

# Treating childhood asthma

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## Introduction

Asthma is the most common chronic disease of South African children, affecting 10-20% of the population. It is sometimes difficult to diagnose. Where uncertainty exists, it may be more beneficial to treat the child as asthmatic, and then wean him or her off the medication later once it is under control, than neglect to administer the correct therapy to a true asthmatic. The treatment of asthma is often problematic, not because of lack of access to appropriate medication, but because of the central role played by additional factors, such as patient adherence and administration of medication technique.

It is always necessary to treat the child as an individual, but some measures apply in all cases. It is important to allay anxiety about the diagnosis. This is best done by carefully explaining the nature and causes of asthma, what to do if an attack occurs, why medicines are prescribed, and how they are given. Patients must be able to understand the difference between controller and reliever therapy. The importance of regularly using controller medication needs to be emphasised.

Time spent on the initial explanation and educating the parents and the child is always well rewarded by the response to treatment. Regular follow-up of these children, preferably by the same doctor, is very important.

## Environmental measures

It is insufficient to rely on medication alone to control the child's symptoms. Parents who smoke should be advised to stop smoking altogether. It is not sufficient for parents to avoid smoking in the presence of their child. Chemicals and odours are transferred to children on the clothes of their parents, and smokers have increased carriage of respiratory pathogens, and may infect their own children.

A typical history of symptoms at particular times of day (night-time for dust mite-sensitive patients), seasonally

(grass or tree allergic patients), or upon exposure to allergenic triggers (e.g. pets and freshly mown lawn), along with appropriate testing for allergic sensitisation, will identify the triggers of an individual's asthma. House dust mite-allergic patients should prepare a dust-free environment in the child's bedroom by changing furnishings and covering bedding with house dust mite impermeable coverings.

## Drug treatment

### Bronchodilators or "relievers"

These include short-acting  $\beta_2$ -agonists, salbutamol and fenoterol. The long-acting  $\beta_2$ -agonists, salmeterol and formoterol, should never be used as monotherapy, and are used as controller medication, despite their maximal effect being bronchodilation. Other bronchodilators that can be used are the anticholinergic, ipratropium, and the theophyllines. Theophyllines are inexpensive oral bronchodilators, but have fallen out of favour because of their unpleasant side-effects, and the need to monitor therapeutic levels. All patients are prescribed a reliever medication to use as required for exacerbations. An increased frequency of use of reliever medication reflects poor control, and is an indication that regular controller therapy needs to be increased.

### Anti-inflammatory drugs or "controllers"

Controller therapy is recommended for all patients with persistent asthma. Corticosteroids are the most effective controller therapy for asthma, and are usually administered by inhalation. The use of inhaled corticosteroids has significantly reduced admissions to hospital and deaths in children with episodes of acute severe asthma. Leukotriene receptor antagonists, e.g. montelukast, also have anti-inflammatory effects via different pathways to inhaled corticosteroids (ICS). Long acting  $\beta_2$ -agonists have weak anti-inflammatory effects, but are synergistic with inhaled corticosteroids. They are never used as monotherapy,

only as co-therapy with inhaled corticosteroids, and only in children older than five years of age. Combinations of inhaled corticosteroids and long-acting  $\beta_2$ -agonists are now available which simplify the administration of regular anti-inflammatory therapy in children with asthma.

## Drug administration

### Inhalation

This route delivers the drug directly to the airways, allowing for a smaller dose than that of the oral drug and reduces side-effects.

### Metered dose inhalers

Metered dose inhalers (MDIs) are small aerosol devices. They are an effective and convenient way of administering many asthma drugs. A spacer device is essential for young children who would have difficulty using the MDI without it. Spacers increase drug deposition in the lungs, and also reduce local adverse effects from inhaled corticosteroids. As commercially produced spacers are often unavailable or unaffordable in many parts of this country, home-made spacer devices using a 500 ml plastic cold-drink bottle are a very useful and effective alternative (Figure 1). The plastic bottles can be modified to function as a spacer by melting a hole in the base of the bottle to fit the MDI. This is done by heating a wire mould of the same shape and size as the mouthpiece of the MDI in an open flame, and applying it to the centre of the base of the bottle. The mouthpiece of the MDI is inserted immediately after removal of the mould while still warm, so creating a tight fit. The spacer should be washed in detergent and air-dried or primed with 10-15 puffs of the MDI aerosol prior to use, to reduce electrostatic charges. For young children and infants who are unable to hold a bottle in their mouths, a face mask can be attached to the neck of the bottle.



Figure 1: Homemade plastic bottle spacer

### Dry-powder inhalers

Virtually all forms of inhaled asthma medication are available in dry powder inhaler form. These inhalers are simple devices that can be successfully used in some children from about six years of age.

### Nebulisers

Solutions for nebulisation are available for use in acute asthma attacks. However, an equivalent or superior effect can be achieved with 10 doses of salbutamol 100  $\mu$ g via a metered dose inhaler and spacer (1 mg) as one dose of salbutamol via a nebuliser (2.5 mg). Solutions administered by a nebuliser are driven by oxygen in hospitals or clinics. However, home nebulisers are electrically driven and do not provide oxygen, which is a serious limitation to their use, and they are usually not recommended. Home nebulisers may give patients a false sense of security, and parents should be aware that they must seek immediate medical care should their child's acute asthma episode not respond to a single nebulisation of bronchodilator medication.

### Oral asthma medication

The oral route is used when administration by inhalation is not possible. Systemic side-effects occur more frequently when asthma medications are given orally. Oral preparations that can be taken include  $\beta_2$ -agonists, corticosteroids, and theophyllines. The leukotriene receptor antagonist, montelukast, has few, if any side-effects, and is available in sprinkle, chewable, and tablet forms, making for easy administration in infants and children of all ages.

Assessment of severity is used as a starting point to assign a child to a particular treatment group. Intermittent asthma requires only reliever therapy and environmental control, whereas persistent asthma requires regular controller therapy (Table I and Table II). Patients with mild-persistent asthma are commenced on Level 1 therapy, moderate-persistent on Level 2 therapy, and severe-persistent on Level 3 therapy.

## Follow-up and assessment of control

Aims of the treatment are to:

- Enable the child to lead a normal life.
- Grow and develop normally.
- Attend school regularly.
- Sleep well at night.
- Participate in sport and activities.
- Stay out of hospital.

Re-evaluation after commencement of regular therapy is necessary within six weeks. Persistence of symptoms, particularly nocturnal cough and exercise-induced symptoms, may indicate inadequate control in treated asthmatics.

**Table I: Controller therapy for persistent asthma in children**

	Level 1	Level 2	Level 3
Children > 5 years	Low-dose ICS <sup>a</sup> twice daily	Medium-dose ICS	High-dose inhaled corticosteroid
	or	or	or
	Oral LTRA <sup>b</sup>	Low-dose ICS with inhaled LABA <sup>c</sup>	Medium-dose ICS with LABA
		or	or
		Low-dose ICS with oral LTRA	Medium-dose ICS with oral LTRA
Children ≤ 5 years	Low-dose ICS twice daily	Medium-dose ICS	Medium-ICS with oral LTRA
	or	or	
	LTRA	Low-dose ICS with oral LTRA	

a = inhaled corticosteroid, b = leukotriene receptor antagonist, c = long-acting  $\beta_2$ -agonist

**Table II: Low, medium and high inhaled corticosteroid doses in controller therapy in children**

Drug	Low daily dose ( $\mu$ g)	Medium daily dose ( $\mu$ g)	High daily dose ( $\mu$ g)
Beclomethasone dipropionate	100-200	200-400	> 400
Budesonide	100-200	200-400	> 400
Ciclesonide	80-160	160-320	> 320
Fluticasone	100-250	250-500	500

Assessment of control includes asking routine follow-up questions:

- In the last week, how often have you experienced asthma symptoms?
- In the last week, how often have you been woken at night because of asthma symptoms?
- In the last week, how often have asthma symptoms limited your ability to be active?
- In the last week, how many puffs of reliever medicine have you used?
- In the last month, have you missed any days of school/work because of asthma?

Similar to the assessment of initial severity, assessment of control depends on the frequency of symptoms and measures of lung function, but the need for reliever therapy also indicates poor control (Table III). A patient must be assigned to the most severe grade in which any feature occurs. Where asthma is uncontrolled, initial concerns must be with adherence and medication administration technique, or the presence of unaddressed triggers or comorbid conditions. If this is thought to be the reason for poor control, medication should be left unchanged, but

adherence and technique improved through education and repeated demonstration.

Where asthma is uncontrolled despite good adherence and technique, treatment may be increased by one step. If the asthma is under control for at least three months, consider reducing the therapy. Apply extra cautious when reducing therapy (even if good control is achieved) in children who have experienced previous life-threatening asthma, or who have concomitant severe food allergies /anaphylaxis due to the increased risks of severe asthma in these children.

**Table III: Levels of asthma control [Global Initiative for Asthma (GINA), 2007]**

Characteristics	Controlled (All of the following)	Partly controlled (Any measure present in any week)	Uncontrolled ( $\geq$ 3 features of partly controlled in any week)
Daytime symptoms: wheezing, cough, difficult breathing	< 2/week	> 2/week	> 2/week
Limitation of activities	None	Any	Any
Nocturnal symptoms/awakening	None	Any	Any
Need for reliever/rescue treatment	< 2/week	> 2/week	> 2/week
Lung function <sup>a</sup> (PEF/FEV1) <sup>b</sup> predicted or personal best (if known)	Normal	< 80%	< 80%

a = Applicable to children older than five years, b = peak expiratory flow rate/forced expiratory volume in one second

## Referral

Children with intermittent asthma and those controlled on Level 1 therapy should be treated in primary care. Children on Level 3 treatment and those under the age of two should be considered for assessment by a paediatric allergist or pulmonologist. Other indications for referral are when the diagnosis is in doubt, multiple severe concomitant allergic diseases exist, the asthma is difficult to control, or where a patient experiences life-threatening asthma, or has frequent attacks, or requires regular oral steroids, or when immunotherapy is being considered.

The National Asthma Education programme ([www.asthma.co.za](http://www.asthma.co.za)) provides free patient and doctor educational materials, and runs an asthma certificate course to teach doctors and nurses how to assess asthma, and to educate patients about how to use their medication to achieve optimum asthma control.