

Cough

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In 1920, Chevalier Jackson, said: “Cough is the watchdog of the lungs”. That statement still stands today, over 85 years later.

Cough is a common **sign of respiratory illness** which causes 50% of all illness in children. In children less than 5 years old, it causes 2/3 of all illness. Preschool children get 8 or more upper respiratory infections each year. Many viral upper respiratory infections (“the common cold”) can present with cough. In this review, I am not addressing viral URIs as an etiology of cough. I will discuss other, more unusual, causes of cough which the clinician may want to consider in a child with this complaint.

The **history** is critical to making the correct diagnosis. The history may sometime give a specific diagnosis. Alternatively, if not a specific diagnosis, an accurate history can narrow the differential diagnosis. The historical findings include: aspiration, choking, cough with feeding, immunization status, malabsorption, pollution, seasonal variation, wheezing, timing of cough, and hemoptysis.

The **age of the child at onset of the cough** is important. Coughing in a neonate is unusual. The differential diagnosis in a neonate with cough includes: congenital anomaly of aerodigestive tract, such as a vascular ring, a tracheoesophageal fistula or a laryngeal or laryngotracheal cleft.

Gastroesophageal reflux is a cause of cough. In brief, there are two types of reflux which occur in children. The first is physiologic reflux which many children exhibit when they are young, to varying degrees. Then there is pathologic reflux, severe enough to cause disease. In both cases, children can cough although it is more common with pathologic reflux.

Coughing is the most common symptom for **cystic fibrosis** involving the respiratory tract.

Chlamydial pneumonia is a cause of cough, especially if there is an antecedent conjunctivitis.

If the cough is seasonal, one would consider allergy.

Aspiration

Aspiration can be defined simply as food “going down the wrong pipe” or into the upper airway rather than into the esophagus. When swallowing, the goal is to get food in the digestive tract and keep it out of the respiratory tract. Everyone has rare episodes of aspiration.

Aspiration is not a diagnosis. It is a sign. The differential diagnosis of aspiration

includes neuromuscular weakness. Children with cerebral palsy may have difficulty swallowing. In extreme cases they cannot take food orally. In these children, aspiration can be obvious, or it can be silent. A video fluoroscopic swallowing study or a video endoscopic swallowing study may aid in the diagnosis of aspiration.

Laryngeal and tracheal clefts

Fortunately, these are rare. If the cleft is severe, the presentation is immediate on feeding at birth. Less severe clefts can be very difficult to diagnosis. If this diagnosis is in the differential, a rigid endoscopy is indicated. Laryngoscopy would be performed with a careful examination of interarytenoid space. If the cleft is not specifically looked for, it can be missed. I use a rigid instrument such as a suction to push the arytenoids apart and determine if there is a cleft present.

H-type tracheoesophageal fistula

These are relatively rare types of TEF's. The H-type fistula is often much higher in the trachea than the normal location for a TEF. These H-type fistulas can be very difficult to diagnosis. Barium swallows may not show a fistula even though there is one which may not be open at the time of the swallow. Endoscopy is indicated to examine the posterior tracheal wall. I have had a child in my practice with two TEF's. There was a traditional TEF lower down in the trachea. Additionally, there was a higher H-type fistula. The lower fistula was successfully repaired, but the child continued to have intermittent aspiration. The second TEF was not diagnosed until endoscopy was performed.

Another cause of aspiration is gastroesophageal reflux disease.

Uncoordinated swallowing in the full term infant or premature infant can cause aspiration. Many premature children require therapy to learn how to swallow. They may require nasogastric tube feedings temporarily until they reach term and acquire the ability to swallow.

The process of swallowing is an extremely complex neuromuscular event. A bolus must be introduced into the oral cavity and moved to the oropharynx. The palate must elevate to seal off the nose, preventing nasopharyngeal reflux or regurgitation. Breathing is stopped. The larynx is elevated, closed, and protected by the epiglottis. Sequencing of pharyngeal sphincters occurs, resulting in opening and closing of the cricopharyngeus at the appropriate time and subsequent peristalsis within the esophagus to move the bolus from the cricopharyngeal level into the stomach.

Choking

The history of choking suggests a possible foreign body in the airway. Cough is the most common symptom of an airway foreign body.

I believe the decision to perform a bronchoscopy to rule out a foreign body is best made on the basis of history. Many foreign bodies are radiolucent and will not be seen on x-ray.

Frequently, with non-metallic foreign bodies, the chest x-ray will remain normal for the first 24 hours or even with significant obstruction.

There may not be any physical signs in the examination.

Any age child or adult can present with an airway foreign body.

Some esophageal foreign bodies can present with airway symptoms. The usually situation is where is a pre-existing compromise to the airway such as subglottic stenosis. Whereas a normal child with an esophageal foreign body may be relatively asymptomatic with respect to the airway, a child with an existing subglottic stenosis may have significant respiratory distress with a foreign body in the proximal esophagus.

Cough with feeding

The presence of a vascular ring or aortic arch anomaly should be considered as well as the cleft larynx mentioned above.

Gastroesophageal reflux disease

Gastroesophageal reflux disease can cause many children to cough routinely after feeding. Frequently, physiologic reflux can be managed by keeping the child slightly upright so that the mouth is above the level of the stomach while feeding and post-prandially.

Immunization status

In Chicago during the winter of 2004-2005, there was a pertussis outbreak. Pertussis is also known as whooping cough and is common in children 5 to 7 years of age. These children will cough 5 to 20 times in a row, followed by a dramatic inspiration which is termed the “whoop” and then start coughing again. In populations who recently immigrated to the U.S., the pertussis vaccination rate can be low.

If there is a history of malabsorption, one would consider cystic fibrosis. The presence of nasal polyps in a child mandates that a sweat test for cystic fibrosis be performed.

Wheezing

Wheezing is a sign of reactive airway disease.

A variant of classic asthma is cough-variant or a cough-equivalent asthma. Cough-variant asthma presents with a patient coughing rather than wheezing. It is a symptom of the upper airway rather than the classic lower airway wheezing.

Overall, there is an increasing incident of asthma in the United States. In cough-variant asthma, the cough can occur with exercise, sleep, and exposure to cold air. In contrast to the cough-variant cough which gets worse with the exposure to cold air, children with croup (laryngotracheobronchitis) may improve with exposure to cold air.

Allergic rhinitis is a huge problem with an estimated 20 to 25% of the U.S. population having seasonal or allergic symptoms. Peak seasons in North America are the spring and fall. The signs and symptoms of allergic rhinitis include: cough, nasal congestion, the allergic salute with the child wiping his nose with the back of his hand, a supra-tip nasal crease due to constant pushing up of the nose with the allergic salute.

Allergic rhinitis

The first-line treatment of allergic rhinitis is nasal steroids. I believe that nasal steroids have had a huge impact on quality of life with patients. The U.S. Food and Drug Administration permits the use of nasal steroids in children beginning at age two. In my experience, many of the younger children will initially resist using

the steroids. However, if the presumptive diagnosis is correct, they will realize the benefit and remind their parents to give them the spray because they have learned that helps them feel better.

Pollution

Pollution is a huge problem in all parts of the industrialized world, to varying degrees. Industrial pollution can certainly cause cough. As well, smoking is also a major cause of cough in children. The smoking can be primary, that is, an adolescent who is smoking. Or the smoking can be passive or secondhand in which a child is exposed to smoke from others. Studies from the United Kingdom have demonstrated a relationship in rate of upper respiratory infection to the numbers of smokers in the house. The more smokers, the higher the incidence of upper respiratory infections.

Timing of the Cough

As mentioned above, if the cough occurs after feeding; gastroesophageal reflux disease could be a factor. If the cough occurs during feeding, aspiration may be present. If the cough occurs on going to bed at night or getting up in the morning, sinusitis may be present.

Hemoptysis is very rare in children. The differential diagnosis includes: Bronchiectasis, cystic fibrosis, a foreign body, pulmonary hemosiderosis and tuberculosis.

In summary, I have reviewed more unusual causes of cough a frequent sign of respiratory disease in disease in children.

Recommended readings

1. Hotaling, AJ, Moynihan, GT. Cough. Pediatric Otolaryngology, Fourth Edition, Volume 2, 1395-1404. 2003
2. Holinger LD, Chronic cough in infants and children. Laryngoscope 96:316.1986.
3. Holinger LD. Sanders AD. Chronic cough in infants and children: an update. Laryngoscope 101:596. 1991.
4. Irwin RD, Curley FJ, French CL. Chronic cough: the spectrum and frequency of causes, key components of diagnostic evaluation, and outcome of specific therapy. Am Rev Respir Dis 141:640. 1990
5. Beardsmore CS, Simpson H. Cough in children. J Asthma 28:309, 1991.