



Diagnosis and treatment of asthma in childhood: an overview of guidelines

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Asthma is the most common chronic respiratory condition of childhood worldwide, with approximately 15% of children and young people affected.⁽¹⁾ This review provides a concise summary of pediatric asthma diagnosis and management, benefiting health care providers in diverse child health settings.

DIAGNOSING ASTHMA IN CHILDREN

In practice, diagnosis of asthma should be established by considering characteristic symptom patterns. Asthma is distinguished by fluctuating symptoms, which may include wheezing, dyspnea, chest tightness, and cough. It is also characterized by variable limitation in expiratory airflow. Both symptoms and severity typically change over time.⁽¹⁾ The variations are often triggered by factors such as exercise, aeroallergens, and particularly viral respiratory infections, which may cause episodic exacerbations that can be severe or even life-threatening.⁽¹⁾ Other factors that support the diagnosis of asthma are respiratory symptoms that worsen at night or on waking.⁽²⁾ In addition to the characteristic clinical presentation, patients with asthma often have a personal history of atopic dermatitis, or allergic rhinitis, and/or a family history of allergic diseases.

The diagnosis is established by identifying the clinical pattern of respiratory symptoms associated with variable expiratory airflow limitation, confirmed by expiratory airflow limitation through spirometry, showing reduced FEV₁ and/or FEV₁/FVC ratio (< 0,9 in children), and excessive variability in lung function, usually demonstrated by positive bronchodilator responsiveness (increase in FEV₁ from baseline by > 12% of predicted values).⁽²⁾

DIFFERENTIAL DIAGNOSIS

The most common differential diagnoses and their distinguishing symptoms from asthma in children are as follows: cystic fibrosis⁽³⁾ (clubbing, family history of cystic fibrosis, gastrointestinal symptoms); primary ciliary dyskinesia (symptoms present from birth, persistent cough, chronic nasal symptoms); bronchiectasis^(4,5) (persistent productive cough, finger clubbing); structural abnormality⁽⁵⁾ (no variation in wheezing); and vocal cord dysfunction⁽⁵⁾ (stridor, exercise-induced respiratory noise).

MANAGEMENT OF SEVERE EXACERBATIONS

Severe exacerbations represent an acute or subacute worsening of symptoms and lung function from the patient's usual status, or, in some cases, a patient may present them for the first time during an exacerbation. The aim of this management is to relieve bronchial airflow obstruction and hypoxemia rapidly, address the underlying inflammatory pathophysiology, and prevent relapse. The following procedures should be followed in all ER settings⁽¹⁾:

- Evaluate the severity of exacerbation based on dyspnea, respiratory rate, and oxygen saturation; initiate treatment with short-acting β_2 agonist (SABA) and oxygen therapy; and adhere to infection control measures.⁽¹⁾
- Administrate SABA repeatedly; for most patients, by pressurized metered-dose inhaler and spacer. The patient should be monitored regarding clinical response and oxygen saturation after 1 h.
- Prescribe systemic corticosteroids in severe exacerbations. Intravenous magnesium sulfate should be considered for patients with severe exacerbations unresponsive to initial treatment.⁽¹⁾
- If there are signs of severe exacerbation, or if the patient exhibits drowsiness, confusion, or a silent chest, promptly transfer him/her to an acute care facility or to an ICU. During the transportation, use inhaled SABA and ipratropium bromide, oxygen therapy, and systemic corticosteroids.⁽¹⁾

Evidence does not support the routine use of antibiotics in the treatment of acute asthma exacerbations unless there is evidence of bacterial lung infection (e.g. high and persistent fever or radiologic evidence of bacterial pneumonia).⁽¹⁾ Similarly, routine chest X-ray is not recommended unless there are physical signs suggestive of pneumothorax, bacterial pneumonia, or inhaled foreign body.⁽³⁾

MAINTENANCE THERAPIES

The main objectives of maintenance therapy are to control daily symptoms in order to minimize the risk of exacerbations and improve lung function. The evaluation of these issues must be made objectively and periodically, using clinical tools such as the GINA asthma control questionnaire or the asthma control test, which evaluates asthma control retrospectively within

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AGE	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
<6 years	Consider intermittent or daily low dose ics	Daily low dose ICS	Double “low dose” ICS	Continue controller and refer for specialist assessment	
6-11 years	Low dose ics whenever saba taken	Daily low dose inhaled ICS	Low dose ics-Laba, or medium dose ics, or very low dose ICS-formoterol mart	Medium dose ICS-laba, or low dose ICS-formoterol mart. Refer for expert advice	Refer for phenotypic Assessment ± higher dose ics-laba or add-on therapy, e.g. Anti-IgE, anti-IL4Ra, anti-IL-5
>12 years	As-needed-only low dose ICS-formoterol		Low dose maintenance ICS-formoterol	Medium dose Maintenance ICS-Formoterol	Add-on lama. refer for Assessment of phenotype. Consider high dose Maintenance ICS-LABA ± Anti-IgE, anti-IL4Ra, anti-IL-5

Managing exacerbations (Children and Adults)

Inhaled albuterol is the usual bronchodilator for acute asthma management. For mild to moderate exacerbations, repeated administration of inhaled SABA (4-10 puffs every 20 minutes for the first hour) help to achieve rapid reversal of airflow limitation. After the first hour, the dose of SABA required varies from 4-10 puffs every 3-4 hours up to 6-10 puffs every 1-2 hours, or more often.

Figure 1. Summary framework for asthma maintenance treatment, separated by age and steps, followed by a summary of exacerbation management. ICS: inhaled corticosteroids; SABA: short-acting β₂ agonist; LABA: long-acting β₂ agonist; and LAMA: long-acting muscarinic antagonist. Based on Carvalho-Pinto et al.⁽⁷⁾

four weeks, in every clinical visit, and assessing lung function once or twice a year.^(6,7) Maintenance therapies follow national and international recommendations based on steps (Figure 1) as follows:

- For children aged 6 years and younger, those who do not have frequent asthma symptoms that justify the use of a daily controller often fall into step 1. From step 2 onward, the use of inhaled corticosteroids (ICS) is recommended, and the ICS dose increases as steps move up. In step 4, a specialist evaluation becomes necessary.⁽⁴⁾
- For children aged 6-11, the preferred treatment in step 1 consists of using intermittent low-dose ICS whenever SABA is administered. In step 2, the patient requires low-dose ICS on a daily basis. In step 3, the preferred treatment is low-dose ICS + long-acting β₂ agonist (LABA), with medium-dose ICS as an alternative therapy. In step 4, medium-dose ICS + LABA is the preferred choice, followed by referral to a specialist. Also, a long-acting muscarinic antagonist (LAMA) may be used as add-on therapy for patients in step 4. In step 5, the patient requires higher doses of ICS + LABA or a third add-on medication, requiring the evaluation by a specialist. Biologics such as anti-IgE (omalizumab), anti-IL4R (dupilumab), and anti-IL-5 (mepolizumab) may be used in patients with severe asthma.
- For patients aged 12 years and older, the preferred treatment in steps 1 and 2 consists of using intermittent low-dose ICS + formoterol as required. In step 3, low-dose maintenance with ICS + formoterol on a daily basis is the preferred choice. In step 4, medium-dose ICS + formoterol is the preferred treatment. In step 5, add-on LAMA therapy and refer the patient for assessment of clinical phenotype, considering high-dose maintenance ICS + LABA with/without

anti-IgE, anti-IL4R, anti-IL-5, and anti-TLSP (tezepelumab).⁽¹⁾ Low-dose oral corticosteroid may be considered in patients with difficult access to biologics, and so are macrolides for patients with T2-low phenotypes.

When considering withdrawal of treatment or stepping down, it is advisable to do that when both asthma symptoms and lung function have remained stable for at least three months.⁽⁴⁾ Furthermore, education of patients is one of the cornerstones of asthma treatment, involving correct use of inhaled medications, adherence to treatment, recognition of alarm signs, and lifestyle modifications. It is essential to provide training on the inhalation technique to the patient and their family members, and the technique should be reviewed at all medical appointments.⁽³⁾

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CONFLICTS OF INTEREST

None declared

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