

PBL 2 - Respiratory conditions In Children

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It is important for you as a pediatrician to be able to recognize different sounds when using the stethoscope for the diagnosis of the respiratory conditions in children as each sound indicates where the problem is

stridor: is a high-pitched sound that is heard when the **upper** respiratory tract is **partially** obstructed and is mainly heard during **inspiration**.

wheeze: is a high-pitched **musical** sound that is heard when the **lower** respiratory tract is **partially** obstructed and is mainly heard during **expiration**.

Respiratory conditions In Children:

1-cough

most of the cases of the cough starts with low grade fever, decreased appetite and then the cough starts

The mechanism of the cough: initial deep breath > closing the epiglottis to entrap the air > opening of the epiglottis to with closure of the nasopharynx and expiration through the mouth with noise

Different characteristics (productivity, amount, frequency, severity, duration, color, pattern) of the cough can lead to different list of differential diagnosis.

classification of the cough according to:

1-Productivity:

-Dry cough: A non-productive cough that can be caused by asthma, Environmental irritants, or medications such as ACEI.

chronic asthma is the most common Cause of dry cough in children.

there is a lack of phlegm (mucus/sputum) and the patient may describe it as "tickly".

- Chesty/productive cough: a cough that has phlegm that is caused by:

Upper airway cough syndrome (post-nasal drip syndrome), Gastroesophageal reflux disease (GERD), COPD (like Chronic bronchitis), sinusitis and Infections.

GERD and sinusitis cough usually starts as dry cough but if left untreated or if complicated with chronic bronchitis it turns into productive cough.

2-Duration:

-Acute cough: a cough persisting for less than two weeks, usually self-limited and can be caused by viral infections, bacterial infections, or inhalation of a foreign irritant.

we don't worry about acute cough even if it is wet because it is mostly caused by viral

infection.

- Subacute cough: a cough lasting for between 2-4 weeks, most commonly caused by airway hyper-responsiveness following specific infections such as Mycoplasma pneumonia or after the resolution of Bordetella pertussis infection.

- Chronic cough: a cough lasting for more than 4 weeks, most commonly caused by asthma, Upper airway cough syndrome, Upper respiratory tract infection and GERD.

3-Color:

yellow: mostly staphylococcal or streptococcal infection.

green: mostly pseudomonas infection.

4-pattern: there is paroxysmal and intermittent and continuous cough.

5- Frequency and severity: if the cough occurring throughout the day or is it worse in the morning or at night (cortisol levels follow diurnal rhythm, it decreases strongly during night and early morning, cortisol is a strong anti-inflammatory hormone that decreases the frequency of coughing), and if the cough affects the patient's activities.

2-Lower Airways Obstruction

It is characterized by **wheezing** which is a high-pitched musical sound that Reflects a partial obstruction of the lower airways due to inflammation, spasm, or excessive secretion following an acute infection and it is mostly heard during expiration.

1- Bronchial Asthma is a chronic inflammation that is characterized by **reversible** episodes of bronchial smooth muscles spasm with decrease in the airway lumen diameter, asthma is usually associated with other atopic conditions like eczema and allergic rhinitis (hay fever), and it has the characteristic sound of **wheezing (whistling)**.

2- chronic Bronchiolitis is caused by partial lower airway obstruction that is also characterized by **wheezing**, it is almost always associated with viral infections, the infection causes increased mucus secretion which is the cause of the obstruction.

management: supportive treatment, o2 supply, IV fluids, hypertonic saline for airway clearance.

-How to differentiate between the wheezing of Bronchiolitis and asthma?

Bronchiolitis affects younger ages and is always associated with viral illness (the patient is febrile and have fever).

Bronchiolitis Could be recurrent and there are no interval (between illnesses) symptoms.

Bronchiolitis patients have no previous/family history of atopy, and they don't response to bronchodilators like asthmatics.

Asthmatic patients have no zero interval symptoms between the asthmatic attacks, whereas Bronchiolitis patients have zero interval symptoms after the treatment of the infection.

3-upper Airways Obstruction

It is top emergency

Clinical Manifestations:

Usually starts with minor respiratory symptom: non-specific cough, rhinorrhea and fever then develops into **Barking cough, stridor**, and respiratory distress that develops suddenly during the evening or at night

Stridor is a high-pitched breath sound resulting from turbulent air flow in the upper airways when they are partially obstructed, it can be acute or chronic.

stridor can be inspiratory, expiratory, or biphasic (in severe cases), but it is most commonly inspiratory stridor.

1- Croup is a condition where we hear acute strider because of upper airway obstruction that is caused by viral infection (the infection causes edema which causes the obstruction) and it is most commonly caused by parainfluenza 3 virus.

croup is the most common infectious cause of acute inspiratory stridor in children.

the patient is usually previously healthy and don't have any respiratory conditions.

for the treatment of croup, we give epinephrin + systemic steroids like dexamethasone (0.3mg/kg).

exposure to cold air can relieve the symptoms of croup.

2-bacterial tracheitis: more severe than croup, it usually affects children at age of 3-5 years old and mostly caused by staphylococcus infections, clinically presented with fever, barky cough, and acute stridor.

management: IV antibiotics, IV fluids, bronchoscopy.

A



A shows **Steeple sign** seen in chest x-ray of patients with croup (because of the edema)

B



Source: J.E. Tintinalli, J.S. Stapczynski, C.L. Ma, D.M. Yealy, G.D. Meckler, D.M. Cline: Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 8th Edition. www.accessmedicine.com Copyright © McGraw-Hill Education. All rights reserved.

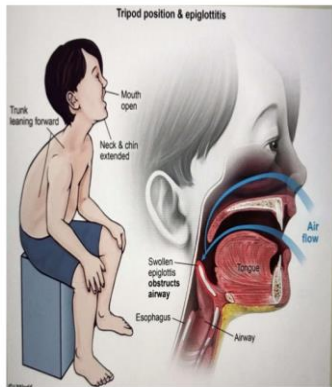
B shows bacterial tracheitis

3-Epiglottitis: most severe form of acute stridor, it is top emergency, however, not commonly seen, mostly caused by haemophiles influenzae.

on examination, the patient is very sick looking, have acute stridor, drooling (excessive salivation), Hyperextended neck, Cough is unusual.

you should not touch the patient or open his mouth if you suspect epiglottitis (we don't want to completely obstruct the airway).

Management: call for ENT specialist and anesthetic specialist and they do intubation under general anesthesia, or they perform tracheostomy + we give broad spectrum antibiotics like 3rd generation cephalosporins.



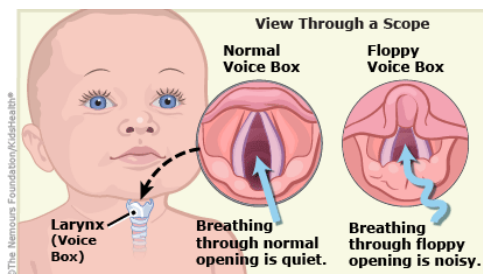
A show the tripod position seen in epiglottitis.

B and **C** shows the thumb sign seen in epiglottitis.

4- Laryngomalacia: it is the most common cause of **chronic** stridor, don't constitute an emergency.

Signs and symptoms: Low pitched inspiratory stridor

- Peaks at 6-9 months
- Positional variation
- Exacerbated by activity (feed, exertion), supine position, and during viral illnesses.
- appears within first 2 weeks of life
- diminishes by rest, prone position and sleeping
- Rarely produces cyanosis



Cases (important)

The doctor explained how to take history from the patient and what questions should you ask in order to reach your diagnosis, if you are interested, read the notes on the original slides and watch the recorded lecture (I encourage you to do so).

Case 1

12-year-old child, presented to the clinic with history of cough for 7 days duration (dry, worse at night and post exercise, associated with whistling sound), symptoms started following a recent URTI). it worsened over last 2 days with dyspnea at times.

Past history: previous episodes occurring mostly during winter, has hay fever, had eczema during early childhood. Positive family history of similar condition.

On physical examination he was afebrile, RR 35 (20-30), Pulse rate 100, SPO2 89%.

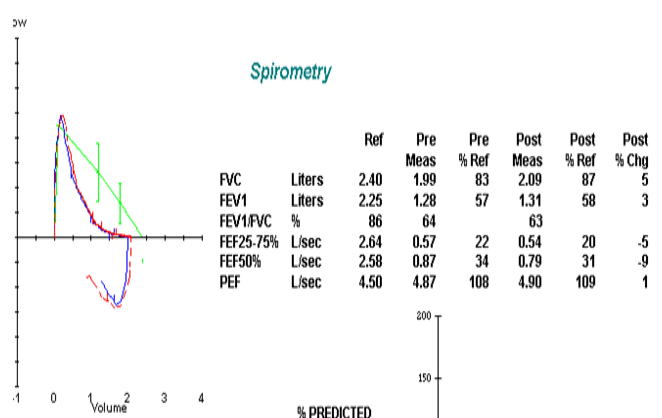
ENT: Hyperemic throat.

Intercostal and subcostal retractions.

Chest: **diffuse Expiratory wheeze**, prolonged expiratory phase with decreased air entry.

CVS: normal, liver is not palpable, hands: no finger clubbing.

x-ray and spirometry of the patient:



-What is your diagnosis?

1-Bronchial Asthma

2-Cystic Fibrosis

3-Primary ciliary dyskinesia

4-GERD

5-Forgein body aspiration

The answer is **Bronchial Asthma**, why?

Typical signs and symptoms with repeated previous episodes, seasonal variation, presence of atopy and family history, exacerbated by exposure (exercise and URTI).

The patient have **diffuse Expiratory wheeze (whistling)**.

spirometry shows typical test of an obstructive lung disease, scooped expiratory graph, decreased FEV1 and FEV1/ FEV ratio with normal FEV (slightly decreased but within normal ranges).

why this patient's test didn't improve after the reversibility test? because we only used one puff of the Ventolin (bronchodilator) (you have to do 4 puffs to see improvement).

chest x-ray shows hyperinflated lung, (you can see more than 6 anterior or 8 posterior ribs, flattening of the diaphragm, small heart, increased lucent of the lung).

As shown in the 4 images above, the patient has signs of allergic rhinitis (pic1), with sniffing sing (pic2), allergic shiners (pic3) which are dark halos around the eyes in allergic rhinitis, and he has eczema on the extensor surface, all of which are associated with asthma.

we can do skin prick test to confirm the diagnosis.

Case 2

A parent brings her 2.5-year-old son into the pediatrics clinic because her son has a loud cough, noisy breathing and a runny nose, the parent explains that her son has been coughing for the past three days, mostly at night. It is a dry cough that sounds like a barking noise and his voice is a bit hoarse. The child has no previous respiratory symptoms nor has been hospitalized for any infections. He is up to date with his vaccination schedule.

On examination: The child looks well apart from a runny nose, and he does not have a temperature or shortness of breath.

What is your diagnosis?

Answer: The child most likely has **croup**, he was previously healthy and then presented with acute cough, this is a common viral illness in a child, which causes a characteristic 'barking' cough. The illness is self-limiting. However, to be managed with nebulized adrenaline and dexamethasone IM/IV if starts to have stridor at rest.

Good luck