“Evaluating a child with recurrent cough and nighttime symptoms”

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Objectives:
At the end of this session, the participant would be able to:

• Discuss the mechanics of coughing
• List differential diagnoses of recurrent cough and nighttime symptoms apart from childhood asthma
• Discuss effective and efficient management options in a good stepwise approach based on gathered clinical evidence
When do we cough?

- Choke
- Colds
- Irritation
- Medications
- Ear canal

Cough is protective
first identify and treat the underlying reason
before suppressing cough
Cough pathway

Mechanics of cough
• deep inspiration → closure of glottis → forceful contraction of the respiratory muscles → glottis opens → forceful expulsion of air, mucus and potentially foreign body
**What could go wrong?**

- during initial deep inspiration - could inhale food material in the pharynx or larynx → more choking or coughing
- cough reflex affected with altered consciousness

**Cough receptors**

- important airway protective reflexes
- Cough receptors - respond to temperature, chemicals and mechanical stresses
  - in the pharynx, larynx, trachea and bronchi


**How many times a day does a child cough?**

- normal child will cough on average 11 times per day when they are well
Natural history of acute cough

- Due to upper respiratory tract infection (URTI)
  - 1 in 10 normal children are still coughing 3 weeks later (post-infectious cough)
- Cough receptor hypersensitivity (CRH) - recurrent prolonged acute coughing following viral URTI
  - may last weeks to months


Cough reflex hypersensitivity


Definition of chronic cough

- How many weeks? variably defined - longer than 3, 4 or 8 weeks
- national and international guidelines on the management of cough in children
- Chronic cough in children 14 years and younger usually is defined as a daily cough lasting four or more weeks (Chest. 2016;148(1):106.) - systematic reviews
History taking

1. How and when the cough started?
2. Is the cough an isolated symptom?
3. What triggers the cough?
4. Does the cough disappear when the child goes to sleep?
5. What is the nature and quality of the cough?
6. What treatments has the child been tried on and how beneficial were they?

7. What other medication is used? e.g. ACE inhibitors
8. Is there a family history of respiratory, allergic or infectious disease?
9. Does the child smoke? Do the parents smoke? Is there evidence of any environmental pollutant at home?
10. How disruptive is the cough?
11. Is there evidence of Obstructive Sleep Apnea? How large are the tonsils?

Cough sounds

• https://www.youtube.com/watch?v=YzKqqh8SWQ
• https://www.youtube.com/watch?v=DPkgVBB3hM
• https://www.youtube.com/watch?v=HjU3n9GCdiU

• Productive/wet cough
• Whooping cough
• Dry cough
• Croup
• Coughing tics
• Psychogenic cough
Wet versus dry cough

- Chronic productive or wet cough
  ('a chesty cough' or a 'smoker's cough')
  < 5 years of age usually rarely spit out phlegm (rather swallow it)
  - suggests underlying cause for mucous hypersecretion

- Dry cough
  - suggests airway irritation, inflammation or a non-airways cause of the cough

Warrants investigation

- Sudden/acute onset of cough with a choking episode (or suspected inhaled foreign body)
- Relentless progressive cough
- Possible underlying diagnosis because of associated weight loss, night sweats (e.g. TB)
- Hemoptysis
- Signs of chronic lung disease (poor growth, finger clubbing, chest wall abnormality and abnormal lung sounds)
- Coughing with history of recurrent pneumonia
- Cough starting in neonatal period
- Swallowing difficulties
- With craniofacial abnormality
- With neuromuscular disorder
- Dyspnea – chronic or exertional
- Wet cough lasting more than 3-4 weeks

Cough pointers and etiology

<table>
<thead>
<tr>
<th>Cough pointers</th>
<th>Etiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough on exertion</td>
<td>Asthma</td>
</tr>
<tr>
<td>Sputum</td>
<td>Intersitial lung disease</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>Bronchiectasis</td>
</tr>
<tr>
<td>Chest deformity</td>
<td>Chronic lung disease</td>
</tr>
<tr>
<td>Perfusion abnormality</td>
<td>Foreign body inhalation</td>
</tr>
<tr>
<td>Feeding or when lying down</td>
<td>Pneumonia</td>
</tr>
<tr>
<td>Associated fever</td>
<td>Respiratory infection</td>
</tr>
<tr>
<td>Digital clubbing</td>
<td>Congenital abnormality</td>
</tr>
<tr>
<td>Failure to thrive</td>
<td>Congenital heart disease</td>
</tr>
<tr>
<td>Medical history of prematurity</td>
<td>Bronchopulmonary dysplasia</td>
</tr>
<tr>
<td>Symptoms present from the first day of life</td>
<td>Congenital abnormalities</td>
</tr>
</tbody>
</table>
Physical exam

- General inspection (growth; failure to thrive)
- Atopic status (eczema, allergic salute)
- Low muscle tone (feeding difficulties; neuromuscular conditions with respiratory sequelae)
- Craniofacial and palatal abnormalities associated with swallowing dysfunction
- Nose and throat exam - rhinitis or post-nasal drip; dental caries associated with acid reflux

Physical exam (continued)

- Wax in the external auditory meatus - can be associated with chronic cough
  - Via stimulation of the Arnold's nerve reflex
- Digital clubbing
- Chest deformity
- Abnormal breath sounds or reduced or asymmetrical air entry
- Cardiovascular abnormalities may point to a particular diagnosis
- Enlarged lymph glands, liver or spleen (possible chest masses or TB)

Physical exam (continued)

- Worth to observe the child’s cough
  - Older children - cough on request
  - Younger children - sound of the cough and the presence of palpable airway secretion by placing one hand on the anterior and the other hand on the posterior chest
**Diagnostics**

- Feeding evaluation (speech and swallow specialist) – for infants with cough and feeding difficulties
- Sputum analysis (cell count)/culture
  - high eosinophils (>3%) count - supportive evidence for asthma
  - bacteria with neutrophils - protracted bacterial bronchitis
- Chest radiograph if warranted; give indications for further investigations
  - may not be indicated if a mild specific disorder is definitively diagnosed (e.g. asthma / allergic rhinitis or if a pertussis-like illness is clearly resolving)
  - a normal chest radiograph does not always exclude significant pathology (e.g. bronchiectasis); further imaging may be needed

**Diagnostics (continued)**

- Spirometry and bronchodilator responsiveness
  - Children > 5 years of age
- Allergy testing – skin prick testing or IgE specific tests
  - When positive put the cough into a background of atopy and make cough variant asthma a possible diagnosis

**Chronic cough (>8 weeks)**

- GERD – 27%
- UACS (upper airway cough syndrome) – 23%
- Asthma – 13%
- Infection – 5%
- Aspiration – 2%
- Multiple etiologies – 20%

*Chest 2009; 136: 811-815*
It clearly is not ethically correct to subject all children to a full battery of potentially invasive tests for conditions that experience shows is likely low probability.

Post-infectious cough or pertussis

- Pertussis (1/3 of children > 5 years old)
- Median duration of cough: 4 months
- Mycoplasma
- Respiratory viral infection eg rhinovirus or RSV

- Cough resolves overtime
- Likely due to a slow recovery of airway mucosal epithelial cells (during this time with cough receptor hypersensitivity)
- Asthma therapy not beneficial


Protracted bacterial bronchitis

- PBB is one of the most common causes of chronic wet cough, particularly in young children (<5 years of age)
- 40% of referrals to pediatric pulmonary specialist clinics

Clinical criteria:
- Chronic wet cough (duration at least four weeks)
- No other symptoms or signs of other causes
- No evidence of an alternative diagnosis after a standard evaluation (including normal spirometry and normal radiograph, other than bilateral peribronchial accentuation)
- Resolution of the cough after a two-week course of appropriate antibiotics
Cough variant asthma

• Some children with asthma have coughing as the predominant feature (and not wheezing)
• If high asthma predictive index, trial of asthma therapy (inhaled corticosteroids-ICS)
• Especially if presence of atopic diseases (eczema, allergic rhinitis)
• Trial (therefore, objective end points)
  • negative response suggests the coughing is unresponsive to ICS/asthma unlikely
  • positive response may indicate natural resolution of the cough or cough variant asthma
• If cough recurs then the medication can be restarted
  • a second positive response is suggestive of cough variant asthma

Allergic Rhinitis and/or post nasal drip (upper airways syndrome)

• May have throat clearing or snorting type cough
• Should respond to:
  • allergen exclusion where possible
  • Intranasal steroids with or without antihistamines

Psychogenic cough

• 2 types of psychogenic cough:
  • dry repetitive ‘tic-like’ cough after an episode of bronchitis (not very disruptive and often cough became a habit)
  • Bizarre honking cough (very disruptive to school and family life, bring some secondary gain for the child)
• Cough reduces when the child is engrossed in some activity and when asleep
• Biofeedback, distraction and suggestion psychotherapies
Other potential causes

• wax in the external ear canal has been associated with chronic coughing
• auricular branch of the vagus nerve (Arnold’s nerve)
• hypertrophied tonsillar tissue impinging on the epiglottis

Gastroesophageal reflux (GERD)

• more difficult to show GERD to be the cause of cough in children
• GERD work-up (conflicting results):
  • multichannel intraluminal impedance
  • pH monitoring
• empirical treatment helps GERD but may not help with respiratory symptoms

ACE inhibitors

• Dry cough which stops once the ACE inhibitor is stopped
• However, children with cardiac problems can also cough for other etiologies such as associated airway problems or pulmonary edema
• Kartagener’s syndrome or immunodeficiency
Children’s Interstitial Lung disease (chILD)

- usually presents with tachypnea but early evolving cases can be associated with a dry repetitive cough

Productive (wet) cough

- Persistent bacterial bronchitis
- Cystic Fibrosis
- Immune deficiencies
- Primary ciliary disorders
- Recurrent pulmonary aspiration
- Retained inhaled foreign body

Chronic brassy barking or seal-like cough

- suggests a tracheal or glottic cause (eg tracheo- and/or bronchomalacia)
- many children who have undergone tracheoesophageal fistula (TOF) surgery have tracheomalacia and develop a loud cough (“TOF – cough”)
- especially disruptive during an intercurrent infection
Relentlessly progressive cough

- progressively becoming more severe and violent
- Needs investigated early

Causes:
- Pertussis
- Expanding intrathoracic tumor
- Retained inhaled foreign body
- TB

Chest x-ray cases of children with chronic cough

perihilar bronchial thickening
Airway foreign body

Right middle lobe atelectasis

Bronchiectasis in a child
Primary ciliary dyskinesia

Normal thymus gland in an infant

Right-sided aortic arch

the absence of the left aortic contour
Bronchoscopy in a child with protracted bacterial bronchitis

Management

• Identify the underlying cause
• In majority of cases, related to upper respiratory infection, supportive measures
• Over-the-counter cough suppressants, antihistamines and decongestants are comparable to placebo, and may have potential to cause side effects
• Bronchodilators are not effective and should be avoided in non-asthmatic children with cough
• Remove child from environmental tobacco smoke or other pollutant exposure.
CME question 1
1. Which of the following characteristics of cough warrant further investigation?
   a. Cough in Neonatal period
   b. Sudden, acute onset of cough with a choking episode
   c. Coughing up blood (hemoptysis)
   d. Wet cough lasting >4 weeks
   e. All of the above
   e. All of the above

CME question 2
2. Which are characteristics of psychogenic cough in children?
   a. Wet cough
   b. Occurs when sleeping
   c. Dry, repetitive cough
   d. Productive cough
   e. Goes away when busy with other activities
   f. Both c and e
   f. Both c and e

CME question 3
3. Cough suppressants are the mainstay for treating which type of cough?
   a. Cough variant asthma
   b. Cough due to GERD/LP reflux
   c. Viral-infection induced cough
   d. Cough suppressants are not the main treatment for cough. The first step is identifying and then treating underlying cause.
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CME question 4

4. Causes of brassy or barking cough in children include:
   a. Asthma
   b. GERD
   c. Bronchomalacia
   d. ACE inhibitor induced cough
   e. None of the above

   c. Bronchomalacia

CME question 5

4. Which conditions can cause a wet (productive cough) in children?
   a. Cystic fibrosis
   b. Immune deficiencies
   c. Recurrent pulmonary aspiration
   d. Persistent bacterial bronchitis
   e. All of the above

   e. All of the above

Summary

- Making the correct diagnosis and then managing the underlying condition
- Treatment of the symptom of cough in isolation is unsatisfactory
- Remove the child from environmental tobacco smoke or other pollutant exposure.
- Make a specific diagnosis and use specific treatments