ALL THAT WHEEZES IS NOT ASTHMA
...just most!
Disclosures

• Dr. Brooks has disclosed that he is on the scientific advisory board for United Allergy Services.
Objectives

By the end of this activity, the participant should be better able to:

- List the most common causes of cough in the pediatric population.
- Describe the diagnostic steps for respiratory issues in pediatric patients.
- Describe the management of the most common causes of pediatric respiratory issues.
Case

- 5 y/o boy with 3 month history of nasal congestion, nighttime cough, bad breath, intermittent purulent rhinorrhea alternating with clear rhinorrhea, episodes of sneezing/nasal itching
- OTC cold meds haven’t worked
- This has been recurrent for the past 2 years
- Possible diagnoses?
- Bacterial sinusitis vs. Allergic Rhinitis
- Number and duration of antibiotic courses?
- How did the child respond on abx…off abx?
- Last time child was completely clear?
- Exposures (siblings, school, allergens, pollutants, etc.)
- Allergic triggers? Seasonality, exposure to pets, diurnal variation?
- Family Hx. sinus/allergic disease?
- Breathing problems (asthma?)
- Other infections (immunodeficiency)
- Foul discharge from nare unilaterally (foreign body)
Clinical Symptoms of a URI?

Day of Illness

% of Patients with Symptom

- Fever
- Sore Throat
- Cough
- Nasal Drainage
Acute Bacterial Rhinosinusitis

• Most often preceded by a viral URI
• A [probable] diagnosis may be made if a viral URI has not improved after 10 days or has worsened after 5 to 7 days or if symptoms are out of proportion to a typical URI
• Common bacteria:
  - *Streptococcus pneumoniae*
  - *Hemophilus influenzae*
  - *Moraxella catarrhalis*
  - *Staphylococcus aureus*, atypical bacteria (*M. pneumoniae*, *Chlamydia*)
Allergic Rhinitis:
Signs and Symptoms

◆ Provoked by exposure to environmental allergens
◆ Common Symptoms:
  – Nasal, eye itching
  – Sneezing, clear rhinorrhea, post nasal drip, watery eyes tearing
  – Nasal congestion / obstruction
    – Mouth breathing, snoring
  – “Sinus” headache, ear pressure - ostial & Eustachian tube dysfunction
Allergic Rhinitis: Signs and Symptoms

- **Eyes:**
  - Conjunctivitis, Dennie’s lines, allergic “shiners”

- **Nose:**
  - Edematous/pale/enlarged nasal turbinates, clear/thin mucoid rhinitis, polyps, transverse nasal crease from “allergic salute”

- **Ears:**
  - Otitis media, retracted tympanic membrane from ET dysfunction

- **Throat:**
  - Prominent lymphoid patches (cobblestoning) lateral pharyngeal bands

Allergic Conjunctivitis

Allergic Shiners
Allergic Rhinitis: Signs and Symptoms

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Nasal congestion secondary to seasonal allergic rhinitis
Allergic crease
Allergic salute
Allergic Rhinitis – Triggers

- Provoked by exposure to environmental allergens
- Perennial (year round) (mites, molds, pets)
- Seasonal (intermittent) (pollens)
Most Rhinosinusitis Results From a Cycle of Mucosal Inflammation

- Mucosal Swelling
  (URI, allergy, environment)
- Bacterial Infection
- Ostial Obstruction
- Mucous Stasis
  (antihistamines)
Nasopharyngeal Obstruction

- Infection: URI, TB, bacterial sinusitis, fungal sinusitis (aspergillus)
- Allergic rhinitis
- Foreign bodies
- Tumors, granulomas
- Anatomic abnormalities: deviated septum, coanal atresia
- Polyps, adenoids, tonsils
Extrathoracic Airway Disease

- Gastroesophageal reflux
- Laryngotracheobronchitis (croup), epiglottitis
- Laryngomalacia, tracheomalacia
- Vocal cord dysfunction, paralysis
- Vocal cord polyps, tumors
- TE fistula, laryngeal webs
Gastroesophageal Reflux

• Symptoms of “heartburn” after meals, nocturnal, often silent
• Associated with apnea, choking, rumination
• May result in laryngospasm, bronchospasm
• Often associated with food allergy
Layngotracheobronchitis (Croup)

- Inspiratory stridor, barking cough
- Viral infection (*Parainfluenza, Adenovirus, RSV*)
- May respond to racemic epinephrine (steroids?), cool mist
- May also be associated with lower respiratory tract disease
Lower Airway Disease

- Asthma
- Bronchitis/Bronchiolitis
- Atypical pneumonia
- Foreign Body
- Granulomas (TB, sarcoid)
- Bronchopulmonary Dysplasia
- Cystic Fibrosis
- Tumors
- Vascular ring
- Pulmonary fibrosis
- Bronchiectasis
- Dysmotile Cilia
Diagnostic Criteria for Asthma

• Episodes of airflow obstruction:
  • Cough, wheeze, shortness of breath, or chest tightness
  • Exercise-induced symptoms
  • Nocturnal symptoms (after 12 MN)
  • Common Triggers (Virus, weather change, exercise, allergens, chemicals)

• Evidence of reversible bronchospasm (spontaneous, b-agonists, corticosteroids)
  • Objective measures:
    – Improvement in PEFR, spirometry
  • Improvement in clinical signs/symptoms and PE
    – Cough, wheeze, SOB, chest tightness, etc.
    – Breathlessness, RR, HR, auscultation, retractions, O₂ Sat

• Associated atopic disease in patient or family
  • Rhinitis, asthma, eczema, food allergy
Figure 4-1a. Stepwise Approach for Managing Asthma in Children 0-4 Years of Age

Persistent Asthma: Daily Medication
Consult with asthma specialist if step 3 care or higher is required.
Consider consultation at step 2.

Step 1
Preferred: Low-dose ICS
Alternative: Cromolyn or Montelukast

Step 2
Preferred: Medium-dose ICS

Step 3
Preferred: High-dose ICS + either LABA or Montelukast
Oral systemic corticosteroids

Step 4
Preferred: Medium-dose ICS + either LABA or Montelukast

Step 5
Preferred: High-dose ICS + either LABA or Montelukast

Step 6
Preferred:

Step up if needed
(first, check adherence, inhaler technique, and environmental control)

Assess control
Step down if possible
(and asthma is well controlled at least 3 months)

Patient Education and Environmental Control at Each Step

Quick/Relief Medication for All Patients
- SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms.
- With viral respiratory infection: SABA q 4-6 hours up to 24 hours (longer with physician consult). Consider short course of oral systemic corticosteroids if exacerbation is severe or patient has history of previous severe exacerbations.
- Caution: Frequent use of SABA may indicate the need to step up treatment. See text for recommendations on initiating daily long-term control therapy.
Bronchitis/Bronchiolitis

- Viral infection (RSV, Rhinovirus, Parainfluenza)
- Severe airway inflammation, swelling, air trapping, wheezing
- Minimal bronchospasm (minimal response to bronchodilators - 20% of patients worsen)
- Supportive therapy
Bronchiectasis

- Chronic productive purulent cough
- Only responds to antibiotics, but returns quickly
- Associated with immunodeficiency
- Destruction of bronchioles
Bronchopulmonary Dysplasia

- Associated with prematurity, RDS, mechanical ventilation, oxygen
- Increase in bronchial smooth muscle, epithelial damage/scarring
- Increased susceptibility to bronchiolitis, pneumonia, pneumothorax
- Improves with age (1-3 years)
- Airway dysfunction persists till adolescence
Allergic Broncho-pulmonary Dysplasia (ABPA)

- Asthma
- High IgE (>1000 ng/ml), eosinophilia
- Hypersensitivity to Aspergillosis fumigatus (IgE, IgG)
- CXR infiltrates
- Central bronchiectasis
Foreign Body Aspiration

“if there’s one animal in the forest that can eat you, you’d better be able to identify it”

- Localized wheezing (insp. and/or exp.)
- Preceded by acute coughing, gagging
- May develop pneumonia
- Unresponsive to bronchodilators
- CXR: air trapping/atelectasis
Case 1

• 13 y/o CF was brought by EMS to the ED with c/o severe SOB, cough, wheeze. Evaluation revealed wheeze bilaterally and prolonged expiration, mild resp. distress, O2 SAT 100% on RA.
• DX: Asthma Exacerbation.
• PMHx: Asthma x 2 years, allergic rhinitis (cedar), Hx of milk allergy, currents sx of GERD
Case 1

• Normal spirometry
• Dx: Mild intermittent asthma with severe exacerbations, exercise-induced bronchospasm and allergic rhinitis.
• 2 weeks later presented with severe asthma episode, but symptoms resolved within 2 hours of admission to the ICU.

Interpretation: mild large airway obstruction, otherwise normal.
Vocal Cord Dysfunction

- Abnormal closure of vocal cords
- Sx: Throat tightness, cough, wheeze
- Unresponsive to medical Rx
- Rx: Psychotherapy, relaxation
Vocal Cord Dysfunction

Selected Stills (Image Compression - 19:1)

02:49:20 - Fully abducted position
02:37:14 - Attempting to Breathe
03:30:19 - Voicing
02:55:04 - Attempting to Breathe

Videostroboscopy
(video laryngoscopy, fiberoptic rhinolaryngoscopy)
Case 1

- Relaxation therapy
- Psychiatry referral
  - Depression
  - Generalized Anxiety disorder
- GERD: Placed on H2-blockers
• 12 y/o with EIB and acute episodes triggered by “smell of smoke,” chlorine

• 17 y/o with EIB, and SOB “when she thinks about her breathing”
Induction of VCD with Exercise

From: Landwehr: Pediatrics, Volume 98(5).November 1996.971-974
Case 2

• Pt referred to Pedi Asthma Clinic for evaluation of severe asthma. Pt was very thin, had diffuse wheezing, clubbing.
• Meds: High-dose inhaled steroids, frequent pulses of oral steroids, albuterol
• PMHx: Chronic illness since birth, recurrent sinusitis/otitis, sinus surgery, PE tubes, chronic wheeze, FTT, chronic congestion, RML syndrome
Case 2

- Sweat Cl\(^{-}\) nl.
- CXR: Hyperinflation, peribronchial thickening, RML atelectasis, fine nodular interstitial pattern in lower lobes
- High resolution CT: Fine peribronchial nodular lesions
- **Open lung Bx.** Revealed peribronchial nodular lymphoid lesions
- **Tracheal bx:** Disorganized ciliary movement, absence of dynein arms

Interpretation: severe small airways obstruction, not reversible
Dysmotile Cilia Syndrome
(Primary Ciliary Dyskinesia-PMD)

- Chronic cough, wheeze
- Clubbing
- Freq. otitis/sinusitis, infertility
- RM lobe atelectasis syndrome
- Chronic obstructive pulmonary disease
- LAB: Bx. Airway ciliated epithelium, saccharine test
• Case 3: 1 y/o male, born at 36 weeks gestation developed progressive respiratory distress at birth. On mechanical ventilation for 6 months. Re-intubated at 10 months after a resp. infection and remained ventilator dependent. Diagnosed as “bad” BPD. Responded partially to steroids.

• Case 4: 4 y/o brother had a history of frequent respiratory infections, dyspnea on exertion and chronic productive cough, frequent wheezing. CXR showed diffuse reticulo-nodular interstitial pattern. PFTs revealed FVC 50% with no obstruction. Responded partially to hydroxychloroquine.
Idiopathic Pulmonary Fibrosis

Desquamative Interstitial Pneumonitis
Idiopathic Interstitial Pneumonitis

• Surfactant deficiency
  – Surfactant Protein-B: AR, neonatal resp. failure
  – SP-C: AD, sporadic, can result in pulmonary fibrosis in older children
  – ATP binding cassette protein member A3 (ABCA3): AR, neonatal resp. failure
• RX: Lung transplantation
Case 3

• 12 y/o male with past h/o “mild” asthma requiring only occasional albuterol

• For the past 6 months his “asthma” had gotten significantly worse with persistent chronic wheezing, exercise intolerance, cough

• Seemed to initiate with an acute resp infection 6 months ago
Case 3

- CXR showed no infiltrates, mild PHPB, mild increased interstitial markings
- He was placed on frequent albuterol, inhaled steroids, montelukast, theophylline, antihistamines and eventually oral steroids without resolution
- Had a minimal response to bronchodilators
Case 3

- Antibody titers to legionella, pertussis, and mycoplasma, chlamydia were obtained
- Positive IgG to legionella
- Dx: Legionnaire's disease
- Rx: Responded rapidly to 5-day course of azithromycin. The “asthma” resolved.
Atypical Pneumonia

- May present as an asthma exacerbation
- Chronic “walkin’ pneumonia”
- Acute febrile illness
- CXR may show, consolidation, scattered “fluffy” infiltrates or none at all
- Constellation of associated findings: sore throat, rhinorrhea, sinusitis, malaise, headache, etc.
- Usually responds to macrolides, but clinical symptoms, including fever may persist
Lessons Learned

• Make your own diagnosis. Don’t let the patient walk in and tell you what they have.
• Give it some time…most diagnoses won’t hide forever.
Lessons Learned

• When you hear horse hooves…think horses, but don’t forget about the zebras

• If there’s one animal in the jungle that can eat you…you’d better be able to spot it
1. 5 y/o boy in Austin, Texas c/o chronic productive cough for the past month starting on New Year’s day. He was previously diagnosed with mild persistent asthma and allergic rhinitis. His parent tells you his allergy testing was positive to various trees. He coughs when he lies down for a nap and at bedtime. He does not wake in the middle of the night with coughing and he does not cough with exercise. He also has nasal and eye itching, watery eyes, clear nasal discharge, no fever. He has no improvement with albuterol.

What’s the most likely cause of the cough?
1. Asthma
2. Upper respiratory infection and chronic sinusitis
3. Allergic rhinitis
4. GERD
2. An 18 month boy has a 2 day h/o rhinorrhea, cough, wheeze, SOB, low grade fever, poor appetite but is taking fluids. T 101, R 33, P 93 O2 Sat 98. PE: comfortable but breathing faster with intermittent cough, bilateral diffuse end expiratory wheeze, well hydrated, good perfusion. In your office you give an albuterol neb and he has no change in his symptoms VS R 31 P 110 O2 Sat 92.

What’s the most appropriate therapy?
1. Supportive care, maintain hydration, anti-pyretics prn
2. Supportive care, maintain hydration, anti-pyretics prn, albuterol nebs q6hrs till improved
3. Supportive care, maintain hydration, anti-pyretics prn, albuterol nebs q6hrs till improved + budesonide bid
4. Supportive care, maintain hydration, anti-pyretics prn, albuterol nebs q6hrs till improved + prednisolone 2/kg x 5 days
3. A 15 month girl has a 3 month h/o cough at night. About 3 times a week she wakes up about an hour after going to bed with severe coughing and gagging/choking spells. In her past history, she was breast fed for 2 months and then bottle fed, but had to be changed to Nutramigen due to vomiting and colic. She was transitioned to whole cow’s milk at 1 year and seems to be tolerating with no vomiting. She had a “cold” about a month ago and the coughing was worse for about a week. Her brother has asthma and her mother gave her one of his albuterol treatments at bedtime, but it didn’t seem to help.

What’s the most likely diagnosis?
1. Asthma
2. Upper respiratory infection and chronic sinusitis
3. Allergic rhinitis
4. GERD
4. 7 y/o boy in Houston c/o chronic cough for the past year that seems to be getting worse. His mother says that he coughs mostly with “colds” and the cough is worse in the middle night. She says he is always sick from the Sept till April and seems to catch everything. His colds last longer than her other kids, about 2-3 weeks. In between his colds he’s fine. She’s been to urgent care a few times and they give him antibiotics, which may help a little. He recently started playing soccer and seems to cough during the games and can’t keep up with the other kids.

What’s the most likely cause of the cough?

1. Asthma
2. Upper respiratory infection and chronic sinusitis
3. Allergic rhinitis
4. GERD
Questions?