Pediatric Cough

Jesus R. Guajardo, MD, MHPE, PhD.

Initial Question

The most common causes of prolonged cough (>3 weeks) in children include asthma, GERD, and upper airway cough syndrome (UACS):

1. True
2. False

Focusing Questions

• Do children have the same causes of cough as adults do?
• Should we evaluate pediatric patients in the same way adult patients are evaluated?
• Should we follow the adult guidelines for empiric treatment of cough in children?

Objectives

• Brief review of cough mechanisms
• Causes of ‘prolonged’ cough in children
• Assessment and management of cough in children
• Discuss three atypical cases of cough and possible diagnostic investigations

Let’s Start
Basic Concepts

- Cough: To expel air from the lungs suddenly and noisily. Germanic imitative base: “Kox”
- Four phases:
  - Inspiratory, Compressive, Expiratory & Relaxation
- Initiated
  - Larynx, Trachea, & Bronchi
  - Ear (Arnold reflex), Pharynx, Esophagus, Nose

Kids vs Adults

Kids more prone to cough?

- Immune System
  - Maturational Delay
- Exposure
  - Day care
- More GER → microaspiration?
- Swallow Maturation → microaspiration?

How Common is the prevalence/incidence of cough?

What is the percentage of pre-school children that report cough in ANY given month?

1. Around 5%
2. Close to 1/3
3. Around half of them
4. Most of them (75%)

Causes of Chronic Cough

In non-smoking adults with a normal CXR the most common cause of chronic cough would be:

1. Pertussis infection
2. Asthma, GERD, or UACS
3. Sinusitis or bronchitis
4. Cardiac disease
5. Bronchiectasis or interstitial lung disease

Dx & Mgmt Cough Chest 2006

- Acute Cough (≤ 3 weeks)
- History, examination investigations
- Subacute cough (3–8 weeks)
- Pneumonia, upper respiratory infection, otitis media or COPD, FL; see management, other respiratory disease

Subacute Cough

- History and Physical Exam
- Non-pertussis
- Pertussis
- Upper respiratory infection
- Infants under 12 months
- UACS
- Asthma
- GERD
- Bronchitis
- Work-up same as chronic cough

In patients with chronic cough and a normal CXR finding who are non-smokers and are not receiving therapy with an ACE inhibitor, the diagnostic approach should focus on the detection and treatment of UACS, asthma, NAEB, or GERD, alone or in combination.

What about Children

Most common cause of persistent cough (>3wks) in children:

1. Persistent Bacterial Bronchitis (PBB)
2. GERD
3. Asthma
4. Pertussis
5. Dysphagia/Aspiration

Let’s talk about a paper that supports PBB
(Persistent/Protracted Bacterial Bronchitis)

Evaluation & Outcome of Young Children with Chronic Cough

Chest 2006
**Pediatrics Grand Rounds**

**1 March 2013**

**University of Texas Health Science Center at San Antonio**

---

### Investigation 

<table>
<thead>
<tr>
<th>Investigation</th>
<th># (%)</th>
<th>Abnl</th>
<th>Most Common Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>CXR</td>
<td>108 (100)</td>
<td>63%</td>
<td>48 w PBT, 11 w Atelectasis</td>
</tr>
<tr>
<td>Spirometry</td>
<td>33 (100)</td>
<td>12%</td>
<td>1 w reversible bronchoconstriction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 w restrictive pattern</td>
</tr>
<tr>
<td>Bronch</td>
<td>102 (94)</td>
<td>90%</td>
<td>57 w Bronchitis, 36 w malacia</td>
</tr>
<tr>
<td>BAL</td>
<td>101 (93)</td>
<td>73%</td>
<td>46 w neutrophilia, 10 w lymphocytosis</td>
</tr>
<tr>
<td>Ig's</td>
<td>105 (97)</td>
<td>6.7%</td>
<td>3 w IgA Def, 3 w IgG2 def (?)</td>
</tr>
<tr>
<td>CF gene</td>
<td>93 (86)</td>
<td>3.2%</td>
<td>3 w a single mutation (ΔF508)</td>
</tr>
<tr>
<td>Sweat Test</td>
<td>71 (66)</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>IgE</td>
<td>76 (70)</td>
<td>4%</td>
<td>3 w IgE &gt; 2400 ug/l (1000 KU/L)</td>
</tr>
<tr>
<td>HRCT</td>
<td>42 (39)</td>
<td>71%</td>
<td>6 w Bronchiectasis, 4 atelectasis, 4 scarring</td>
</tr>
<tr>
<td>pH probe</td>
<td>38 (35)</td>
<td>47%</td>
<td>18 Abnormal</td>
</tr>
</tbody>
</table>

---

**Eval & Mgmt Ped Chronic Cough**

**Chest 2006**

### 3 yo Down Syndrome Male

- Chronic wet cough, apparently early after birth.
- Large septal defect repaired early on, no active cardiac issues
- No fever. Playful. Eating well.
- PE: NI VS. Diffuse ronchi.
- Has used albuterol with mild or questionable improvement

---

**So, PBB (persistent bacterial bronchitis) it is!!**

Now, lets chat about three cases
Be prepared, NOT typical

---

**Most important next step?**
3 yo Down Syndrome Male

- Diagnosis: “Dysphagia” (ICD9: 787.20) leading to chronic bronchitis/pneumonia.
- Management: speech therapy with thickened liquids. Depending on results of MBS
- Additional treatment
  - Reflux: H2 blockers, PPIs
  - Anti-inflammatory: ICS (consider SABA)
  - Antibiotics
  - Constipation management too.
- Consider a bronchoscopy to evaluate anatomy to r/o laryngeal clefts and other malformations

8 yo Male with Wheezing

- Diagnosed with asthma at 3 years of age
- Not much improvement on asthma medicines
- Currently on Singulair and high dose Flovent (220 mcg 2 p inh bid)
- Continues with occasional wheezing, mostly when very active
- Coughs with exercise
- Besides allergic rhinitis, he is mostly healthy
- Best Next Step?

Final Dx

- Vascular Ring
- Bronch and CT scan performed
- Right aortic arch with abnormal L subclavian artery (Kommerell’s Diverticulum)
- Cough/Wheezing much improved after surgery
- His “asthma” was “cured” after surgery
Last Case

5 mo old Male with Cough

- Second episode of bronchiolitis
- Admitted for first episode in November
- Improved and sent home
- Continued with mild cough and retractions
- By December got worse and was admitted again

5 MO with “Bronchiolitis”

- Very tachypneic. Retracting.
- VS Afebrile. RR 60’s. Sats 96% on 70% "vapotherm"
- Chest: Diffuse ronchi. No crackles/Wheezing

- CBC: WBC 16.6 (30%N, 13%L, 54%Eos)
- Na 138, K 3.1, Cl 109, HCO3 19, BUN 7, Crea 0.5.
- Gas: pH 7.39, pCO2 36, HCO3 21
- Let’s look at his blood smear and CXR

Blood Smear

November Film

December Film
Where would you put your money?

- **1. PFTs?**
  - Too young to do standard pulmonary function testing

- **2. CT Scan?**
  - Maybe in the future if not improved

- **3. Asthma Rx?**
  - Start steroids and SABA? May only help a little

- **4. MBS?**
  - Good option, but difficult to obtain as he is very tachypneic

- **5. Abx Rx?**
  - Start broad spectrum Abx?
  - Reasonable, but won’t give you an answer

- **6. Immune w/u?**
  - IgG=10, IgA=25, IgM=51, IgE=0.1

- **7. Bronch?**
  - Pretty good idea, but not as the initial test

- **8. pH probe?**
  - Reflux is not likely the cause of this kid’s findings

No Ig’s, No T or NK cells

**SCID!**

Bronch w BAL then was performed:

![Bronch Giemsa Stain](image)

**Bronch Giemsa Stain**

+Pneumocystis Jiroveci

**Final Diagnosis**

- SCID
- Bronch: + Pneumocystis Jiroveci
- Underwent BMT after clinical stabilization

**Let’s Wrap Up**
Summary

• Asthma, GERD, and UACS are not the most common cause of chronic cough in the pediatric population
• Think Protracted Bacterial Bronchitis (PBB): persistent cough, not the episodic asthmatic cough
• Rx: Broad spectrum antibiotic
• We discussed three “atypical” cases
  – 3 yo Down Syndrome with Dysphagia/Aspiration
  – 8 yo “Asthmatic” with vascular ring
  – 6 mo w “recurrent bronchiolitis” dx with SCID

Thanks!

Any Questions?
Jesus R. Guajardo, MD, PhD
Second Case Slides