > age 2 years
 - Mild otalgia
 - Temp < 39 degrees
- Adequate pain management is essential
- “Safety net” prescription
 - WASP “Wait and See Prescription”

AOM treatment failure at 48-72 hrs

- If initially treated with amoxicillin or other first line therapy:
 - Augmentin
 - Ceftriaxone IM/IV x 3 days
- PCN allergic:
 - Clindamycin plus third generation cephalosporin

AOM Patient Education

- Proper use of the prescribed antibiotic
- The predicted course of the infection once antibiotics are started
- Follow up in 2 to 3 days if no improvement
- Pain control

Asthma and COPD

Asthma

- Pathophysiology
 - Chronic inflammatory disorder of the airways
 - Recurrent episodes of wheezing, breathlessness and chest tightness
 - Airflow obstruction is reversible
- National Asthma Education and Prevention Program *Expert Panel 3 Guidelines* (2007) are used for management of all types of asthma
- Classification of Asthma
 - Mild intermittent
 - Mild persistent
 - Moderate persistent
 - Severe persistent
- Adult and children definitions differ slightly

Asthma

- Goals of Therapy
 - Reduce Impairment
 - Prevent chronic symptoms
 - Reduce use of inhaled short-acting beta agonists
 - Maintain normal or near normal pulmonary function
 - Maintain normal activity levels
 - Meet patient/family expectations of asthma care
 - Reduce Risk
 - Prevent recurrent exacerbations and minimize ED visits and hospitalizations
 - Prevent loss of lung function
 - Provide optimal therapy with minimal ADRs

Mild Intermittent Asthma

- Step 1 Therapy
- Use short-acting beta₂ agonists as needed for symptoms
- Patients have symptoms when exposed to triggers (URIs, allergens, chemical inhalents)
- Exercise can be mild intermittent
- Need an annual Flu shot

Beta₂ Receptor Agonists

- Short-acting beta agonists
 - Albuterol (ProAir, Ventolin, Proventil)
 - metaproterenol (Alupent)
 - terbutaline (Brethine, Brethaire)
 - bitolterol (Tornalate)
 - pirbuterol (Maxair)
 - levalbuterol (Xopenex)
- Long-acting beta agonists
 - salmeterol (Serevent)
 - formoterol (Foradil)
 - Indacaterol (Arcapta Neohaler)
 - arformoterol (Brovana)

Albuterol

- Selective beta₂ agonist with minor beta₁ activity
- Levalbuterol is where the (S)-isomer from racemic albuterol is removed

Salmeterol

- Salmeterol is more selective for beta₂ receptors than albuterol and has minor beta₁ activity
- 12 hour half life

Beta Agonists Clinical Use

- Exercise induced bronchospasm
 - Albuterol 2 puffs 15 min before exercise
 - Salmeterol 2 puffs 30 to 60 min before exercise
 - Do not use if already on daily dose of salmeterol
 - Leukotriene modifiers taken daily may decrease EIB symptoms in 50% of patients, but pt will still need to use albuterol before exercise

Beta₂ Agonists

- **Precautions and Contraindications**

- Cardiac arrhythmias
- Diabetics: potential drug-induced hyperglycemia
- Long-acting beta agonists:
 - Black Box warning: the risks of salmeterol (Serevent) and formoterol (Foradil) outweighed the benefits and should not be used singly in asthma for all ages
 - 2-fold increase in catastrophic events (asthma related intubations and death)
- Terbutaline Pregnancy Category B (others Cat C)
- Children:
 - Albuterol safe for all age children
 - Salmeterol should not be used in children < age 4 yrs and never singly

Beta Agonists: Drug Interactions

- Digitalis glycosides: increased risk of dysrhythmia
- Beta adrenergic blocking agents: direct competition for beta sites resulting in mutual inhibition of therapeutic effects
 - Including beta blocker eye drops
- TCAs and MAOIs potentiate effects of beta agonist on vascular system

Monitoring

- Once control is achieved, the patient is seen every 1 to 6 months to determine if a step up or step down in therapy is indicated
- The Expert Panel III guidelines recommend the dose of inhaled corticosteroids be reduced about 25% to 50% every 2 to 3 months to lowest possible dose to maintain control

Managing Exacerbations

- Treat with oral steroids to regain control
- Use a short burst
 - Adults: 40 to 60 mg/day x 5 to 10 days
 - Children: 1 to 2 mg/kg daily (max 60 mg/day) x 3 to 10 days
- If not effective then step up in therapy

Mild Persistent Asthma

- Step 2 Therapy
- Treat with one long-term control medication daily
 - Low dose inhaled corticosteroids are the mainstay for all age patients
 - Cromolyn or a leukotriene modifier are alternative
 - See dosage chart for low dose schedule of each inhaled corticosteroid
- Use beta agonists as needed, if using more than ≥ 2 days per week then step up in therapy

Moderate Persistent Asthma

- Step 3 Therapy
- Treat with medium-dose inhaled corticosteroids
 - Or low-dose inhaled steroids plus long-acting beta agonists (adults)
 - Alternative: medium dose inhaled steroid plus leukotriene receptor modifier
- May use short acting beta agonists
- Exacerbations may require oral corticosteroids

Severe Persistent Asthma

- Step 4 Therapy
 - Medium-dose inhaled inhaled corticosteroids plus long-acting beta agonist
 - Or medium-dose inhaled corticosteroid and a leukotriene modifier or theophylline
- Step 5 Therapy
 - High-dose inhaled corticosteroids plus long-acting beta agonists
- Step 6 Therapy
 - High dose inhaled corticosteroids plus long-acting beta agonists and oral corticosteroids
- Severe persistent asthma requires consultation with asthma specialist