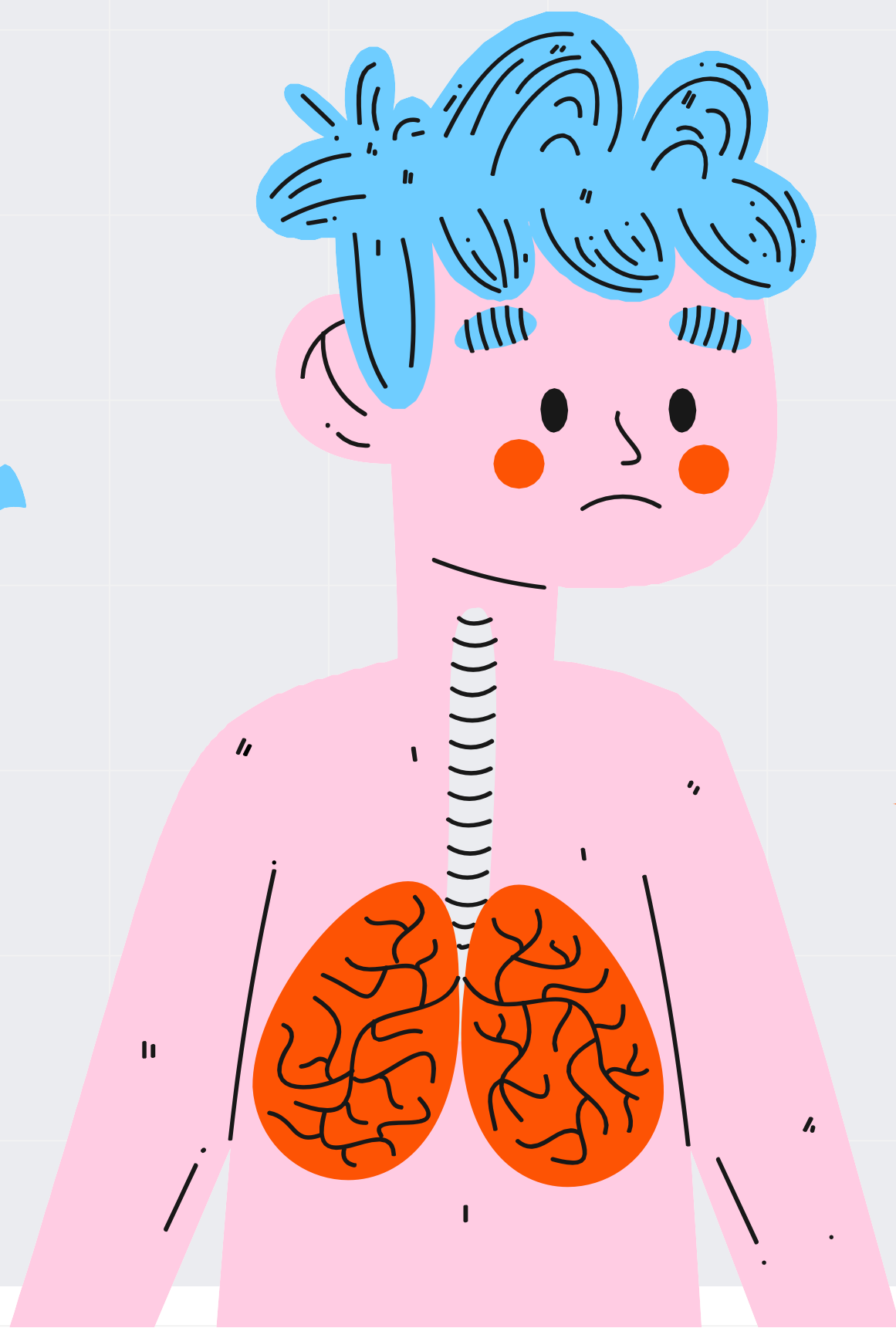
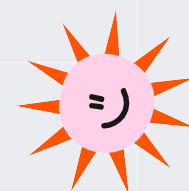


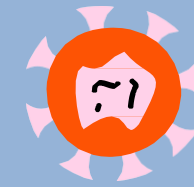


WHEEZING

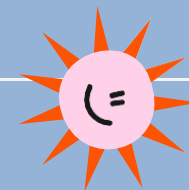
Dr. Lobat Shahkar

**Pediatric pulmonologist, Associate Professor of
Gorgan University of Medical Science**



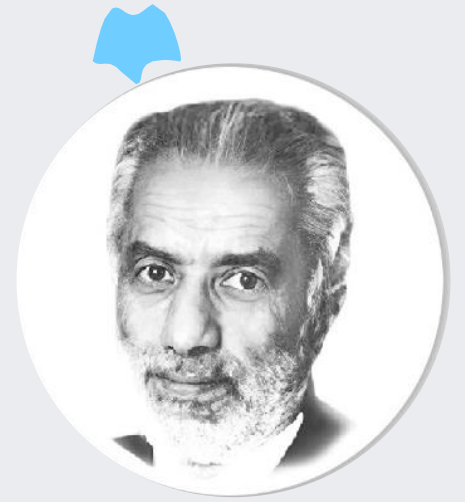


Wheezing is characterized as a high-pitched, musical sound resulting from airflow through narrowed or compressed airways. It is most commonly heard during expiration but can also occur during inspiration, depending on the location and nature of the airway obstruction.





Pathophysiology of Wheezing



The production of wheezing involves several key mechanisms:

۱. Airway Narrowing: Inflammation, bronchospasm, or external compression can reduce the caliber of the airways, increasing resistance to airflow.

۲. Airflow Turbulence: As air moves through these narrowed passages, it becomes turbulent, causing the airway walls to oscillate and produce the characteristic wheezing sound.





Airways Involved in Wheezing



Airways Involved in Wheezing

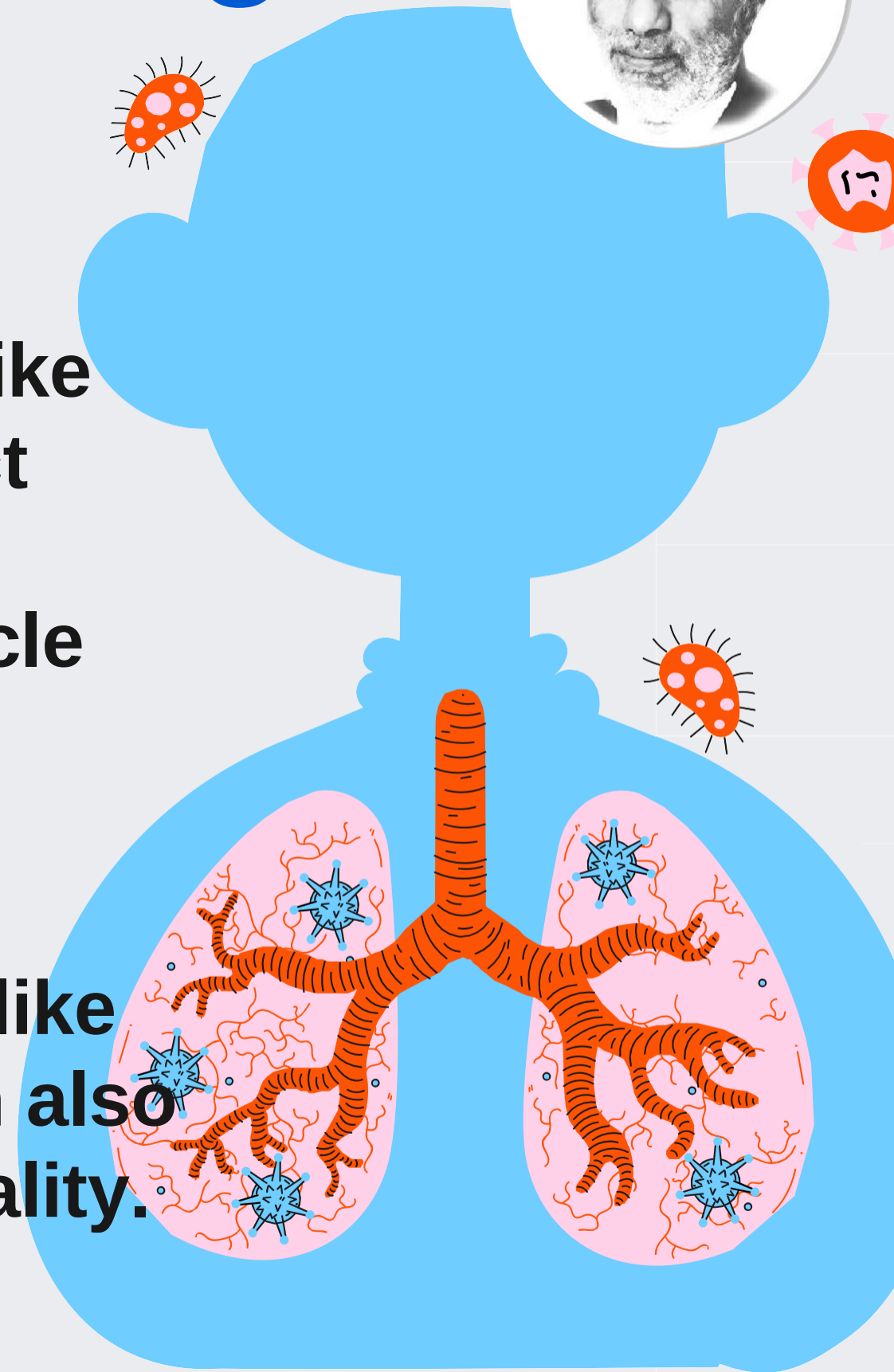
۱. Bronchi and Bronchioles (Lower Airways):

- These are the primary sites affected in conditions like asthma, bronchiolitis, and viral lower respiratory tract infections.

- Inflammation, mucus production, and smooth muscle constriction in these airways lead to narrowing and wheezing.

۲. Trachea and Major Bronchi (Central Airways):

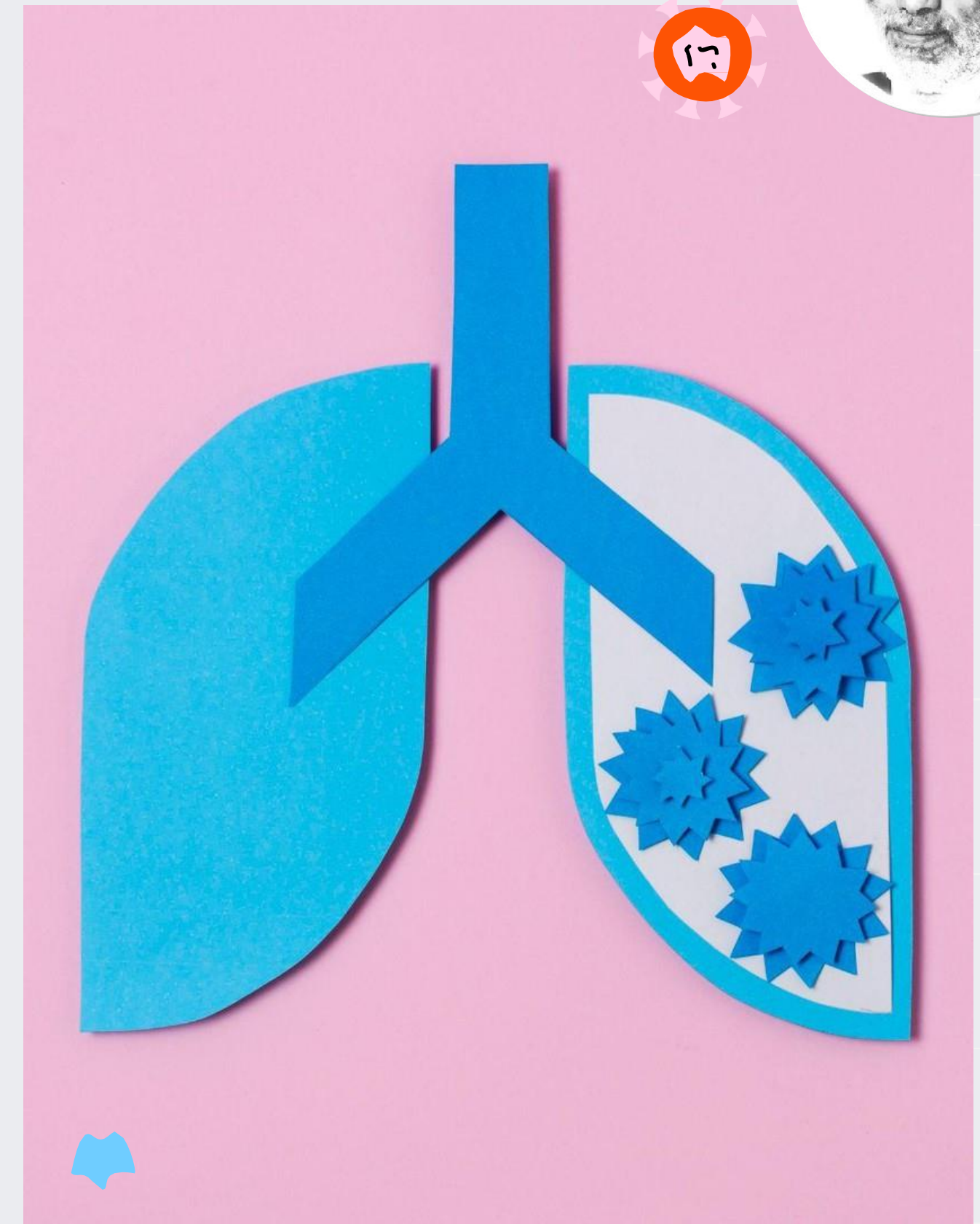
- Obstruction in these larger airways, due to factors like foreign bodies, tumors, or external compression, can also produce wheezing, often with a different acoustic quality.





Where You Hear Wheezing Best:

۱. Anterior Chest (especially mid- axillary and lower zones)
۲. Posterior Chest (especially between the scapulae and in the lower lobes)
۳. Over the Trachea (for central or upper airway wheeze, though this may be mistaken for stridor)

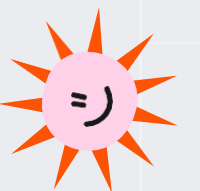
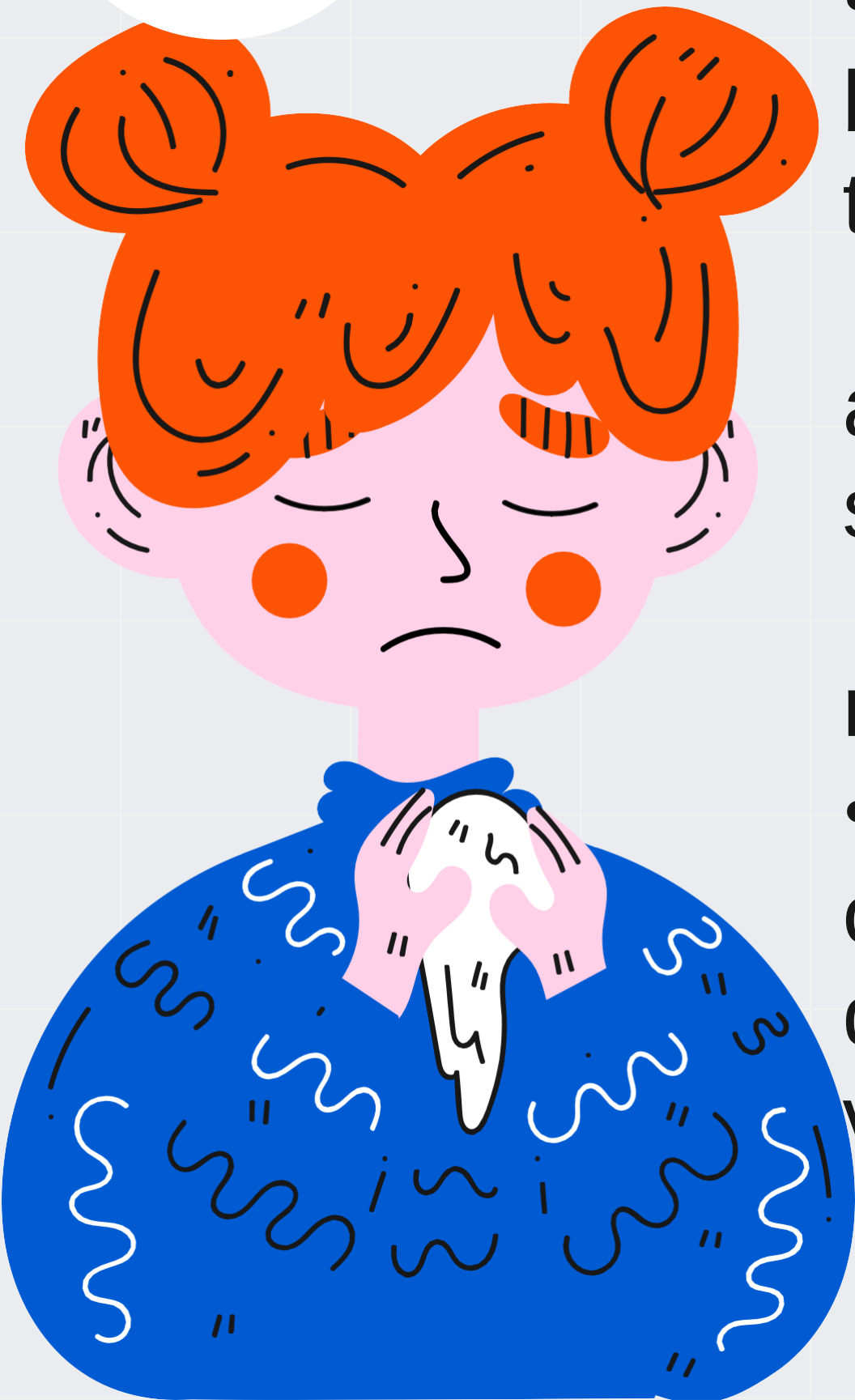




Why It's Best Heard There:



- Wheezing originates in the bronchi and bronchioles, which are mostly central and lower in the lungs.
- These airways are closer to the chest wall in the anterior and posterior lower zones, making the sound transmission more distinct.
- During expiration, air passes forcefully through narrowed lower airways, amplifying the wheeze.
- Diffuse wheezing (e.g., in asthma or bronchiolitis) is often heard throughout the chest, but it is most clearly detected in the dependent areas of the lungs where ventilation is greatest.

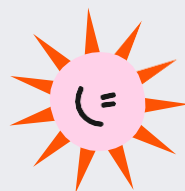




Tips for Auscultation



- Ask the patient to take deep breaths through an open mouth.
- Listen through a full respiratory cycle (inspiration and expiration).
- Compare both sides of the chest to detect asymmetry or localization (important in foreign body aspiration).

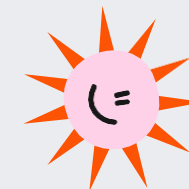




types of wheeze



- ۱) **Timing of Wheezing**
- ۲) **Characterization of Wheezing**
- ۳) **Distribution of Wheezing**





- ❑ Wheezing in early life is a common disorder, with approximately 50% of children having an episode of wheezing in the first year of life .A recurrent wheeze is estimated to occur in one-third of children of preschool age and can cause significant morbidity, decrease quality of life, and increase the frequency of the use of health care services and economic costs
- ❑ in which children were classified into four main subtypes, including never wheezing, early transient wheezing, persistent wheezing, and late-onset wheezing; later reports further categorized patients with persistent wheeze as having nonatopic persistent wheezing or atopic/IgE-associated wheezing





Wheeze can be divided according to its pattern and duration:

. 1.

Wheeze subtypes according to pattern (symptomatic classification):

◦ a.

Episodic wheeze: Wheezing within a discrete period that is often associated with clinical evidence of a viral cold. There is wheezing between episodes.

◦ b.

Multitrigger wheeze: Wheezing presenting with and apart from an acute viral episode.

. 2.

Wheeze according to duration:

◦ a.

Never or infrequent: Children who never wheeze or have presented with wheezing once in their life. In addition, 51% of patients in the Tucson study, 59.9% of the patients in the Avon Longitudinal Study of Parents and Children (ALSPAC) study, 75% of the patients in the Prevention and Incidence of Asthma and Mite Allergy (PIAMA) study, and 83% of the patients in the Italian Studies of Respiratory Disorders in Childhood and the Environment (SIDRIA) had a higher forced expiratory volume in the first



- ❑ Transient early wheeze: This is a type of wheeze that starts early in the first year of life and then continues through the second year before beginning to subside after the third year. Most of these patients are not atopic and exhibit no evidence of eosinophilia or other markers of inflammation, which are observed in approximately 16% of affected patients
- ❑ Intermediate wheeze: This is very rare in the first 18 months
- ❑ Late-onset wheeze: This presents as infrequent wheezing from 6 to 42 months of age that becomes more frequent at 42 months of age and then persists to an age of 6 years (approximately 1.7–6%)
- ❑ Persistent wheeze: This is wheeze with onset at 6 months of age or later that occurred in approximately 3.1% of patients
- ❑ Nonatopic persistent wheezing phenotype: This accounts for approximately 40% of patients with persistent wheeze and usually presents as episodic wheezing triggered mainly by viral illness
- ❑ IgE-associated atopic and/or persistent wheezing phenotype: Accounting for 60% of persistent wheezing cases



Common causes of wheeze in children

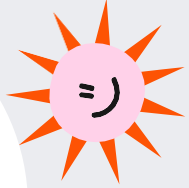


Clinical clues indicating other diagnoses

Persistent moist cough	Cystic fibrosis, aspiration, immune disorder, ciliary dyskinesia, protracted bacterial bronchitis
Paroxysmal cough	Pertussis or malacia
Cough while feeding	Gastroesophageal reflux disease with or without swallowing problems
Purulent nasal discharge	Sinus infection
Clear nasal discharge	Allergic nose
Abnormal voice or cry	Anatomical cause
Focal sign in chest	Foreign body aspiration
Episodic, seasonal	Asthma
Finger clubbing	Cystic fibrosis, ciliary dyskinesia, immune disorder
Failure to thrive	Immune disorder, cystic fibrosis
Prematurity, low birth weight	Bronchopulmonary dysplasia/chronic lung disease



- ☐ Vitamin D status and recurrent wheeze in children
- ☐ Maternal obesity and recurrent wheeze
- ☐ Maternal iron and wheeze
- ☐ Folic acid during pregnancy
- ☐ Prenatal administration of acetaminophen



1. Timing of Wheezing



❑ **Expiratory Wheeze:** Most common; occurs during expiration due to intrathoracic airway obstruction, as seen in asthma and bronchiolitis.



❑ **Inspiratory Wheeze:** Less common; suggests extrathoracic airway obstruction, such as in laryngeal anomalies or foreign body aspiration.



❑ **Biphasic Wheeze:** Occurs during both inspiration and expiration; indicates fixed central airway obstruction, like subglottic stenosis.





2. characterization of wheezing

.monophonic wheeze:

Single pitched sound; often due to localized airway obstruction, such as a tumor or foreign body.

.polyphonic wheeze:

multiple pitches; typically associated with diffuse airway obstruction, as seen in asthma.





3. Distribution of Wheezing



.Localized Wheeze: Heard in a specific area; may indicate a focal obstruction like a foreign body.



. Generalized Wheeze: Heard throughout the lung fields; suggests widespread airway narrowing, Common in asthma or bronchiolitis.





Table 439.2

Pertinent Medical History in the Wheezing Infant

- Did the onset of symptoms begin at birth or thereafter?
- Is the infant a noisy breather, and when is it most prominent?
- Is the noisy breathing present on inspiration, expiration, or both?
- Is there a history of cough apart from wheezing?
- Was there an earlier lower respiratory tract infection?
- Is there a history of recurrent upper or lower respiratory tract infections?
- Have there been any emergency department visits, hospitalizations, or intensive care unit admissions for respiratory distress?
- Is there a history of eczema?
- Does the infant cough after crying or cough at night?
- How is the infant growing and developing?
- Is there associated failure to thrive?
- Is there a history of electrolyte abnormalities?
- Are there signs of intestinal malabsorption, including frequent, greasy, or oily stools?
- Is there a maternal history of genital herpes simplex virus infection?
- What was the gestational age at delivery?
- Was the patient intubated as a neonate?
- Does the infant bottle-feed in the bed or the crib, especially in a propped position?
- Are there any feeding difficulties, including choking, gagging, arching, or vomiting with feeds?
- Is there any new food exposure?
- Is there a toddler in the home or lapse in supervision in which foreign body aspiration could have occurred?
- Is there a change in caregivers or a chance of nonaccidental trauma?





Table 439.1 Differential Diagnosis and Etiologies of Wheezing in Infancy

INFECTION

Viral

Respiratory syncytial virus
Human metapneumovirus
Parainfluenza
Adenovirus
Influenza
Rhinovirus
Bocavirus
Coronavirus, including COVID-19 variants
Enterovirus

Other

Chlamydia trachomatis
Tuberculosis
Histoplasmosis
Papillomatosis

ASTHMA

ANATOMIC ABNORMALITIES

Central Airway Abnormalities

Malacia of the larynx, trachea, and/or bronchi
Laryngeal or tracheal web
Tracheoesophageal fistula (specifically H-type fistula)
Laryngeal cleft (resulting in aspiration)

Extrinsic Airway Anomalies Resulting in Airway Compression

Vascular ring or sling
Mediastinal lymphadenopathy from infection or tumor
Mediastinal mass or tumor
Esophageal foreign body

Intrinsic Airway Anomalies

Airway hemangioma or other tumor
Congenital pulmonary airway malformation (cystic adenomatoid malformation)
Bronchial or lung cyst
Congenital lobar emphysema
Aberrant tracheal bronchus
Sequestration
Congenital heart disease with left-to-right shunt (increased pulmonary edema)
Foreign body

Immunodeficiency States

Immunoglobulin A deficiency
B-cell deficiencies
AIDS
Bronchiectasis

MUCOCILIARY CLEARANCE DISORDERS

Cystic fibrosis
Primary ciliary dyskinesia
Bronchiectasis

ASPIRATION SYNDROMES

Gastroesophageal reflux disease
Pharyngeal/swallow dysfunction

OTHER

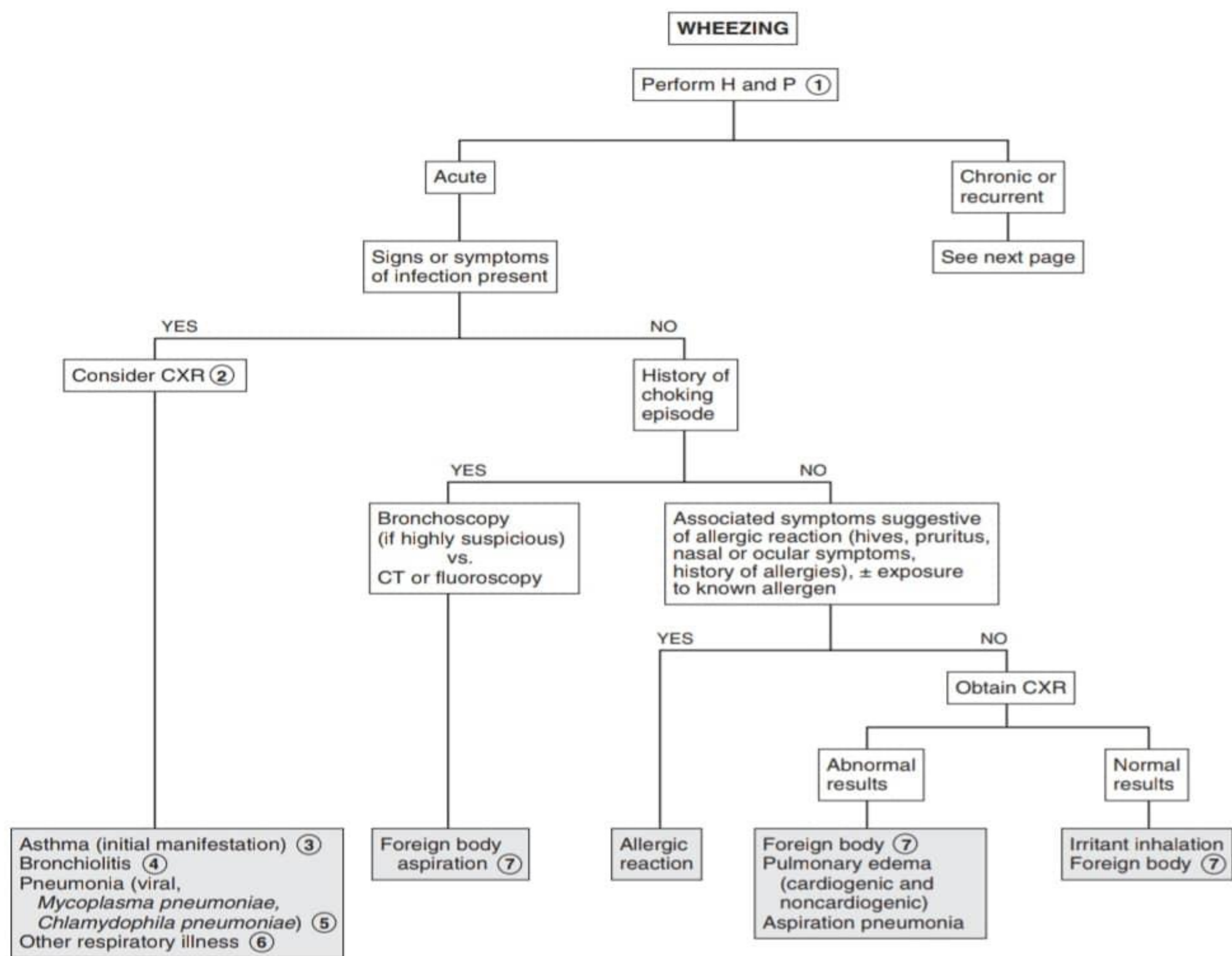
Bronchopulmonary dysplasia
Eosinophilic granulomatosis with polyangiitis
Interstitial lung disease, including bronchiolitis obliterans
Heart failure
Anaphylaxis
Inhalation injury—burns

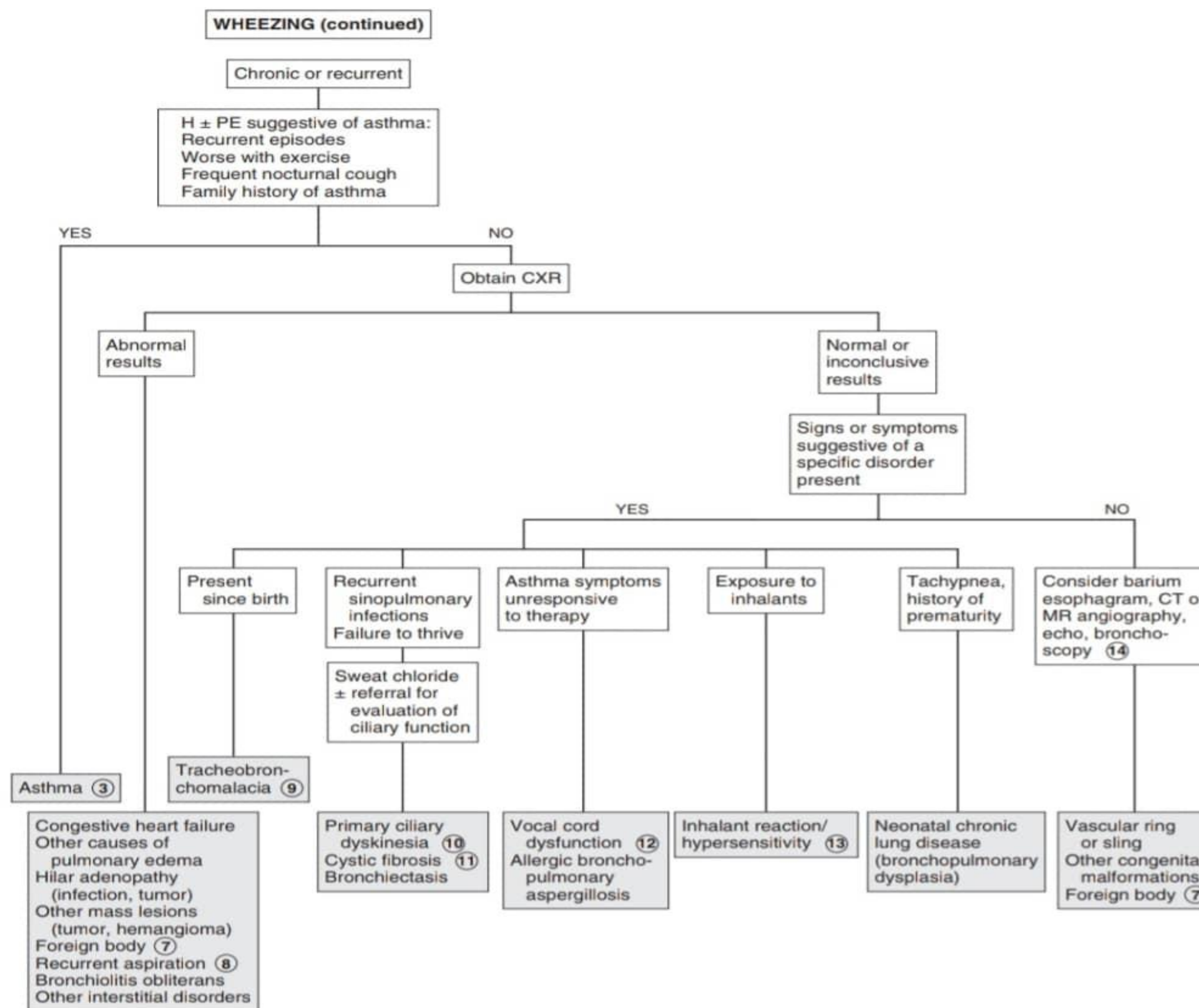


آمفیزم لوپار مادرزادی



approach to wheezing







Common Causes of Wheezing



- ☐ Asthma
- ☐ Viral bronchiolitis (RSV)
- ☐ Laryngomalacia
- ☐ Tracheomalacia Foreign body
- ☐ CF = Cystic Fibrosis
- ☐ PCS = Primary Ciliary Dyskinesia GERD
= Gastroesophageal Reflux Disease
- ☐ Pneumonia (viral or bacterial) Vocal Cord
Dysfunction (VCD)



Upper vs Lower Airway Causes

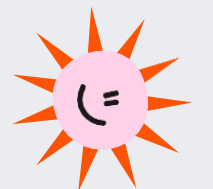


.Upper airway obstruction can mimic wheezing

Auscultation of the neck helps differentiate

.Lower airway causes are more common

(e-g-,bronchiolitis, asthma)





Bronchiolitis

Most common cause of recurrent wheezing in infants

Symptoms: cold, wheezing/crackles, tachypnea, poor feeding

Usually caused by RSV

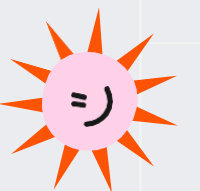
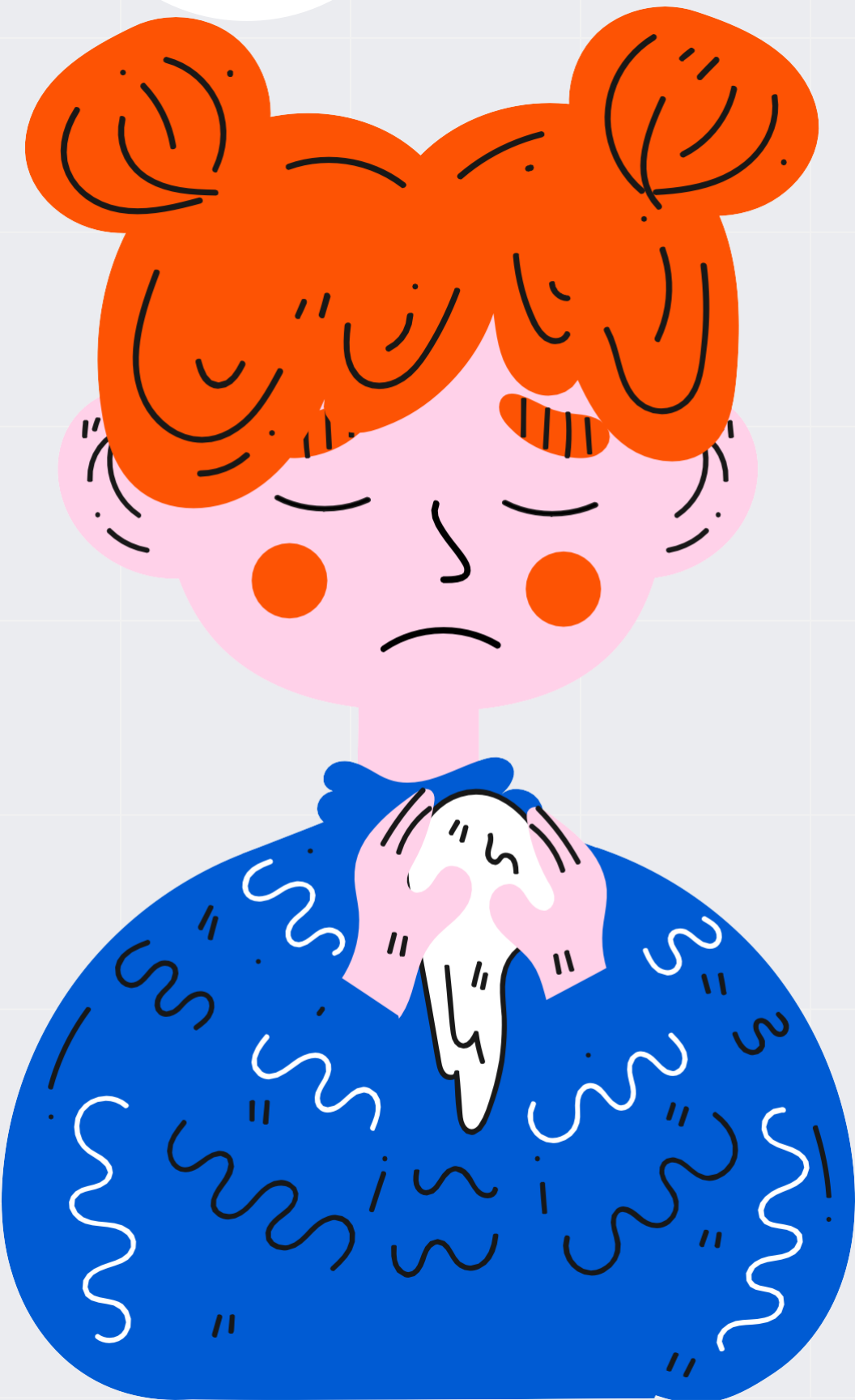
Affects children < 2 years,
peak: 2-6 months

Diagnosis is clinical; CXR not routinely needed



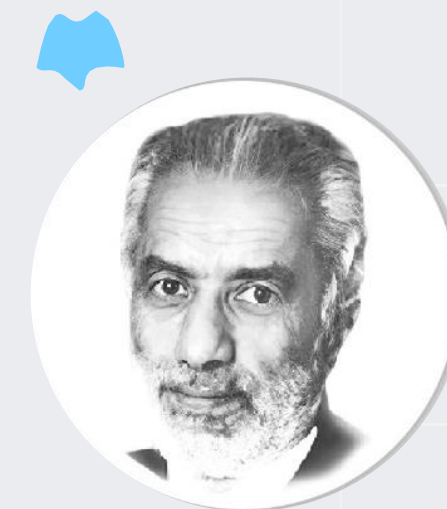
Bronchiolitis - Key Features

- ☐ Triggered by viral infections
- ☐ Worsens over a few days, then resolves
- ☐ Trial of bronchodilators may help but not diagnostic
- ☐ No antibiotics unless bacterial coinfection suspected



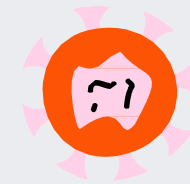


Asthma



- ☐ Chronic airway inflammation
- ☐ Recurrent: wheezing, cough, chest tightness, dyspnea
- ☐ Often worse at night or early morning
- ☐ Triggered by: viruses, allergens, exercise, cold air
- ☐ Diagnosis in young children is challenging
- ☐ Family history supports diagnosis





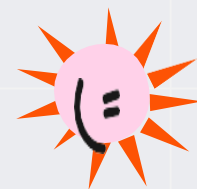
Atypical Pneumonia (Older Children)

Mycoplasma pneumoniae, *Chlamydia pneumoniae*

Cause prolonged cough + wheeze

More common in school-age children and Adolescents

Diagnosis: clinical, supported by imaging

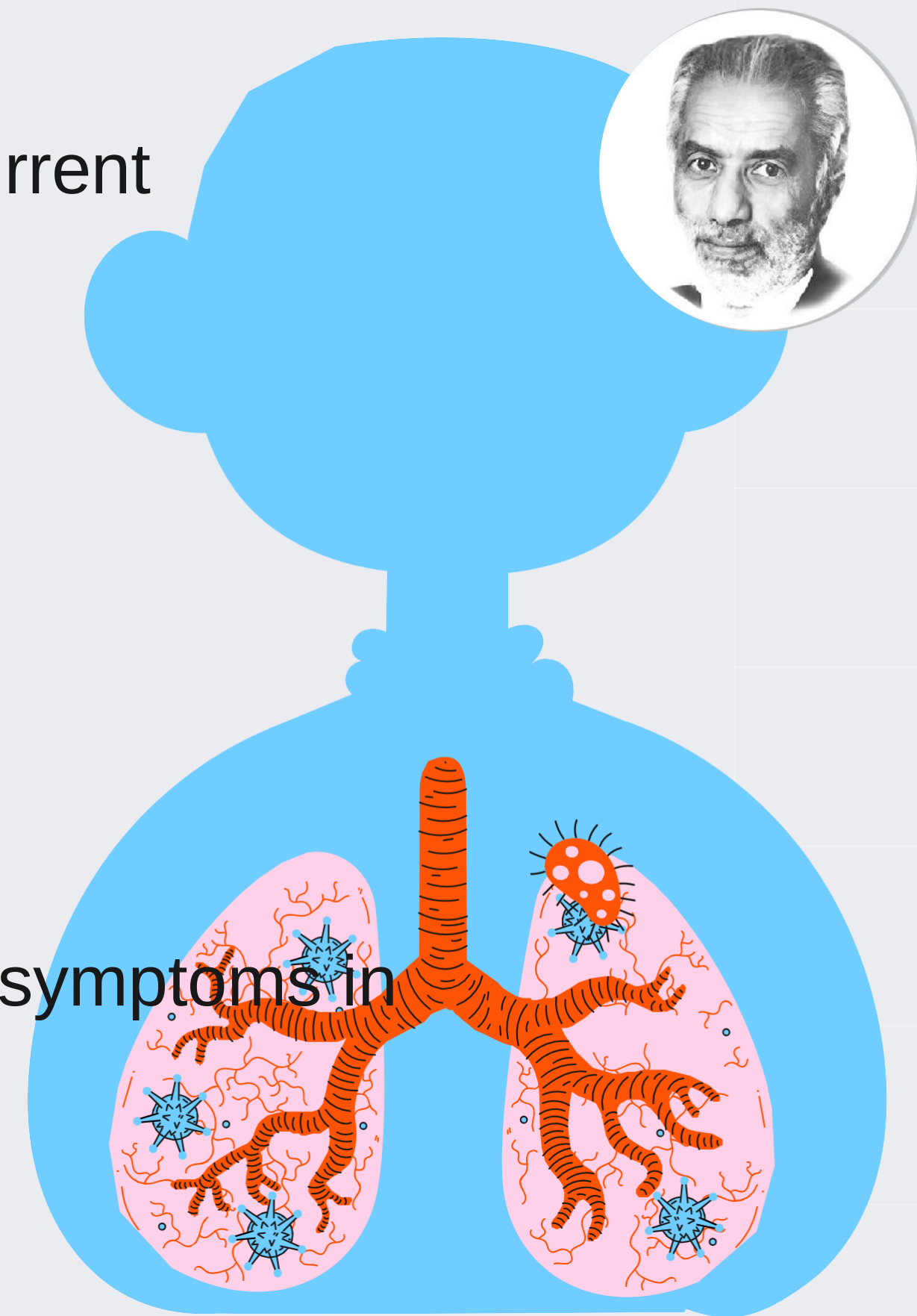




Foreign Body Aspiration

- Consider in unilateral wheezing, persistent/recurrent pneumonia
 - History may be absent or unclear
 - CXR may be normal; look for:
 - Unilateral hyperinflation
 - Atelectasis
 - Persistent segmental pneumonia
 - Bronchoscopy = diagnostic and therapeutic
- Recurrent aspiration causes chronic respiratory symptoms in children with:
 - Neurological dysfunction
 - Swallowing difficulties

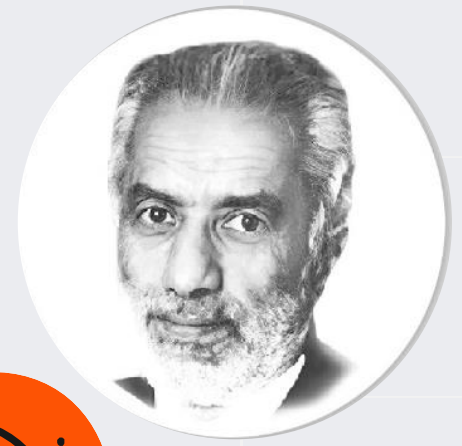
GERD often coexists but rarely causes significant lung disease alone without aspiration

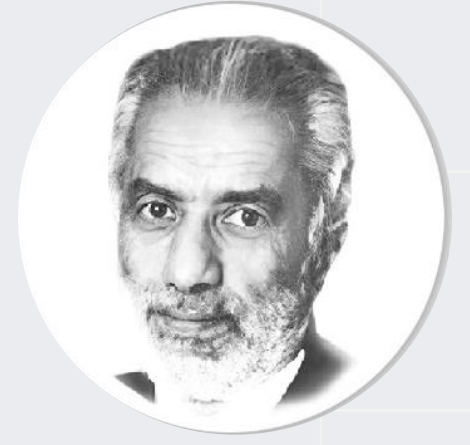




Airway Malacia

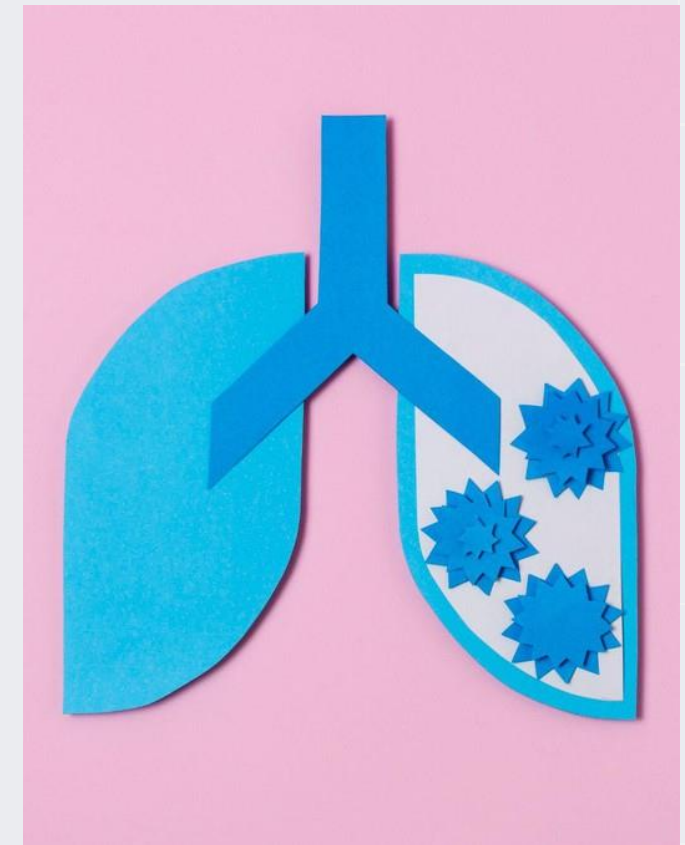
- Tracheomalacia / Bronchomalacia:
 - Weak airway cartilage → floppy trachea/bronchi
 - Symptoms: barking cough, stridor, expiratory wheeze
- Diagnosis: clinical $\pm$ bronchoscopy
 - Often improves with age





Primary Ciliary Dyskinesia (PCD)

- Rare genetic disorder with abnormal ciliary function
- Poor mucus clearance → chronic infections
- Signs:
- Neonatal distress
- Chronic rhinitis, sinusitis, otitis
- $\pm$ Situs inversus
- Poor feeding, failure to thrive





Cystic Fibrosis (CF)

Early diagnosis due to newborn screening

Chronic cough, wheezing, recurrent infections

GI symptoms: greasy stools, poor weight gain

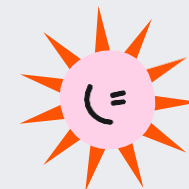
Diagnosis: positive sweat chloride test

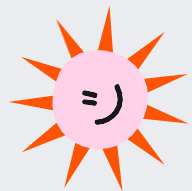




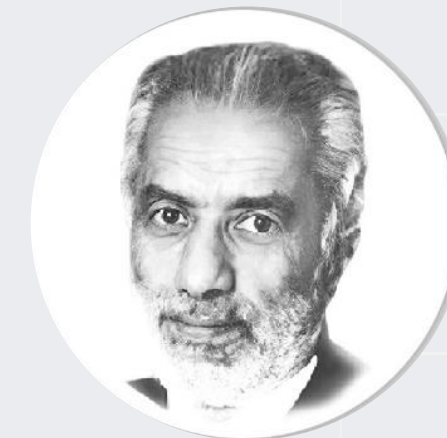
Vocal Cord Dysfunction

- Mimics asthma (wheezing, SOB)
- Due to paradoxical vocal cord closure
- Clues: sudden onset/offset, poor response to asthma meds
- Diagnosis: history + direct observation





Other Considerations



- Environmental exposures (dust, fumes, gases) can cause lung disease
- Imaging:
 - CXR: may help but often non-specific
 - CT/MRI: useful for structural anomalies (e-g-, vascular rings)





Treatment



☐ Bronchodilator

☐ Inhaled steroids

☐ Systemic steroids

☐ Antileukotriene

☐ Antibiotics

☐ Palivizumab

☐ Ipratropium bromide

☐ Antihistamine

☐ Parental level of education



Conclusion

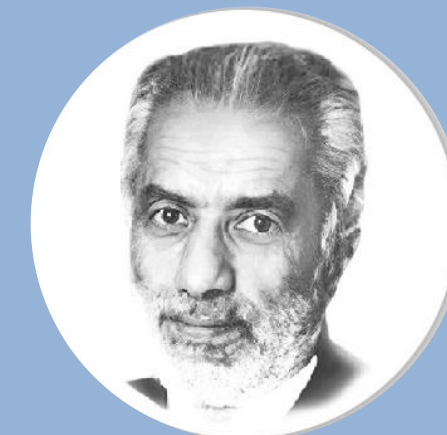
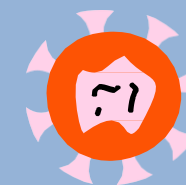
- ❑ Wheezes are very common in children, in whom they appear as heterogeneous groups; hence, physicians should be aware of wheezing phenotypes, most of which abate with age. Few groups continue to wheeze during childhood, although exposure to environmental triggers is a poor prognostic factor. Determining the appropriate level of investigation and treatment remains a challenge to physicians at the level of investigations and treatments. The modified Asthma Predictive Index could be beneficial for predicting which groups should be treated as asthmatic patients, in whom interventions are conditional but regular follow-up and monitoring are strongly recommended. Wheezes are known to be a burden to any patient's health care, and interventions should therefore be based on evidence



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Thanks for your attention!

