

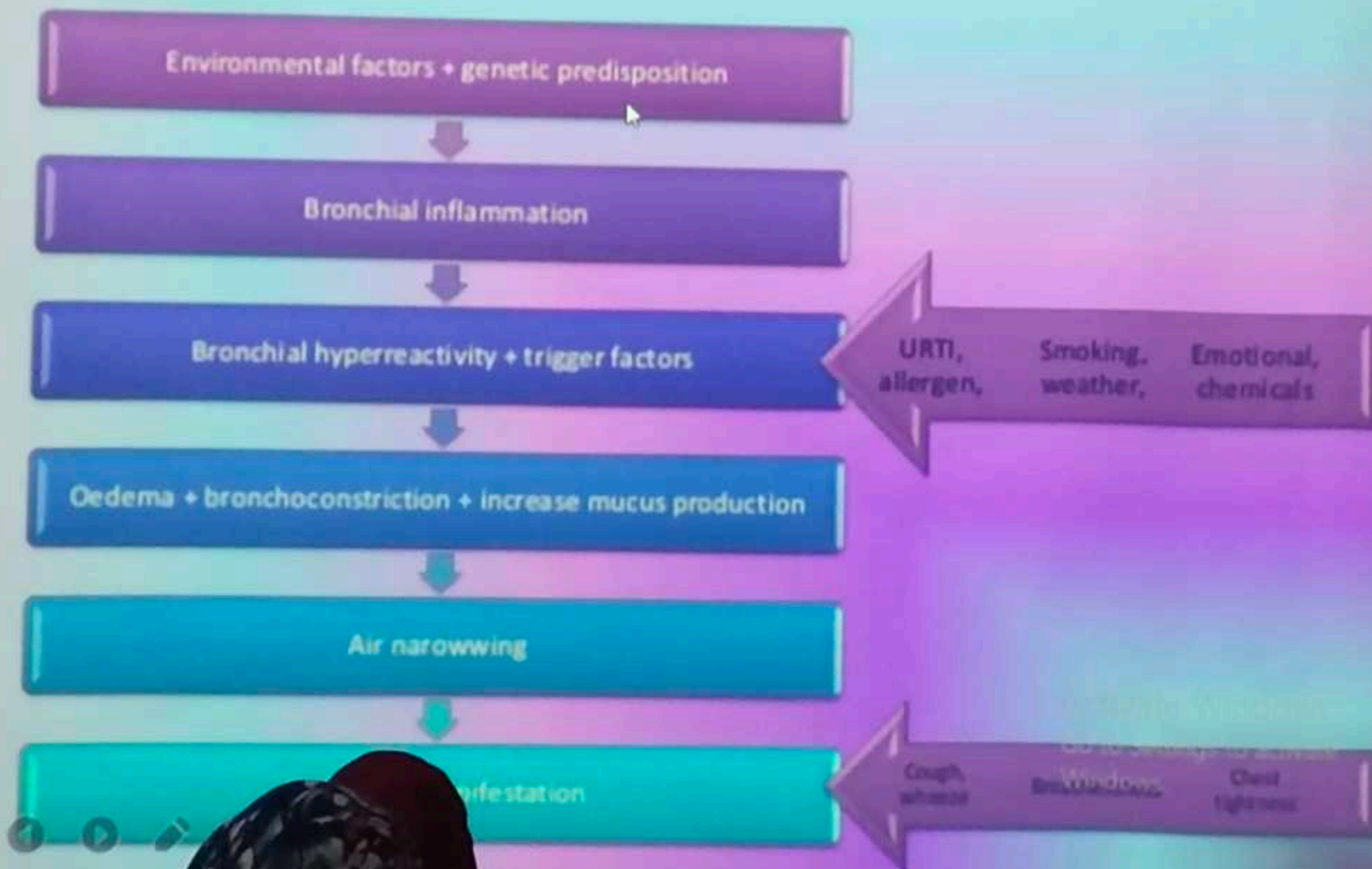
# Definition of Asthma

- A chronic inflammatory disease of the airways with the following clinical features:
  - Episodic and/or chronic symptoms of airway obstruction
  - Bronchial hyperresponsiveness to triggers
  - Evidence of at least partial reversibility of the airway obstruction
  - Alternative diagnoses are excluded

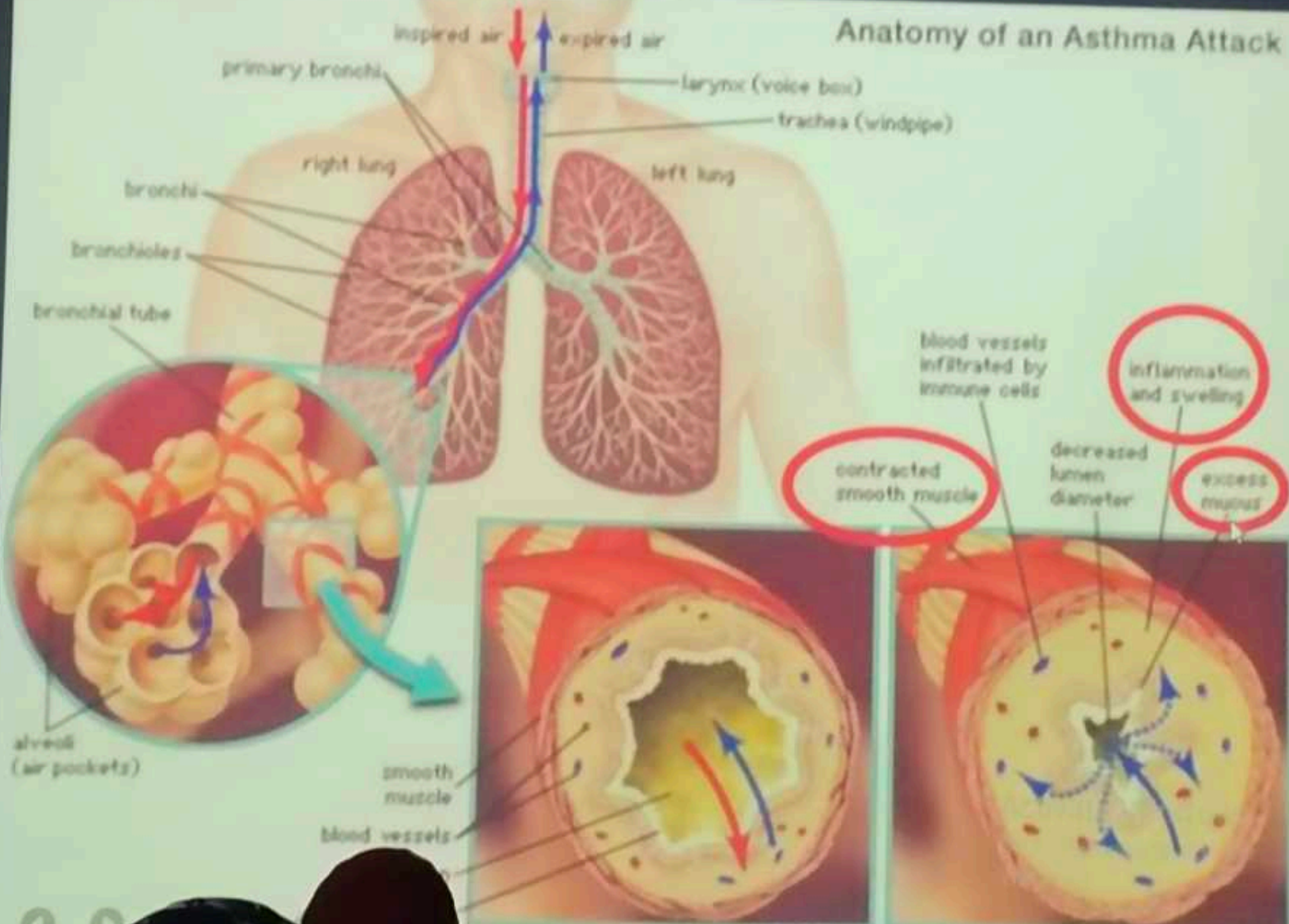
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# Pathophysiology



# Anatomy of an Asthma Attack





## Epidemiology

- Bronchial asthma (BA) is one from the most frequent chronic diseases in children and its incidence continues to increase in the last years. Conformable to ISAAC data (International Study of Asthma and Allergy in Children), BA affects 5-20% of children on the earth globe, this index varying in different countries (in USA - 5-10%, in Canada, UK - 25-30%, in Greece, China – 3-6%).

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**Does wheezing mean that I have asthma ?**



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## Wheezing—Asthma?

- Wheezing with upper respiratory infections is very common in small children, but:
  - Many of these children will not develop asthma.
  - Asthma medications may benefit patients who wheeze whether or not they have asthma.

**Child that wheezes is not asthma.**

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# Recurrent wheeze in infancy

Transient early wheezing

Non-atopic wheezing

IgE-mediated wheezing (atopic asthma)

Recurrent aspiration of feeds

CF

Cow's milk protein intolerance

Inhaled foreign body

Congenital abnormality of lung, airway or heart

Idiopathic

## Transient early wheezing

- Common in infancy
- Small airways obstruction due to inflammation 2<sup>o</sup> to viral infection
- Decreased lung function since birth due to small airway calibre
- Risk factor: smoking mother ( pregnancy / prematurity)
- Common in males and resolves by 5 years age

## Non-atopic wheezing

- Normal lung function at early life
- LRI; viral infection (RSV) leads to wheezing during first 10 years of life
- Less severe persistent wheezing and symptoms improve during adolescent

## Ig-E mediated wheezing (atopic asthma)

- Lung function normal at birth
- Recurrent wheeze develops with allergic sensitisation , increased blood IgE and positive skin prick tests to common allergens
- Persistence symptoms and decreased lung function later in childhood
- Risk factors: FH, allergy, eczema
- Exposure to smoke / prematurity not risk factors



## Typical features of Asthma

- Afebrile episodes
- Personal atopy (allergic rhinitis, allergic conjunctivitis, atopic dermatitis, food allergies),
- Family history of atopy or asthma
- Nocturnal Exacerbations.
- Exercise /Activity induced symptoms
- Trigger Induced Symptoms
- Seasonal exacerbations
- Relief with bronchodilators.

## Cough—Asthma?

- Consider asthma in children with:
  - Recurrent episodes of cough with or without wheezing
  - Nocturnal awakening because of cough
  - Cough that is associated with exercise/play

**Cough may be the only symptom  
present in patients with asthma.**

# On examination

- expiratory wheezing
- prolonged expiratory phase
- Decreased breath sounds in some of the lung fields.
- **Crackles** (or rales) and rhonchi.
- The combination of segmental crackles and poor breath sounds can indicate **lung segmental atelectasis**.
- **In severe exacerbations**, features of respiratory distress, with inspiratory and expiratory wheezing, increased prolongation of exhalation, poor air entry.
- **In extremis**, airflow may be so limited that wheezing cannot be heard.



# Clinical Manifestations and Diagnosis

- Intermittent dry **coughing**
- expiratory **wheezing**
- **shortness of breath and chest tightness**
- Intermittent, nonfocal chest pain.
- Respiratory symptoms can be worse at **night**
- **Daytime symptoms**, often linked with physical activities or play.
- limitation of physical activities, general fatigue.

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## Asthma Predictive Index

- Identify high risk children (2 and 3 years of age):
  - $\geq 4$  wheezing episodes in the past year

*PLUS*

- One major criterion

- Parent with asthma
- Atopic dermatitis
- Aero-allergen sensitivity

*OR*

- Two minor criteria

- Food sensitivity
- Peripheral eosinophilia ( $\geq 4\%$ )
- Wheezing not related to infection

## investigations

- **Lung function tests** can help to confirm the diagnosis of asthma and to determine disease severity.
- **Spirometry** is helpful as an objective measure of airflow limitation. usually feasible in **children > 6 yr of age.**



- **Peak expiratory flow (PEF) monitoring** devices provide simple and inexpensive home-use tools to measure airflow and can be helpful in a number of circumstances.
- **Radiology;** The findings of chest radiographs in children with asthma often appear to be normal, aside from subtle and nonspecific findings of hyperinflation (flattening of the diaphragms) and peribronchial thickening. Also complications and co morbidities can be looked.
- Other tests, such as allergy testing to assess sensitization to inhalant allergens, help with the management and prognosis of asthma.





The diagnosis of asthma in preschool children is based on recognising a characteristic pattern of episodic respiratory symptoms and signs in the absence of an alternative explanation, the **diagnosis is usually purely clinical.**

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# Treatment

- **Management** of asthma should have the following components:
  - (1) assessment and monitoring of disease activity;
  - (2) education to enhance the patient's and family's knowledge and skills for self-management;
  - (3) identification and management of precipitating factors and co-morbid conditions that may worsen asthma; and
  - (4) appropriate selection of medications to address the patient's needs.
- **The long-term goal of asthma management is attainment of optimal asthma control.**

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# In general ???

❖ There are two main types of drugs used for treating asthma.

## ❑ Medications to reduce bronchoconstrictions:

- Beta 2 Agonist
- Anticholinergics
- Theophylline

## ❑ Medications to reduce inflammations:

- Steroids ( oral, Parenteral & Inhalers)
- Not steroids:
  - **Leukotriene modifiers** ( montelukast is available worldwide; zafirlukast is mentioned only in NAEPP and pranlukast only in Japanese Guidelines for Childhood Asthma, 2008 (JGCA))
  - **Cromolyn & Nedocilil** (Reduction of mast cell degranulation)

## Farther more ???

### □ Long-term control medications:

- Corticosteroids (mainly ICS, occasionally OCS).
- Long Acting Beta Agonists (LABA's) including salmeterol and formoterol,
- Leukotriene Modifiers (LTM)
- Cromolyn & Nedocromil
- Methylxanthines: (Sustained-release theophylline)

### □ Quick- relief medications:

- Short acting Beta Agonists (SABA's)
- Systemic corticosteroids
- Anticholinergics



- **Classifying Asthma Severity** into **intermittent, mild, moderate, or severe persistent** asthma depending on symptoms of impairment and risk
- Once classified, use the **6 steps** depending on the severity to obtain asthma control with the lowest amount of medication
- **Controller medications** should be considered if:
  - **>4 exacerbations/year,**
  - **2 episodes of oral steroids in 6 months, or**
  - **use of SABA's (salbutamol) more than twice a week**

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# Classifying Asthma Severity and Initiating Treatment in Children 0 to 4 Years of Age

Components of Severity		Classification of Asthma Severity (0–4 years of age)			
		Intermittent	Mild	Persistent	
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	0	1–2x/month	3–4x/month	>1x/week
	Short-acting beta <sub>2</sub> -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	≥2 exacerbations in 6 months requiring oral systemic corticosteroids, or ≥4 wheezing episodes/1 year lasting >1 day AND risk factors for persistent asthma		
		Consider severity and treatment based on exacerbations. Frequency and severity may fluctuate over time.			
Recommended Step for Initiating Therapy		Step 1	Step 2	Step 3 and consider short course of oral systemic corticosteroids	
(See figure 4-1a for treatment steps)		In 2–6 weeks, depending on severity, evaluate level of asthma control that is achieved. If no clear benefit is observed in 4–6 weeks, consider adjusting therapy or alternative diagnosis.			

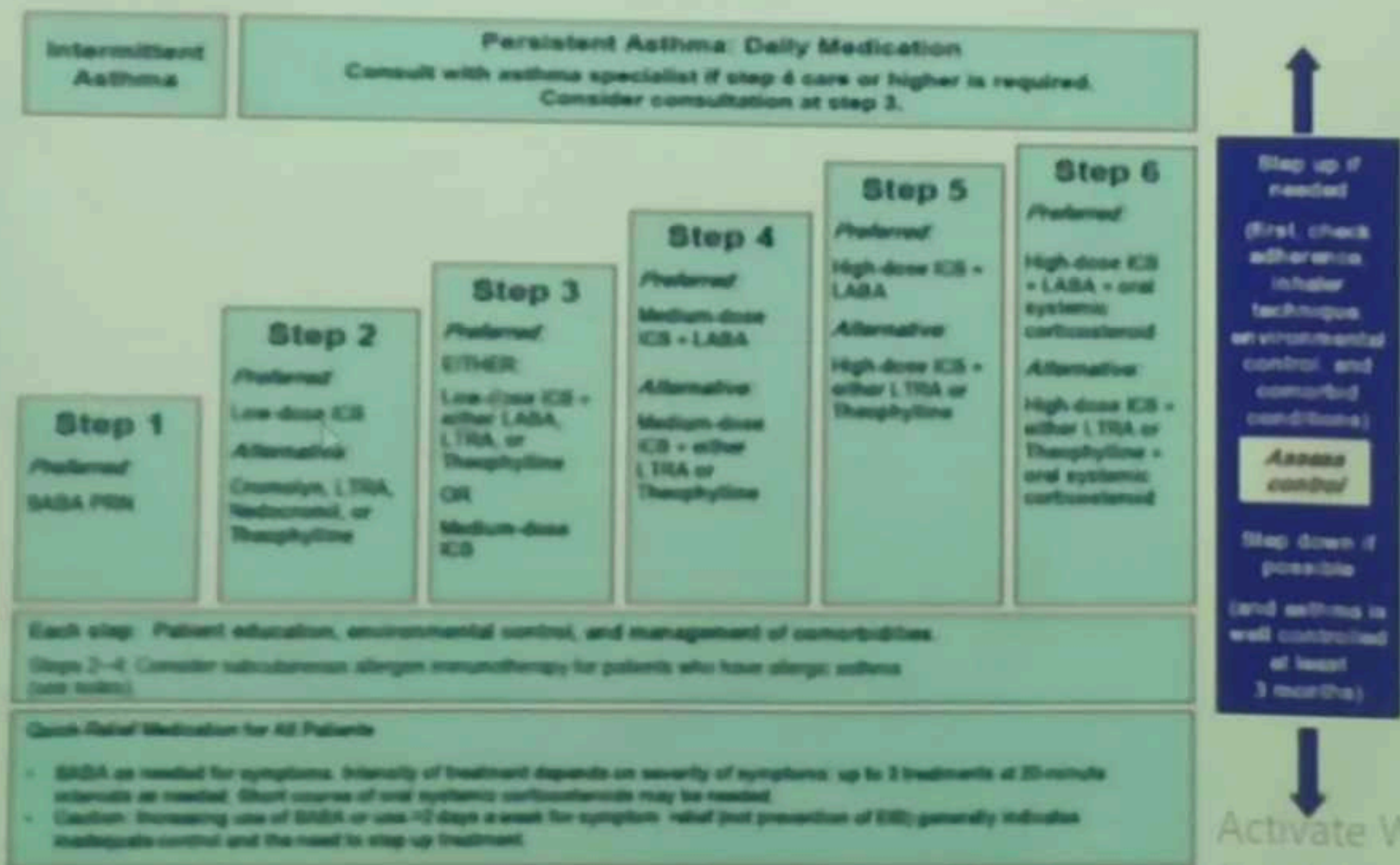
# Classifying Asthma Severity and Initiating Treatment in Children 5 to 11 Years of Age

Components of Severity		Classification of Asthma Severity (5–11 years of age)			
		Intermittent	Mild	Moderate	Severe
Impairment	Symptoms	<2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	<2x/month	3–4x/month	>2x/week but not nightly	Often 7x/week
	Short-acting beta <sub>2</sub> -agonist use for symptom control (not prevention of EOB)	<2 days/week	>2 days/week but not daily	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
	Lung function	<ul style="list-style-type: none"> <li>• Normal FEV<sub>1</sub> between measurements</li> <li>• FEV<sub>1</sub> &gt;80% predicted</li> <li>• FEV<sub>1</sub>/FVC &gt;80%</li> </ul>	<ul style="list-style-type: none"> <li>• FEV<sub>1</sub> &gt;80% predicted</li> <li>• FEV<sub>1</sub>/FVC &gt;80%</li> </ul>	<ul style="list-style-type: none"> <li>• FEV<sub>1</sub> = 60–80% predicted</li> <li>• FEV<sub>1</sub>/FVC = 75–80%</li> </ul>	<ul style="list-style-type: none"> <li>• FEV<sub>1</sub> &lt;60% predicted</li> <li>• FEV<sub>1</sub>/FVC &lt;75%</li> </ul>
Risk	<p>Exacerbations requiring oral systemic corticosteroids</p> <p>0–1/year (see note)   1–2/year (see note)   3–4/year (see note)   5+ /year (see note)</p> <p>← Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time for patients in any severity category. Relative annual risk of exacerbations may be related to FEV<sub>1</sub>.</p>				
Recommended Step for Initiating Therapy		Step 1	Step 2	Step 3, medium-dose ICS option	Step 3, medium-dose ICS option, or step 4
		and consider short course of oral systemic corticosteroids			
		In 2–4 weeks, evaluate level of asthma control that is achieved, and adjust therapy accordingly.			

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# Stepwise Approach for Managing Asthma in Children 5 to 11 Years of Age



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# Reviewing response and adjusting treatment

- **How often should asthma be reviewed?**
  - 1-3 months after treatment started, then every 3-12 months
  - After an exacerbation, within 1 week
- **Stepping up asthma treatment**
  - *Sustained step-up*, for at least 2-3 months if asthma poorly controlled
    - Important: first check for common causes (symptoms not due to asthma, incorrect inhaler technique, poor adherence)
  - *Short-term step-up*, for 1-2 weeks, e.g. with viral infection or allergen
    - May be initiated by patient with written asthma action plan
- **Stepping down asthma treatment**
  - Consider step-down after good control maintained for 3 months
  - try to reduce therapy (usually by **25-50%**)
  - Find each patient's minimum effective dose, that controls both symptoms and exacerbations.

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## Aim of management

Aim of asthma management is to control the disease

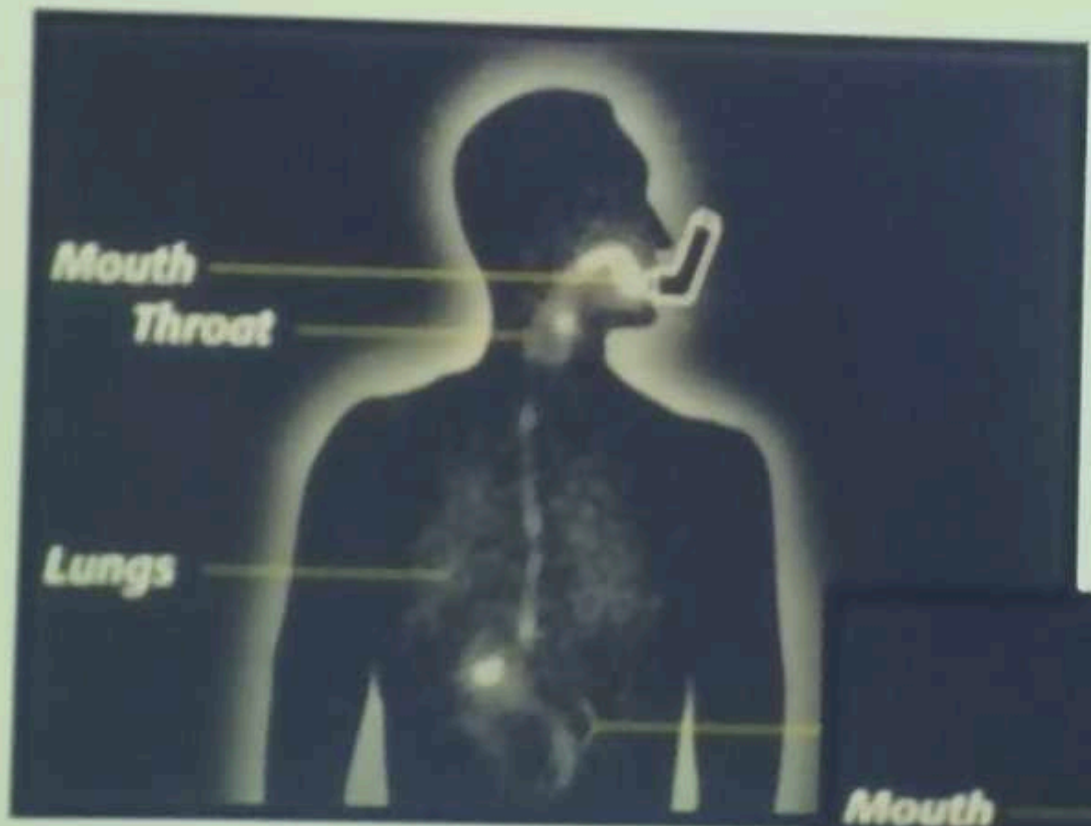
Complete Control is defined as

1. No daytime symptoms
2. No night-time awakening due to asthma
3. No need for rescue medication
4. No asthma attacks
5. No limitations on activity including exercise
6. Normal lung function (in practical terms FEV1 and/or PEF > 80% predicted or best)
7. Minimal side effects from medication.

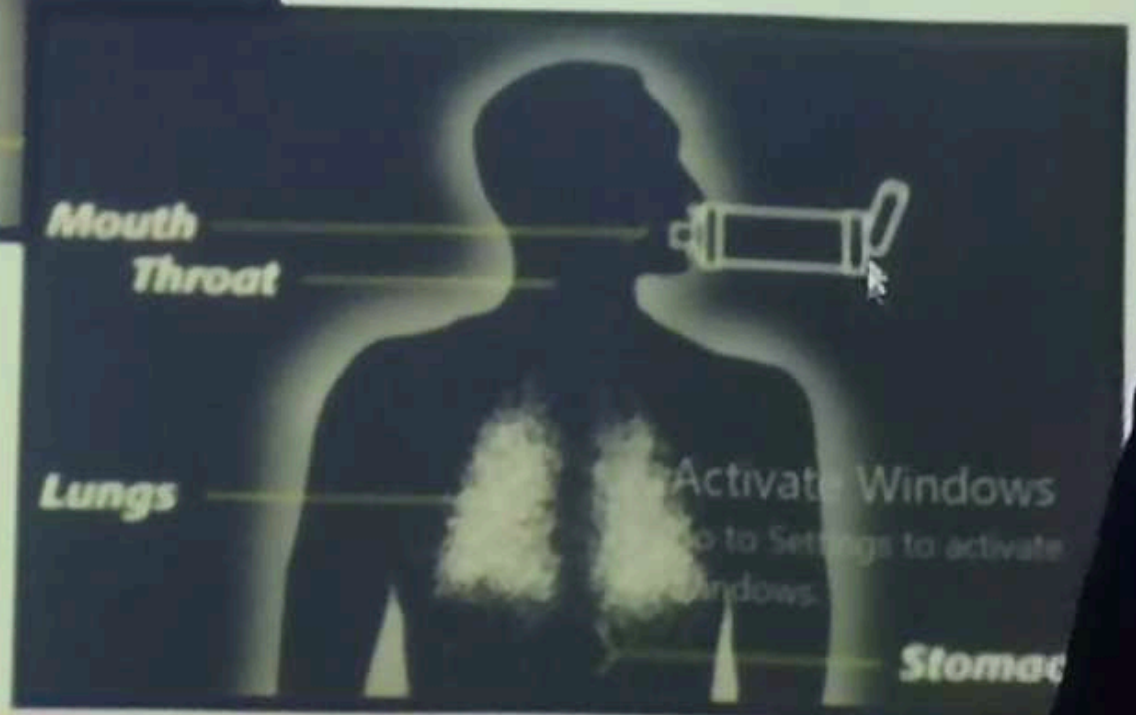
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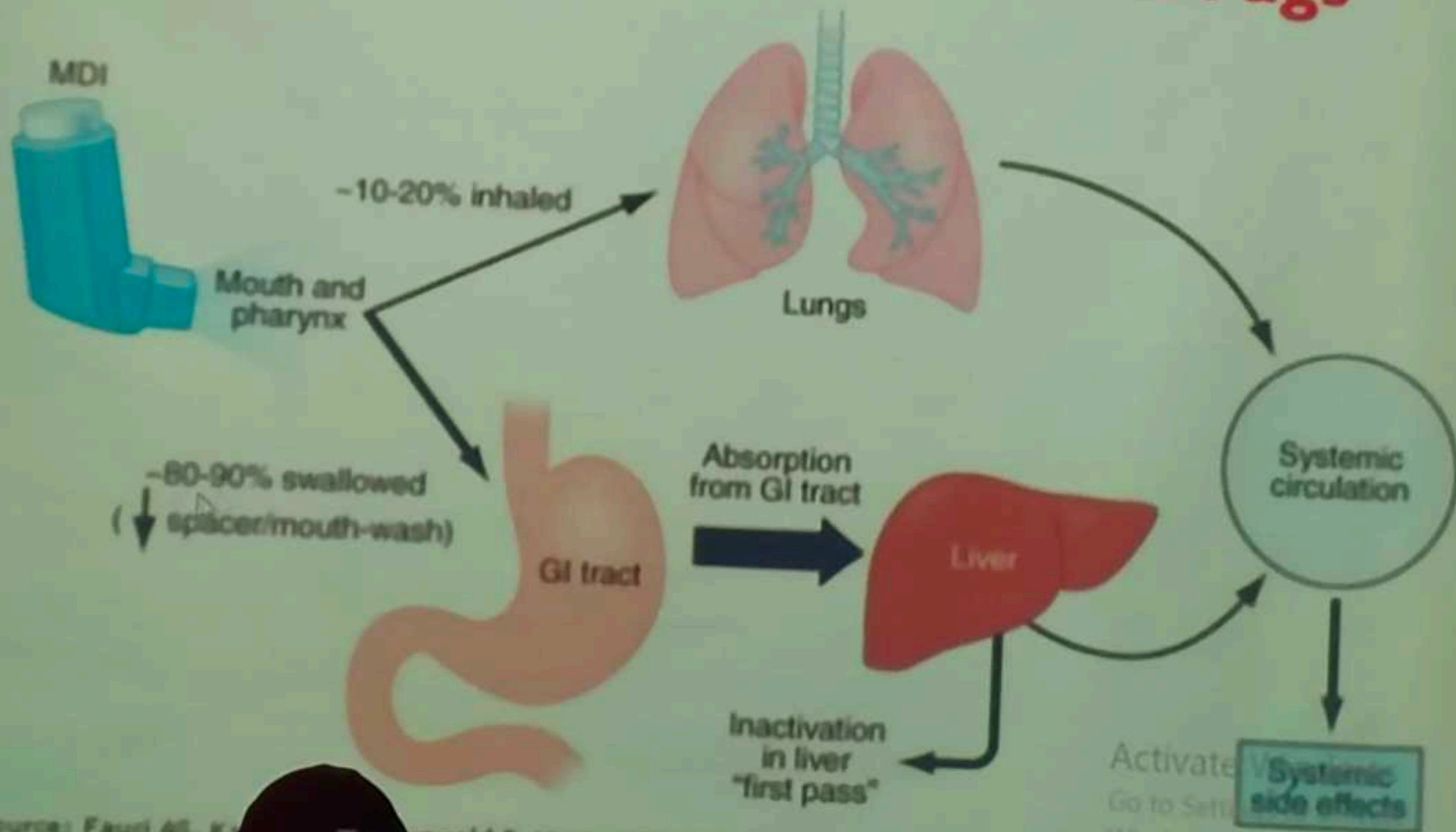
Without Spacer  
←



With Spacer  
→



# Pharmacokinetics of Inhaled Drugs



## Local side effects

1. Oropharyngeal candidiasis
2. Hoarseness
3. Coughing

### To reduce the potential for adverse affects:

- Use the lowest dose necessary to maintain control.
- Administer with spacers/holding chambers.
- Advise patients to (Rinse with water , gargle and spit out) after inhalation.

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# INHALER / "PUFFER" WITH SPACER & MOUTHPIECE (4+ YEARS)



OPEN



SHAKE



INSERT



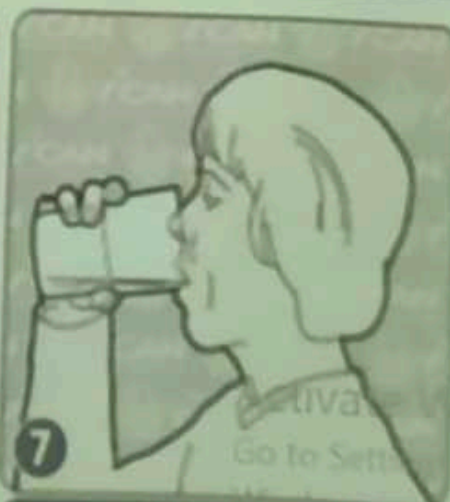
PRESS DOWN



SLOWLY BREATHE IN & HOLD



REMINDER

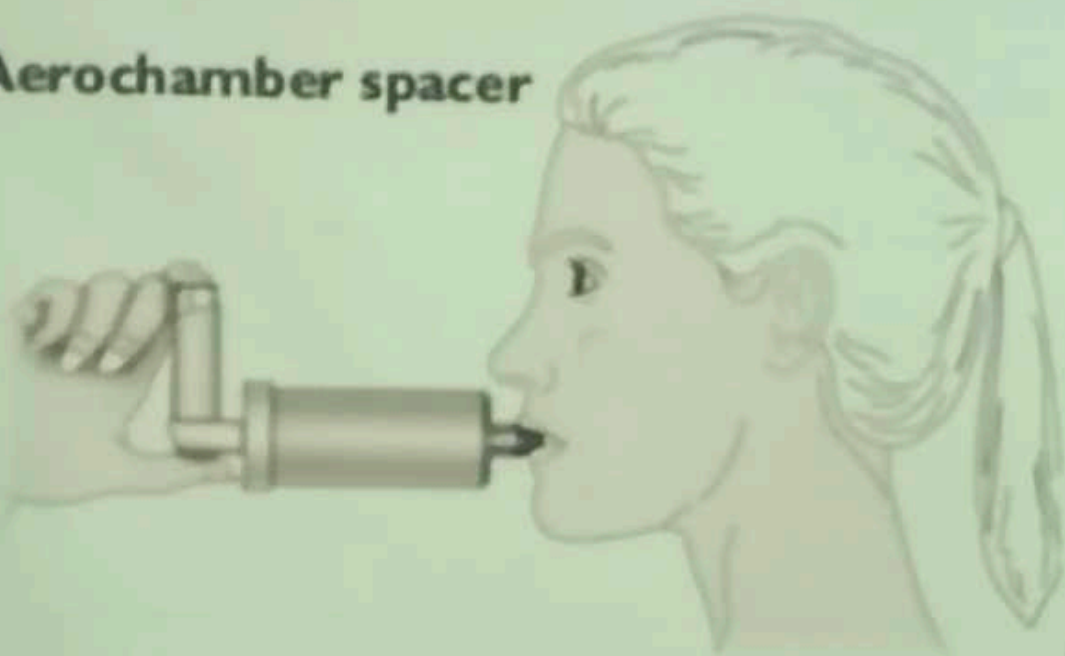


DRINK OR BRUSH TEETH

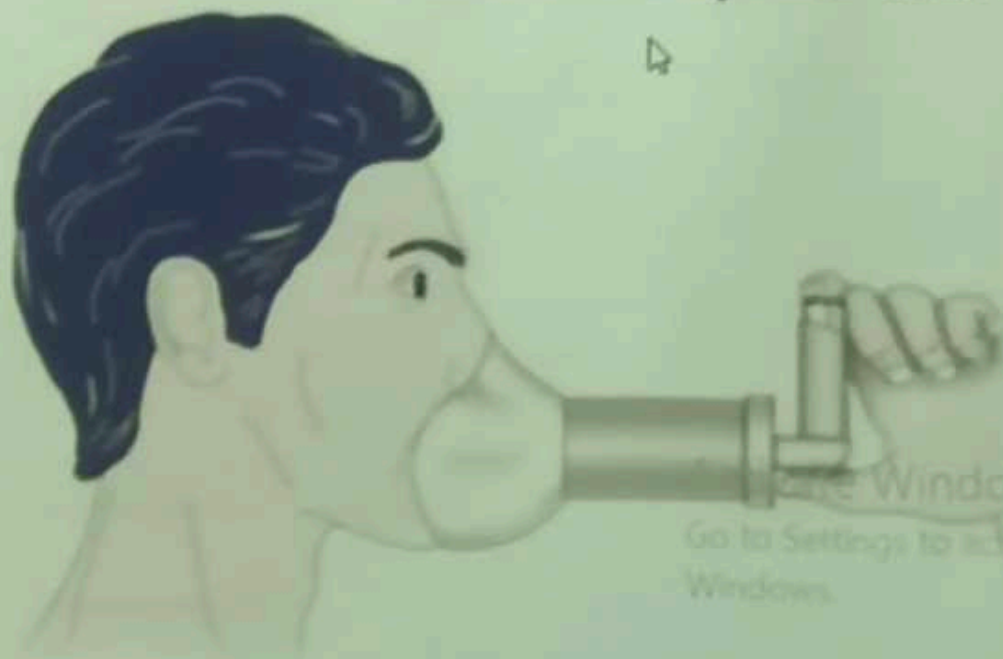
## Choosing an inhaler device for children with asthma

Age group	Preferred device	Alternative device
Younger than 4 years	Pressurized metered-dose inhaler plus dedicated spacer with face mask	Nebulizer with face mask
4-5 years	Pressurized metered-dose inhaler plus dedicated spacer with mouthpiece	Nebulizer with mouthpiece
Older than 6	Dry powder inhaler or breath actuated pressurized metered-dose inhaler or pressurized metered-dose inhaler with spacer with	Nebulizer with mouthpiece

## Aerochamber spacer



## Aerochamber spacer with mask



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# REMEMBER



- Inhaled medications is a waste of money if not used properly
- Poor technique is a barrier to good control
- Check at each visit
- Don't rely on patient's knowledge – ask them to demonstrate

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## Allergen immunotherapy in asthma

The use and role of allergen immunotherapy (AIT) in asthma is still a matter of debate, and no definite recommendation about this is made in guidelines, both for the subcutaneous and sublingual routes.

This is essentially due to the fact that most controlled randomised trials were not specifically designed for asthma

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# Assessment of child with asthma

## Acute

Determine the severity

Breathlessness to talk and eat??

Increased work of breathing: Severe tachypnoea:  $>30$  breaths/min

Chest recession

- Moderate: intercostal
- Severe: accessory neck muscle
- Life-threatening: poor resp effort

Auscultation - wheeze / silent chest, Pulse - Severe  $>120$  bpm

Consciousness, exhaustion, cyanosis (tongue)

Peak flow (% predicted)

- Moderate -  $>50\%$
- Severe -  $<50\%$
- Life threatening -  $<33\%$

O<sub>2</sub> saturation

- Moderate -  $>92\%$
- Severe -  $<92\%$

## Chronic

Growth and nutrition

Peak flow/spirometry

Chest: hyperinflation, Harrison's sulci, wheeze

Allergic disorder

Sought other causes if:

- Sputum
- Clubbing
- Growth failure

Monitor

- PEFR daily
- Severity and frequency of symptoms
- Exercise tolerance
- Interference with life: school, sleep
- Appropriate use of preventer and reliever
- Inhaler technique

Triggers??

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# Prognosis

- Recurrent coughing and wheezing occurs in **35% of preschool-aged children.**
- Of these, approximately **one third** continue to have persistent asthma into later childhood, and approximately **two thirds** improve on their own through their teen years.

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# Prognosis

- Asthma severity by the **ages of 7-10 yr** of age is predictive of asthma persistence in adulthood.
- Children with **moderate to severe asthma** and with **lower lung function measures** are likely to have persistent asthma as adults.
- Children with **milder asthma and normal lung function** are likely to improve over time, with some becoming periodically asthmatic (disease-free for months to years);
- **however, complete remission for 5 yr in children is uncommon.**

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## Vaccinations

Influenza can trigger acute asthma exacerbations & worsening of asthma symptoms , and **patients with moderate-severe asthma are advised to receive an influenza vaccination every year.**

However, patients should be advised that vaccination is not expected to reduce the frequency or severity of asthma exacerbations (Evidence A).

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