



Indian Medical Association

Recommendations on
Management of **Asthma**
in **Primary Care (2020)**

Message from National President



Dear Colleagues,

We at Indian Medical Association (National Voluntary Organization of Doctors of Modern Scientific System of Medicine) look after the interest of doctors as well as well-being of the community at large.

Our objective is to promote and advance medical and allied sciences in all their different branches and to promote the improvement of public health and medical education in India. Hence, Indian Medical Association (IMA) took the step to develop recommendations based on thorough literature review and robust evidence for assisting general practitioners (GPs) to perform accurate diagnosis and appropriate management of asthma in India. A group meeting was conducted between GPs, chest physicians and pediatricians, where important issues related to asthma diagnosis and management were discussed.

I feel immense pleasure to announce that the final recommendations from the meeting have been derived and are published for access to all.

I thank all the experts for their participation to develop these recommendations so that they can be utilized by GPs for diagnosis and management of asthma effectively in the Indian scenario.

A handwritten signature in black ink that reads "Rajan Sharma". The signature is written in a cursive style.

Dr. Rajan Sharma

National President, IMA



Preface

Despite an ever-increasing prevalence of asthma across all age groups, this condition remains poorly managed in India.^{1,2} Majority of Indian patients remain undiagnosed or wrongly diagnosed in general clinical practice and even those who get diagnosed, remain poorly or inadequately treated. General practitioners (GPs) are considered to be the first point of contact in routine clinical practice. Thus, providing adequate information on asthma diagnosis and its effective management to GPs is the need of the hour. Communication skills are an integral part of effective asthma management as majority of Indian patients have varied myths and misbeliefs associated with the condition.² Thus, there is a clear and urgent need of enhancing communication skills of Indian GPs to deliver convincing replies to patients' concerns.³ On the other hand, majority of Indian patients with asthma continue to be on oral drugs rather than inhalation therapy. Moreover, many patients cannot use their inhaler device correctly.²

To overcome these clinical challenges, the Indian Medical Association (IMA) took a lead in bringing about the transformation in the way asthma is managed in Indian scenario. Hence, a first step was taken to develop recommendations for assisting GPs to perform accurate diagnosis and appropriate management of asthma in India. This was achieved by having a group meeting between general physicians having clinical experience in managing patients with asthma along with chest physicians and pediatricians. With reference to Indian patients, important questions related to asthma diagnosis and its management were discussed and the final recommendation decisions were derived from the joint group discussion.

Experts at the Group Meeting

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Key Highlights

- Disparity exists between the perception of an Indian patient with asthma and the objective criteria in asthma control.
- Presence of characteristic symptoms and their pattern, along with findings on physical examination, is sufficient to suspect asthma.
- Asthma is a clinical diagnosis; however, in cases where dilemma exists refer to an expert. In clinical practice for GPs, peak expiratory flow (PEF) can be a good indicator for asthma diagnosis if it shows reversibility on bronchodilator medication.
- Asthma diagnosis in young children is mainly based on recurrent symptom patterns plus assessment of family history plus physical findings plus differential diagnostic possibilities.
- Asthma medications in inhaled form should be considered as compared to systemic formulations (oral/IV) to improve clinical outcomes in asthma.
- Inhaled medicines work fast to improve the symptoms and outcomes. Inhaled route is safer as compared to oral or IV route.
- ICS-containing controller treatment should be initiated immediately as needed (in mild asthma) or daily, to reduce the risk of serious exacerbations and to control the symptoms.
- Lung function tests play a crucial role in evaluating asthma control and should be assessed at diagnosis, start of treatment, post 3-6 months of controller treatment and periodically thereafter.

Introduction

Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms (shortness of breath, wheeze, cough and chest tightness) that vary over time and in intensity, together with variable expiratory airflow limitation.¹ It is a potentially serious disorder that affects people of all ages and imposes an immense burden on patients, their families and the community.² Asthma is one of the most common chronic condition encountered in children, thus it is crucial for GPs to suspect asthma in early childhood if patients have history and clinical presentation. In childhood, allergic rhinitis is the forerunner of asthma; hence, if children have frequent cough and cold then it increases the suspicion to diagnose asthma and GPs need to be more clinically vigilant.

There is a tremendous burden of asthma, with > 300 million people currently suffering from asthma worldwide.² The largest Indian INSEARCH study

“Asthma often starts in pediatric group hence the GP has to be clinically vigilant in this specific patient population.”

conducted on 85,105 men and 84,470 women in India estimated the prevalence to be 2% among those aged > 15 years, in addition, with an estimated national burden of 18 million patients with asthma. According to WHO, India has the largest number of asthma deaths in the world, contributing to 22.3% of all global asthma deaths. Likewise, Indian patients with asthma have a high frequency of reported exacerbations (67%), resulting in substantial functional and emotional limitations. In the biggest Indian AP-AIM survey analysis using GINA guidelines, none (0%) of the Indian patients had controlled asthma and 40% patients had

“Poor asthma control due to inadequate treatment is still a major issue in India.”

uncontrolled asthma. On the other hand, 29% and 60% patients in the survey perceived that their asthma was well controlled and reasonably controlled, respectively. This reflects the poor asthma control and inadequate treatment attributed to clinical gaps between evidence-based recommendations and practice, particularly in primary care, where majority of patients with asthma are seen.³



Natural History of Asthma

The GP who treat patients with asthma should be well aware that considerable variability exists in the course of the disease. Most infants wheeze with viral infections and many would lose this tendency to wheeze over next 3-6 years. This possibility is higher if the episodes are mild and infrequent. However, if they are more frequent and severe, the asthma is likely to continue into school years, although this is not a rule. Some of the patients with asthma seem to recover completely while some have long remissions with occasional mild relapses, while some get worse and develop irreversible airway obstruction.^{4,5} Likewise, adult-onset asthma or late-onset asthma is considered when asthma symptoms represent for the first-time during adulthood. However,

“Asthma that starts in childhood has a high probability of continuing into adulthood but can be controlled by proper management.”

little is known of the natural history of adult-onset asthma.⁶ Although asthma cannot be ‘cured’, clinical episodes can largely be prevented and controlled by proper management. Likewise, allergic rhinitis and skin allergy may coexist with or before the onset of asthma.^{4,5}

Risk Factors

The exact cause of asthma is unknown; but it could be partly genetic or environmental in origin. There are some major factors which are important either to cause or to produce its clinical manifestations (or both) (Figure 1).^{5,7,8}

Triggers

A trigger is defined as a factor or an exposure which elicits an exacerbation in a stable or previously asymptomatic patient of asthma.⁵ Several major factors have been known to precipitate asthma (Figure 2). Although food is often regarded as a common trigger for asthma, they are predominantly not responsible for exacerbation of asthma episodes.^{5,7,8}

Diagnosis of Asthma in Adults, Adolescents and Children Aged > 5 Years

Accurate diagnosis of asthma is the first crucial step in achieving disease control. However, due to its myriad clinical presentations, there is no single clinical rule to make a positive diagnosis in a patient

Figure 1: Major risk factors of asthma

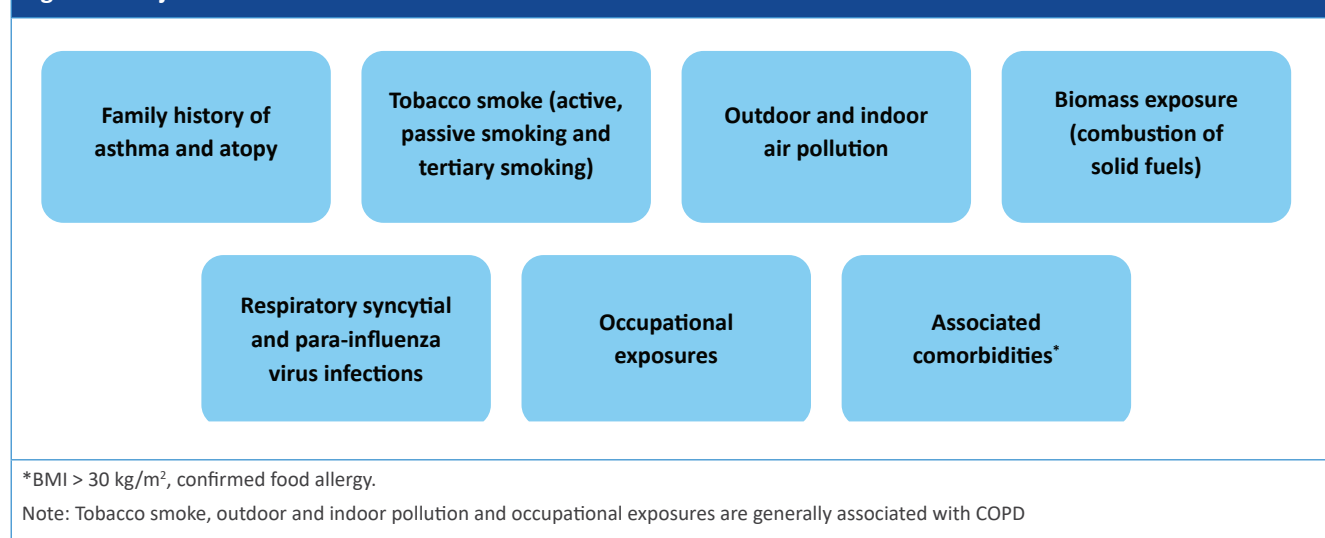
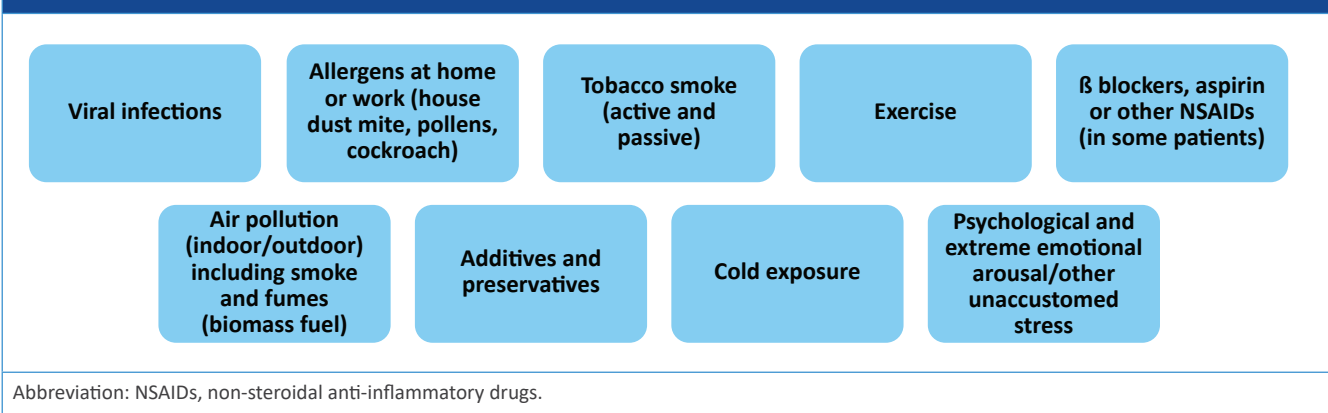




Figure 2: Major asthma triggers



Abbreviation: NSAIDs, non-steroidal anti-inflammatory drugs.

“The diagnosis of asthma is a clinical one.”

suspected to have asthma. A combination of data collected from clinical and laboratory investigations is vital to make a diagnosis. Nonetheless, **in most instances a detailed clinical history and vigilant physical examination should enable the doctor to achieve accurate diagnosis.**⁵ Making an accurate diagnosis of asthma includes identification of both a characteristic pattern of respiratory symptoms (breathlessness, wheeze, cough and chest tightness) and variable expiratory airflow limitation measured on peak expiratory flow meter or spirometry (Table 1). This variable expiratory airflow limitation clinically represents the excessive variation in lung function

that is greater than observed in healthy individuals. Notably, greater variations or more occasions of excess variation observed in suspected patients aids in more confident diagnosis of asthma.⁷

While taking patient history, it is vital to make specific enquiries by asking key questions to the patients regarding the presence of other symptoms that are helpful in ruling out other disorders (Table 2). The presence of fever, weight loss, haemoptysis, or chest pain in adults should alert the GP to an alternative or a coexisting disease (tuberculosis, lung cancer, bronchiectasis, chronic obstructive pulmonary disease (COPD), ischemic heart disease, left ventricular failure). **On the other hand, failure to thrive, presence of diarrhoea, or symptoms onset since birth in children, may be crucial**

Table 1: Diagnostic criteria for asthma in adults, adolescents, and children aged > 5 years

Diagnostic feature	Criteria of making diagnosis of asthma
1. History of variable respiratory symptoms	
Breathlessness, wheeze, cough and chest tightness (symptoms may vary by age, e.g. children may have heavy breathing)	<ul style="list-style-type: none"> • > 1 type of respiratory symptom (in adults, isolated cough is rare due to asthma) • Variable symptoms occur over time and in intensity • Symptoms often worse at night or on waking • Symptoms often triggered by exercise, laughter, allergens, cold air • Symptoms often appear or worsen with viral infections
2. Confirmed variable expiratory airflow limitation	
<ul style="list-style-type: none"> • At least once during the diagnostic process, when FEV1 is low, document that the FEV1/FVC ratio is below the lower limit of normal[†]. The FEV1/FVC ratio is normally more than 0.75–0.80 in adults, and more than 0.90 in children. • Document that variation in lung function is greater than in healthy people 	
[†] Using Global Lung Initiative multi-ethnic reference equations	

Table 2: Key questions to ask a patient to rule out disorders that mimic asthma

Do you have any family history of allergy/atopy?

Do you have any personal history of an atopic disorder (eczema or allergic rhinitis)?

In adults: Do you have fever/weight loss/hemoptysis/chest pain?

In children: Is there any failure to thrive/diarrhea/any symptoms onset since birth in your child?

in identifying coexisting or alternative conditions (parasitic infestations, congenital cardiopulmonary diseases or foreign body aspiration). However, patients presenting for first time with symptoms of cough and expectoration for > 2 weeks, should be evaluated for possible tuberculosis through three sputum smear examinations for the acid-fast bacilli.⁵

During physical examination, the most common abnormal finding on chest is presence of rhonchi (bilateral and diffuse) predominantly heard during expiration (but it may be absent at presentation so normal findings on chest examination does not exclude asthma). Generally, investigations are essential only if the diagnosis of asthma is doubtful or other conditions are suspected to complicate asthma. Notably, this implies a referral to a secondary health care level where the symptoms and signs should be reassessed.⁵

A wide spectrum of simple and clinically available investigations is sufficient to provide vital clues for diagnosing cardiopulmonary diseases other than asthma and other coexisting conditions in patients highly suspected to have asthma. During clinical investigations, a hemogram can detect anaemia as a cause for respiratory symptoms. It is vital to obtain a baseline chest radiograph. Transient radiographic abnormalities are sometimes detected in patients with asthma, however this investigation aids in diagnosing other pulmonary conditions like tuberculosis, bronchiectasis, lung cancer, interstitial or parenchymal lung disease. Likewise, an electrocardiogram aids in diagnosis of a cardiac disorder; whereas sputum should be examined for acid-fast bacilli.⁵

“Presence of characteristic symptoms and their pattern, along with findings on physical examination, is sufficient to suspect asthma.”

Although, asthma is a clinical diagnosis in routine practice, peak flow rate and spirometry can be helpful in confirming the diagnosis of asthma. In particular, the bronchodilator reversibility testing can be an important diagnostic aid. **For GPs, peak expiratory flow (PEF) done on PEF meter can be a good indicator for asthma diagnosis if it shows reversibility on bronchodilator medication. Bronchodilator reversibility is defined as an increase PEF of $\geq 20\%$ after bronchodilator administration with at least 60 L/min absolute increment.** If there is any ambiguity on diagnosis, refer to a specialist for spirometry and further evaluation. Forced expiratory volume in 1 second (FEV1) from spirometry should be considered more reliable than peak expiratory flow (PEF). However, if spirometry is not available, bronchodilator reversibility may be assessed with PEF meters.⁷

“Asthma is a clinical diagnosis; however, in cases where dilemma exists refer to an expert. In clinical practice for GPs, PEF can be a good indicator for asthma diagnosis if it shows reversibility on bronchodilator medication.”

The ‘red flags’ to look out for referral in adult patients with asthma include prominent systemic features (myalgia, fever, weight loss), unexpected clinical findings (e.g. crackles, clubbing, cyanosis, cardiac disease, monophonic wheeze or stridor), persistent non-variable breathlessness, chronic sputum production, unexplained restrictive spirometry, chest X-ray shadowing and marked blood eosinophilia.⁹ An algorithm is recommended for initial presentation for diagnosis of asthma in clinical practice (Figure 3).⁷

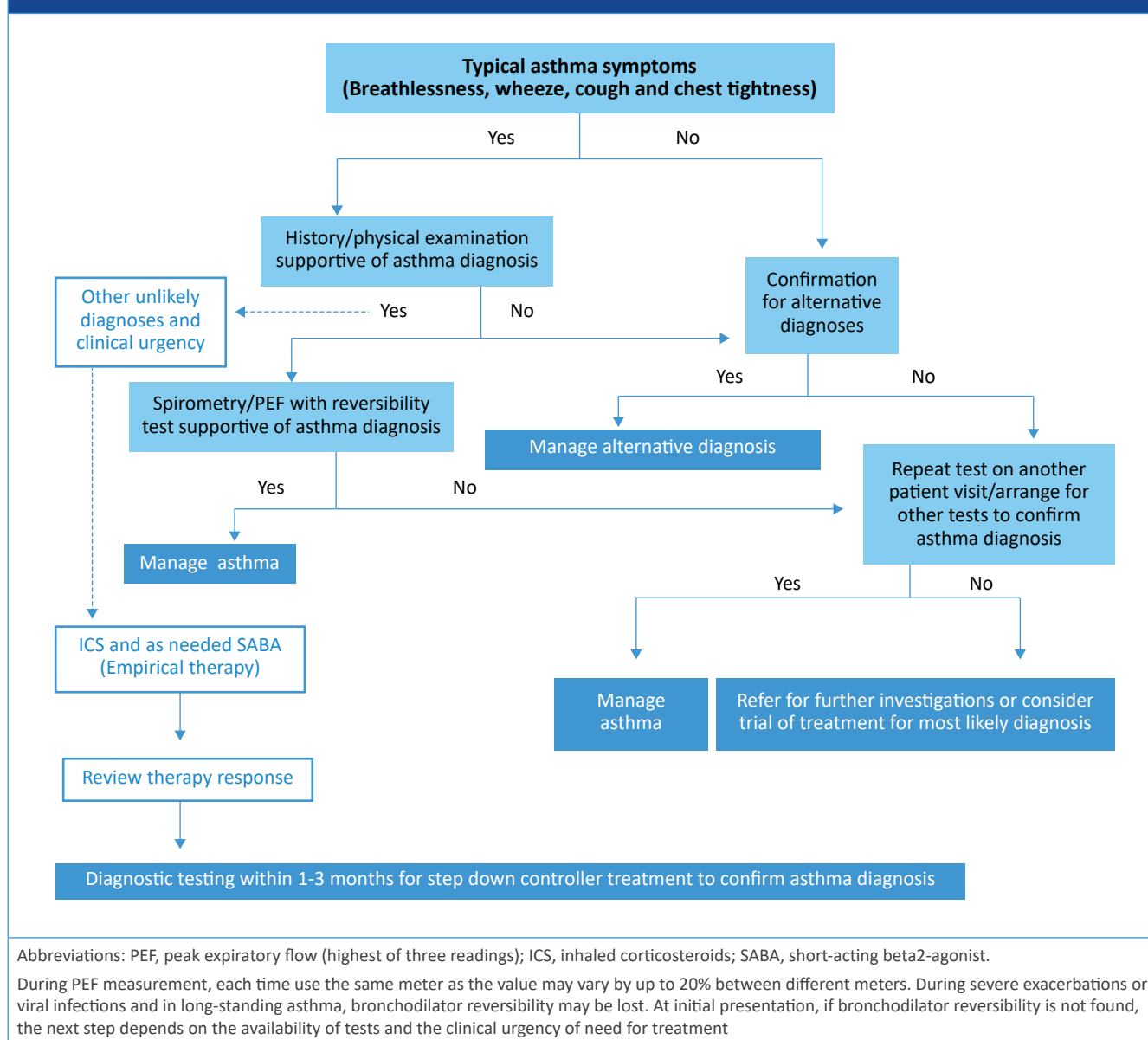
Due to an overlap of respiratory symptoms between various common pulmonary conditions, it may not always be possible to clearly diagnose asthma from other conditions mimicking asthma (Table 3).^{5,7} Any



Table 3: Differential diagnosis for asthma in adults

Diseases that mimic asthma	Differentiating features
COPD	Cough, sputum, dyspnoea on exertion, smoking or noxious exposure ⁷
GERD	Heartburn usually after eating and worst at night ⁷
Tuberculosis	Chronic cough, haemoptysis, dyspnoea; and/or fatigue, fever, (night) sweats, anorexia, weight loss ⁷
Bronchiectasis	Productive cough, recurrent infections ⁷
Cardiac failure	Dyspnoea with exertion, nocturnal symptoms, swelling (oedema) in legs, ankles and feet, rapid or irregular heartbeat ^{7,10}

Figure 3: Algorithm for initial presentation for diagnosis of asthma in clinical practice



of these alternative diagnoses may also be found together with asthma. COPD is a common condition that mimics asthma and may sometimes co-exist

with it. However, distinguishing asthma from COPD can be problematic, particularly in smokers and older adults (Table 4).⁷

Table 4: Distinguishing features between asthma and COPD

Feature	Asthma	COPD
Age of onset	Usually early childhood but may have onset at any age	Usually > 40 years
Pattern of respiratory symptoms	Symptoms vary over minutes, hours or days. Often triggered by exercise, emotions including laughter, dust or exposure to allergens	Persistent and progressive, particularly during exercise, with 'better' and 'worse' days
Lung function	Record of variable airflow limitation (spirometry, peak flow), normal between symptoms	Record of persistent airflow limitation (post BD FEV1/FVC < 0.7), abnormal between symptoms
Past history or family history	Allergies/personal history of asthma in childhood/family history of asthma/allergies	Exposure to noxious particles, tobacco smoking, biomass fuels and occupational hazards
Time course	Spontaneously improves with treatment, but may result in fixed airflow limitation	Progressively worsening even with treatment
Chest X-ray	Normal	Severe hyperinflation and other changes of COPD
Exacerbations	Risk of exacerbations can be reduced by treatment	Exacerbations can be reduced by treatment Comorbid conditions can lead to impairment
Airway inflammation	Eosinophils and/or neutrophils	Neutrophils ± eosinophils in sputum, lymphocytes in airways, may have systemic inflammation

Abbreviations: BD, bronchodilator; FEV1, forced expiratory volume during the first second; FVC, forced vital capacity.

Table 5: Differential diagnosis of asthma in children aged > 5 years

Diseases that mimic asthma	Differentiating features
Chronic upper airway cough syndrome	Sneezing, itching, blocked nose, throat-clearing
Inhaled foreign body	Sudden onset of symptoms, unilateral wheeze
Bronchiectasis	Recurrent infections, productive or wet cough
Congenital heart disease	Cardiac murmurs
Tuberculosis	Chronic cough, haemoptysis, dyspnoea; and/or fatigue, persistent fever, (night) sweats, anorexia, weight loss

In children aged > 5 years, the differential diagnosis in patients with respiratory symptoms is also different from that in older adults (Table 5). This is often accompanied by allergic rhinitis.⁷

Diagnosis of Asthma in Children Aged ≤ 5 Years

Making a confident diagnosis of asthma is challenging in children aged ≤ 5 years as common episodic respiratory symptoms such as wheezing and cough are

present even in children without asthma, especially at the age of ≤ 2 years. Moreover, it is impossible to routinely assess airflow limitation or bronchodilator responsiveness in this age group.⁷

“Making individual decisions for each child is vital, to avoid either over or under treatment.”

Based on the pattern of symptoms during and between viral respiratory infections, a probability-



Figure 4: Probability of asthma diagnosis in children aged ≤ 5 years

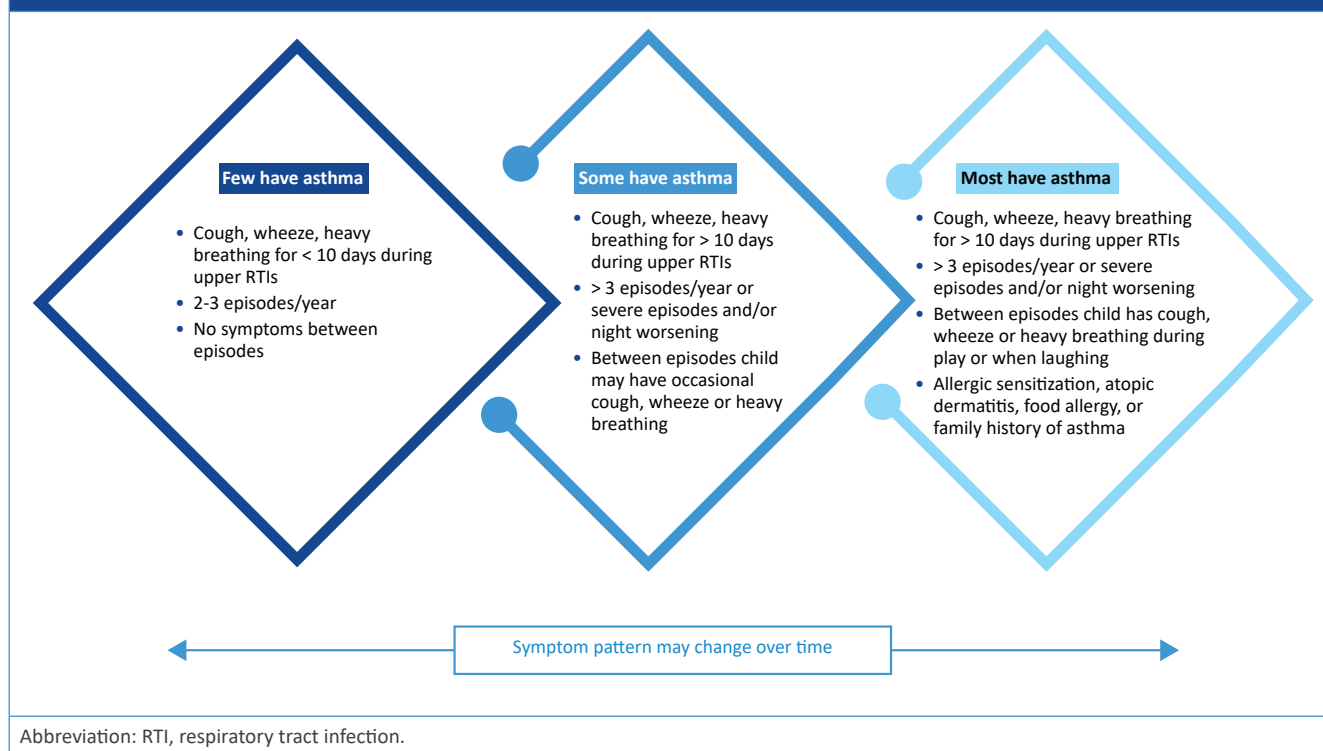


Table 6: Features suggesting a diagnosis of asthma in children aged ≤ 5 years

Feature	Characteristics suggesting asthma
Cough	<ul style="list-style-type: none"> • Recurrent/persistent cough worse at night or accompanied by some wheezing and breathing difficulties • Cough occurring with exercise, laughing, crying or tobacco smoke exposure, in the absence of an apparent respiratory infection
Wheezing	Recurrent wheezing (during sleep or with triggers such as activity, laughing, crying or exposure to tobacco smoke or air pollution)
Difficult/heavy breathing/shortness of breath	Occurring with exercise, laughing, or crying
Reduced activity	Not running, playing or laughing at the same intensity as other children; gets tired early during walks (wants to be carried)
Past or family history	Other allergic disease (atopic dermatitis or allergic rhinitis, food allergy). Asthma in first-degree relative(s)
Therapeutic trial with low dose ICS, and as-needed SABA	Clinical improvement during 2–3 months of controller treatment and worsening when treatment is stopped

based approach, may prove to be useful for discussion with parents/carers (Figure 4). Further, this will aid in making individual patient decisions about whether to prescribe a trial of controller treatment. In children aged ≤ 5 years, diagnosis can often be based on clinical features, risk factors, therapeutic response to controller therapy, exclusion of alternate diagnoses

“Asthma diagnosis in young children is mainly based on recurrent symptom patterns + assessment of family history + physical findings + differential diagnostic possibilities.”

and their characteristics suggestive of asthma (Table 6).⁷

A positive family history of allergic disorders, or the presence of atopy or allergic sensitization should provide additional predictive support. For instance, early allergic sensitization increases the likelihood of a wheezing child to develop persistent asthma.⁷

For children aged ≤ 5 years, no specific tests can confirm the diagnosis of asthma; but there are few useful adjuncts which are as follows:⁷

- **Therapeutic trial:** A therapeutic trial of asthma treatment (as needed short-acting beta2-agonist and regular low dose inhaled corticosteroids) may be indicated to provide some guidance about the diagnosis of asthma. Daytime and night-time symptom control, frequency of wheezing episodes and exacerbations should be evaluated

to determine the treatment response. However, a therapeutic trial may need to be repeated to confirm the diagnosis of asthma due to its variable nature in young children.

- **Chest X-ray:** A plain chest X-ray may help to exclude structural abnormalities (e.g. congenital lobar emphysema, vascular ring), if there is a doubt about the diagnosis of asthma in a wheezing or coughing child, chronic infections such as tuberculosis, an inhaled foreign body, or other diagnoses. Depending on the condition, other imaging investigations should be considered.
- **Lung function testing:** Spirometry has a limited role in diagnosis in this age group as most children aged ≤ 5 years are unable to perform reproducible expiratory manoeuvres.

The red flag signs for referral to a pediatrician of a child aged ≤ 5 years are mentioned in Table 7.

Table 7: Red flag signs in a child ≤ 5 years

• Neonatal or very early onset of symptoms (especially if associated with failure to thrive)
• Vomiting associated with respiratory symptoms
• Continuous wheezing
• Failure to respond to asthma medications (inhaled ICS, oral steroids or SABA)
• No association of symptoms with typical triggers, such as viral upper respiratory tract infections
• Focal lung or cardiovascular signs, or finger clubbing
• Hypoxemia outside context of viral illness and presence of associated stridor

Any of the below mentioned features suggest an alternative diagnosis and indicate the need for further investigations. In children aged < 5 years, it is particularly important to consider and exclude alternative causes that can lead to symptoms of wheeze, cough, and breathlessness before confirming an asthma diagnosis (Table 8).⁷

Table 8: Differential diagnosis of asthma in children aged ≤ 5 years

Diseases that mimic asthma	Differentiating features
Recurrent viral respiratory tract infections	Mainly cough, runny congested nose for < 10 days; no symptoms between infections, usually no rhonchi
GERD	Recurrent chest infections; vomits easily especially after large feeds, recurrent and severe symptoms in < 6 months of age
Foreign body aspiration	Choking when eating nuts etc, followed by cough, stridor or a persistent wheeze, focal lung signs. In young children there may not be a history or choking or aspiration, hence clinical suspicion is important
Tracheobronchomalacia and vascular airway compression	Persistent and severe symptoms in < 6 months of age; monophonic wheezing; poor response to medications
Cystic fibrosis	Early age of onset, persistent wet cough, recurrent LRTI, failure to thrive, bulky greasy stools



Management of Stable Asthma

Preferred Route of Administration in Stable Asthma

Currently, inhalation therapy represents the first line of choice for delivery of drugs to treat asthma than oral medications.^{3,5} However, a recent Indian AP-AIM survey conducted in 9 urban cities have reported that only 36% and 50% Indian patients with asthma used controller and rescue inhalers with a majority

“Inhaled route is safer as compared to oral or IV route.”

still preferring the oral route of asthma medication. Due to preference given to the oral route, this study reported worst clinical outcomes in asthma despite the fact that entire spectrum of highly effective inhaled medications is available at affordable cost.³ Hence, there should be good patient counselling by GPs to increase the use of inhalation therapy. GPs can play an important role by counselling and informing the patients the clinical benefits of inhaled route over oral route (Table 9).^{7,9,10}

“Asthma medications in inhaled form should be considered as compared to systemic formulations (oral/IV) to improve clinical outcomes in asthma.”

Table 9: Clinical benefits of inhaled route vs. oral/IV route in asthma

Inhaled route	Oral/IV route
<p>1 Rapid onset of action Directly delivers to the target organ (lung) → Rapid delivery of high pulmonary drug concentrations → High pulmonary efficacy</p>	Similar pulmonary efficacy compared with inhalation
<p>2 Less severe and less frequent systemic adverse effects Directly delivers to the target organ (lung) → Low systemic drug concentrations → Minimal systemic side-effects</p>	<p>Several independent studies demonstrate that short term or long-term administration of oral/IV drugs in asthma are associated with many ADRs in all age groups.</p> <ul style="list-style-type: none"> • Short-term use of oral/IV corticosteroids: Sleep disturbances, reflux, appetite increase, hyperglycaemia, mood changes • Long-term use of oral/IV corticosteroids: Infections, diabetes, osteoporosis, cataract, glaucoma, hypertension, adrenal suppression and psychiatric disorders • Long term use of oral leukotriene modifiers: Hyperactivity and abdominal pain¹¹
<p>3 Small inhaled doses required Lower inhaled doses → Therapeutically equivalent or even superior to higher doses of systemically administered therapy</p>	Large oral/IV doses required
<p>4 Convenient & patient friendly Painless and relatively comfortable</p>	IV route is painful

Preferred Device for Managing Stable Asthma

Inhalation devices used for the treatment of asthma are available as pressurized metered dose inhalers

(pMDI), dry powder inhalers (DPI) or as nebulising solutions.⁵ There are both advantages and limitations for each inhaled device (Table 10).¹¹ For pMDI, use of a spacer is recommended to improve hand-

Table 10: Advantages and limitations for inhaled devices

	pMDI	DPI
Advantages	<ul style="list-style-type: none"> • Portable and compact • Doesn't require a deep, fast, inhaled breath • Consistent dosing • Comparatively less expensive • Protected from moisture and pathogens • Spacer chamber improves drug delivery and circumvents need for coordination 	<ul style="list-style-type: none"> • Portable and compact • No need for inhalation actuation synchrony • Environment friendly (no propellants) • No need for spacer • Multiple drugs can be administered from the same device
Limitations	<ul style="list-style-type: none"> • Need for 'hand-mouth' coordination • High oropharyngeal deposition • Need of holding chamber in young children 	<ul style="list-style-type: none"> • Require deep, fast, inhaled breath • Requires frequent cleaning • All DPIs are potential vulnerable to humidity and moisture leading to clumping

Note: Nebulization should be used for emergency cases and in cases of acute exacerbation. Breath accentuated MDI can be considered as an option to MDI with spacer.

to-mouth coordination, reduce oropharyngeal deposition, improve pulmonary deposition, achieve desired clinical outcomes and decrease side-effects.⁵ Preferred device in children > 6 years remains as MDI with spacer, since it does not require a high inspiratory velocity, has the maximal drug deposition and lowest oropharyngeal deposition.

Preferred Route/Device in Infants & Children with Stable Asthma

Inhaled therapy constitutes the cornerstone of asthma treatment in children 5 years and younger. Inhaled medicines work fast to improve the symptoms and outcomes. A pressurized metered dose inhaler (pMDI) with a valved spacer (with or

“Inhaled medicines work fast to improve the symptoms and outcomes.”

without a face mask, depending on the child's age) is the preferred delivery system. The spacer device has been documented to show efficacy in young children.⁷

The use of nebulizers should be discouraged except in occasional episodes or in emergency cases where there is need to give oxygen.¹² The

controller treatment should never be initiated with nebulization.^{7,12} Nebulizers are discouraged due to many reasons. Nebulizers may not be ideal devices to generate a therapeutically effective aerosol from a drug formulation. Nebulizers should be discouraged as they are highly inefficient due to residual drug loss in the tubing and medication cup. Moreover, during nebulization because drug is provided throughout the respiratory cycle, significant loss occurs on exhalation.^{13,14}

pMDI with spacers are as effective as nebulizers for delivery of bronchodilators and are more advantageous in children as they have been shown to have less tachycardia. In some cases, the child might tolerate the inhaler with spacer and mask better.^{4,12}

Age wise selection of devices

There are many clinical and age-appropriate factors that GPs and other caregivers need to consider when choosing an appropriate inhalation device or strategy in children (Table 11).⁷

Asthma medications

The drugs available for management of asthma can be divided into two broad categories-controller medications and reliever medications.⁷



Table 11: Selection of inhalation devices based on age

Age Group	Preferred Choice	Alternative Choice
0–3 years	pMDI + spacer with face mask	Nebulizer with face mask
4–5 years	pMDI + spacer	pMDI + spacer with face mask
5 years and above	pMDI + spacer/DPI	Nebulizer

Table 12: Medication class, drug molecules, route, action and use of controller medications in asthma

Medication Class & Drug molecules	Route	Action & Use
Inhaled corticosteroids (ICS) Beclometasone, budesonide, ciclesonide, fluticasone propionate, fluticasone furoate, mometasone, triamcinolone	pMDIs or DPIs (Inhaled once or twice daily)	<ul style="list-style-type: none"> • Most effective anti-inflammatory medications for asthma • Reduce symptoms, increase lung function, reduce risk or exacerbations and asthma-related hospitalizations and death
ICS and long-acting beta2-agonist bronchodilator combinations (ICS-LABA) Beclomethasone formoterol, budesonide formoterol, fluticasone furoate-vilanterol, fluticasone propionate-formoterol, fluticasone propionate-salmeterol, and mometasone-formoterol	pMDIs or DPIs (Inhaled once or twice daily)	<ul style="list-style-type: none"> • When low dose of ICS alone fails to achieve good control, addition of LABA to ICS improves symptoms, lung function, reduces exacerbations than doubling ICS dose
Leukotriene modifiers Montelukast, pranlukast, zafirlukast, zileuton	Oral	<ul style="list-style-type: none"> • Used as an option for controller therapy, particularly in children • When used alone: Less effective than low dose ICS • When added to ICS: Less effective than ICS-LABA
Chromones Sodium cromoglycate and nedocromil sodium	pMDIs or DPIs	<ul style="list-style-type: none"> • Very limited role in long-term treatment of asthma • Weak anti-inflammatory effect, less effective than low-dose ICS • Requires meticulous inhaler maintenance

Abbreviations: ICS, inhaled corticosteroids; LABA, long-acting beta2-agonist; LTRA, leukotriene receptor antagonist.

Note: Pranlukast, zafirlukast, zileuton are not commonly available or used in India

- **Controller medications:** Controller medications are essential to be taken regularly (irrespective of symptoms) and are primarily meant to prevent and control symptoms, reduce airway inflammation and/or decrease the risk of exacerbations (Table 12). In mild asthma, controller treatment may be taken when symptoms occur and before exercise (e.g. as-needed low dose ICS-formoterol).⁷
- **Reliever medications:** Reliever medications (also known as rescue medications) are fast-acting

bronchodilators that are taken as and when needed to relieve the acute symptoms (Table 13). They provide as-needed breakthrough symptomatic relief during worsening of asthma or exacerbations (e.g. SABA). They are also recommended for short-term prevention of exercise-induced bronchoconstriction. Ideally, reducing the need for reliever treatment is considered to be an important goal in asthma management and a measure of the clinical success.⁷

Table 13: Medication class, drug molecules, route, action and use of reliever medications in asthma

Medication Class & Drug molecules	Route	Effects
Short-acting inhaled beta2-agonist bronchodilators (SABA) Salbutamol (albuterol), terbutaline	pMDIs, DPIs and, rarely, solution for nebulization or injection	<ul style="list-style-type: none"> Quick relief of symptoms and bronchoconstriction, acute exacerbations and for pretreatment of exercise-induced bronchoconstriction
Low-dose ICS-formoterol Beclomethasone formoterol or budesonide-formoterol	Inhaled	<ul style="list-style-type: none"> Reliever for patients prescribed as-needed controller therapy for mild asthma compared with SABA-only treatment Reliever for patients with moderate to severe asthma prescribed maintenance and reliever treatment, where it reduces the risk of exacerbations compared with using as needed SABA, with similar symptom control
Short-acting anticholinergics Ipratropium bromide, oxitropium bromide	pMDIs or DPIs	<ul style="list-style-type: none"> Long-term use: Ipratropium is a less effective reliever medication than SABAs Short-term use in acute asthma

Abbreviations: ICS, inhaled corticosteroids; SABA, short-acting beta2-agonist.

Table 14: Medication class, drug molecules, route, action and use of add on therapies in asthma

Medications	Route	Effects
Long-Acting anticholinergic Tiotropium, ≥ 6 years	MDI/DPI Inhaled twice daily	Add-on option at Step 4 or 5 for patients with a history of exacerbations despite ICS ± LABA
Anti Immunoglobulin E (Anti-IgE) Omalizumab, SC, ≥ 6 years	SC inj. once every 2/4 weeks	Add-on option for patients with severe allergic asthma uncontrolled on high dose ICS-LABA
Anti-Interleukin 5 (Anti-IL5) and Anti-interleukin-5 receptor (Anti-IL5R) Anti-IL5 mepolizumab [SC, ≥ 12 years] or reslizumab [IV, ≥ 18 years], or anti-IL-5 receptor benralizumab [SC, ≥ 12 years]	SC, IV	Add-on options for patients with severe eosinophilic asthma uncontrolled on high dose ICS-LABA
Anti-Interleukin-4 receptor (Anti-IL4R) Dupilumab, SC, ≥ 12 years	SC	In severe eosinophilic or type 2 asthma uncontrolled on high dose ICS-LABA, or requiring maintenance OCS
Systemic corticosteroids Prednisone, prednisolone, methylprednisolone, hydrocortisone	Oral, IV, Intramuscular	In severe acute exacerbations, oral preferred to IM/IV therapy for preventing relapse, tapering required if treatment given for > 2 weeks

Abbreviations: ICS, inhaled corticosteroids; LABA, long-acting beta2-agonist; IM, intramuscular; SC, subcutaneous; OCS, oral corticosteroids; IL, interleukin.

- Add-on (controller) therapies in severe asthma:**
 They are ideally considered for persistent symptoms and/or exacerbations despite optimized treatment with high dose controller medications (e.g. a high dose ICS and a LABA). Add-on therapies can also be considered as a treatment of modifiable risk factors (Table 14).⁷

needed (in mild asthma) or daily, to reduce their risk of serious exacerbations and to control symptoms. However, SABA inhaler therapy alone should be

“ICS-containing controller treatment should be initiated immediately as needed (in mild asthma) or daily, to reduce the risk of serious exacerbations and to control the symptoms.”

All adults and adolescents with asthma should receive ICS-containing controller treatment, either as-



discouraged for managing asthma in adults and adolescents for safety concerns. In mild asthma, daily low dose ICS is highly efficacious for reducing asthma symptoms and reducing the risk of asthma-related exacerbations, hospitalization and deaths. Moreover, treatment with as-needed low dose ICS-formoterol reduces the risk of severe exacerbations by about two-thirds compared with SABA-only treatment. In addition, low dose ICS-formoterol is non-inferior to daily low ICS dose in adults and adolescents with mild asthma.⁷

Starting treatment in stable asthma

ICS-containing treatment should be initiated after diagnosis. Managing stable asthma by starting with SABA-only treatment (without ICS) is not recommended especially in adults due to safety reasons. At all stages, it is recommended to give ICS with LABA bronchodilators (e.g. formoterol). Moreover, before starting initial controller treatment, it is crucial to record evidence for asthma diagnosis (if possible), document symptom control and risk factors and assess lung function. Always, the GP should train the patient to use the inhaler correctly, check their technique and finally schedule a patient follow-up visit. Likewise, after starting initial controller treatment it is vital to review response after 2-3 months, or according to clinical urgency.⁷

It is challenging to decide when a child aged ≤ 5 years should be initiated by controller treatment as

many young children wheeze with viral infections. Nevertheless, the frequency and severity of wheezing episodes and the temporal pattern of symptoms (only with viral colds or also in response to other triggers) should be ideally considered. Any given controller treatment should be viewed as a treatment trial, with follow up scheduled after 2-3 months to review the response since the symptoms pattern tends to change over time in children.⁷

Stepwise approach for adjusting asthma treatment in adults, adolescents, children aged 6–11 years and children ≤ 5 years⁷

Step 1 Recommendations are for patients with mild asthma and symptoms less than twice a month and no exacerbation risk factor.

Step 2 Recommendations are for patients with mild asthma with risk of exacerbations.

Step 3 Recommendations are for patients with moderate asthma which is uncontrolled on low dose ICS.

Step 4 Recommendations are for patients with severe asthma which is uncontrolled on low dose ICS-LABA despite good adherence and correct technique.

Step 5 Recommendations are for patients with severe asthma with uncontrolled symptoms and/or exacerbations despite being on step 4 treatment.

	Step 1	Step 2	Step 3	Step 4	Step 5
For adults and adolescents	<p>Preferred controller:</p> <ul style="list-style-type: none"> As needed low dose ICS + LABA <p>AND</p> <ul style="list-style-type: none"> Do not give SABA only as a treatment 	<p>Preferred controller:</p> <ul style="list-style-type: none"> Daily low dose of ICS + <p>OR</p> <ul style="list-style-type: none"> LTRA/As needed low dose ICS-LABA combination (data available with ICS-formoterol combination) 	<p>Preferred controller:</p> <ul style="list-style-type: none"> Daily low dose ICS-LABA <p>OR</p> <ul style="list-style-type: none"> Medium dose ICS <p>OR</p> <ul style="list-style-type: none"> Low dose ICS + LTRA 	<p>Preferred controller:</p> <ul style="list-style-type: none"> Daily medium dose ICS-LABA <p>OR</p> <ul style="list-style-type: none"> High dose ICS, add on tiotropium/add on LTRA 	<p>Preferred controller:</p> <ul style="list-style-type: none"> Daily high dose ICS-LABA +/- tiotropium <p>OR</p> <ul style="list-style-type: none"> Low dose oral corticosteroids (but consider side-effects)

	Step 1	Step 2	Step 3	Step 4	Step 5
For children aged 6-11 years	Preferred controller: <ul style="list-style-type: none"> As needed low dose ICS + SABA 	Preferred controller: <ul style="list-style-type: none"> Daily low dose of ICS OR <ul style="list-style-type: none"> Other less effective controller options for children include daily LTRA/taking low dose ICS whenever SABA is taken 	Preferred controller: <ul style="list-style-type: none"> Low dose ICS-LABA or medium dose ICS, which have similar benefits OR <ul style="list-style-type: none"> Low dose ICS + LTRA 	Preferred controller: <ul style="list-style-type: none"> Medium dose ICS-LABA Refer for expert evaluation 	Preferred controller: <ul style="list-style-type: none"> Refer for expert evaluation OR <ul style="list-style-type: none"> Add-on drugs: Tiotropium, Anti IgE, Omalizumab
In children ≤ 5 years	Preferred controller: <ul style="list-style-type: none"> As needed inhaled SABA 	Preferred controller: <ul style="list-style-type: none"> Regular daily low dose ICS OR <ul style="list-style-type: none"> Other controller options: LTRA/intermittent ICS 	Preferred controller: <ul style="list-style-type: none"> Double low dose ICS OR <ul style="list-style-type: none"> Other controller options: Low dose ICS + LTRA and consider referral to specialist 	Preferred controller: <ul style="list-style-type: none"> Continue controller and refer to specialist for assessment OR <ul style="list-style-type: none"> Add LTRA or increase ICS frequency or add intermittent ICS 	-

Note: As needed SABA as a preferred reliever treatment in steps 1, 2, 3, 4, 5 for adults, adolescents and children aged 6-11 years. As needed SABA as a preferred reliever treatment in steps 2, 3, 4 for children aged ≤ 5 years.

Abbreviations: ICS, inhaled corticosteroids; LABA, long-acting beta2-agonist; LTRA, leukotriene receptor antagonist; OCS, oral corticosteroids; SABA, short-acting beta2-agonist.

Asthma Assessment

Severity assessment in adults, adolescents, older children (> 5 years) and younger children (< 5 years)

Asthma severity is currently evaluated retrospectively from the level of treatment needed to achieve symptom control and for reduction in exacerbations. It can be evaluated once the patient with asthma has been on controller treatment for several months. If appropriate, treatment step down has been considered to find the patient's minimum effective

level of treatment. Asthma severity may change over months or years and can be assessed when the patient has been on regular controller treatment for several months (Table 15).⁷

Control assessment in adults, adolescents and children aged 6-11 Years

For assessing asthma control in adults, adolescents and children (6-11 years), a consensus-based symptom control tool is recommended (Table 16). Moreover, specific questions can be asked for assessing asthma symptom control in children aged 6-11 years (Table 17).⁷



Table 15: Types of asthma based on its severity

Asthma types	Definitions
Mild asthma	Well controlled with step 1 or step 2 treatment (with as-needed controller medication alone), or with low-intensity maintenance controller treatment (low dose ICS, leukotriene receptor antagonists/chromones)
Moderate asthma	Well controlled with step 3 treatment (low dose ICS-LABA)
Severe asthma	Requires step 4 or 5 treatment (high-dose ICS-LABA) to prevent it from becoming 'uncontrolled', or asthma that remains 'uncontrolled' despite this treatment. While many patients with uncontrolled asthma may be difficult to treat due to inadequate/inappropriate treatment, or persistent problems with adherence or comorbidities. According to European Respiratory Society/American Thoracic Society Task Force, severe asthma should be reserved for patients with refractory asthma in whom response to treatment of comorbidities is incomplete.

Table 16: Assessment of asthma control in adults, adolescents and children aged 6-11 years

In the past 4 weeks, did the patient have:	YES	NO
1. Daytime asthma symptoms for more than twice a week?		
2. Any activity limitation due to asthma?		
3. Reliever medication for more than twice a week?		
4. Any night waking due to asthma?		
Level of asthma symptom control		
Well controlled: None of above		
Partly controlled: 1-2 of above		
Uncontrolled: 3-4 of these		

Note: Watch inhaler techniques, assess adherence and side-effects. Assess for comorbidities (Rhinitis, rhinosinusitis, gastroesophageal reflux, obesity, obstructive sleep apnoea, depression and anxiety which contribute to symptoms and poor quality of life, and sometimes to poor asthma control).

Table 17: Specific questions for asthma symptom control in children aged 6-11 years

Day symptoms	How many times/week or day does the child experience cough, wheeze, dyspnea or heavy breathing? Are there any triggers for these symptoms? How are these triggers handled?
Night symptoms	Does the child experience cough, awakenings, tiredness during the daytime? (If cough is the only symptom, consider rhinitis or GERD)
Reliever use	How many times the child is given a reliever medication? (check date on inhaler or last prescription, differentiate between its pre-exercise usage and use for symptomatic relief)
Level of activity	Does the child participate in sports/hobbies/interests, at school and in their play time? How is the activity level of the child as compared to their friends or siblings? How many days is the child not able to attend the school? Try to obtain an accurate schedule of the child's day from the child.

Role of lung function tests in control assessment & monitoring

It is vital to assess lung function tests at diagnosis or start of treatment. Later on, the lung function tests should be performed after 3-6 months of controller

“Lung function tests play a crucial role in evaluating asthma control and should be assessed at diagnosis, start of treatment, post 3-6 months of controller treatment and periodically thereafter.”

treatment and periodically thereafter. Lung function is used for assessment of patient's personal best FEV1. Generally, in adult patients with asthma, lung function should be recorded at least every 1-2 years. However, lung function tests should be recorded more frequently in higher risk patients (with exacerbations and with risk of lung function decline).⁷

In children, the lung function tests should be recorded more frequently based on asthma severity and clinical course. However, spirometry results cannot be reliably obtained until the age of ≥ 5 years.⁷

Once the diagnosis of asthma is confirmed, short-term PEF monitoring is used to assess treatment response, to evaluate triggers and to establish a baseline for management action plans. On the other hand, long-term PEF monitoring is only recommended in severe asthma, or in patients with impaired perception of airflow limitation.⁷

Control assessment in children aged ≤ 5 years

While assessing asthma symptom control in children ≤ 5 years, it is crucial to define satisfactory symptom control on information derived from family members and carers. Based on current expert opinion, an assessment of asthma control in children ≤ 5 years has been recommended which includes symptom assessment; the child's level of activity and their need for reliever/rescue treatment and risk factors assessment for adverse outcomes (Table 18).⁷

Management of Non-Severe Exacerbations in Asthma (Adults, Adolescents, Children Aged 6-11 Years)

Exacerbations of asthma are episodes characterized by a progressive increase in respiratory symptoms and progressive decrease in lung function, i.e. they represent a change from the patient's usual status that is sufficient to require a change in treatment. However, exacerbations which do not fulfil the criteria for severe or life-threatening asthma are termed as 'non-severe' exacerbations. An algorithm is recommended for management of non-severe exacerbations in asthma (Figure 5).^{7,8}

Management of Asthma in Special Populations

- **Asthma in pregnancy:** During pregnancy, asthma control often changes. Asthma control is essential for the well-being of both the mother and the foetus. The advantages of actively treating asthma markedly outweigh any potential risks of usual controller and reliever medications for the baby and the mother.^{5,7}

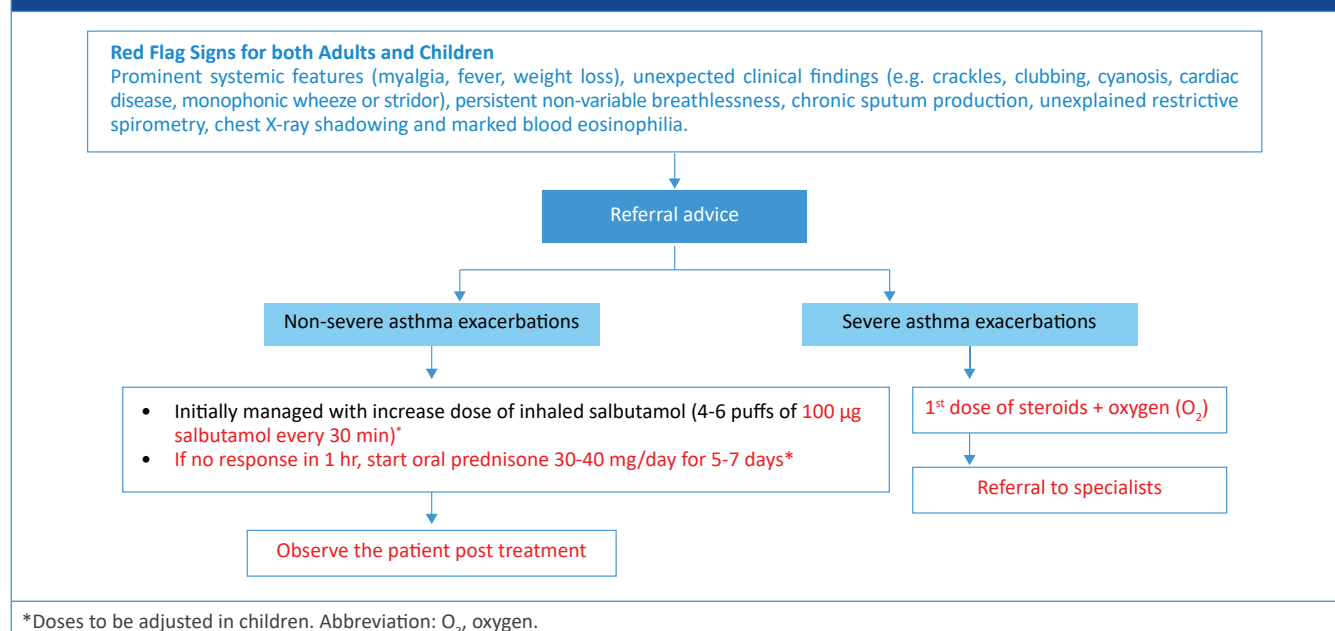
Table 18: Assessment of asthma symptom control in children ≤ 5 years

In the past 4 weeks, did the patient have:	YES	NO
1. Daytime asthma symptoms for more than few minutes/once a week?		
2. Any activity limitation due to asthma? (Runs/plays less than other children, tires easily during walks/playing?)		
3. Reliever medication for more than once a week?		
4. Any night waking/coughing due to asthma?		
Level of asthma symptom control		
Well controlled: None of above		
Partly controlled: 1-2 of above		
Uncontrolled: 3-4 of these		

Note: For achieving good asthma control, GPs should focus on correct use of inhaler techniques by the patients and educate them on medication adherence. Likewise, there is a need for assistant inhalation both in elderly and children.



Figure 5: Management algorithm of non-severe exacerbations in asthma



- **Asthma in surgery:** Whenever possible, good asthma control should be achieved preoperatively. Always ensure that controller therapy is maintained throughout the perioperative period.^{5,7}
- All patients with asthma should be further investigated for allergic rhinitis or polyps and managed appropriately.^{5,7}
- GERD is suspected in all patients with asthma and symptomatic patients should be given appropriate treatment.^{5,7}

Role of GP in Educating and Counselling Patient with Asthma

- Keep oneself continuously updated on asthma.^{5,7}
- Choose most appropriate device for patient before prescribing.^{5,7}
- Provide suitable information and training so that patient can adjust treatment according to the medication plan.^{5,7}
- Clarify queries during patient visits on a continual basis to improve compliance.^{5,7}
- Every patient should be trained in essential skills and guided in asthma self-management.^{5,7}

- Invest more time in educating and counselling patients.^{5,7}
- Share useful web links which act as a patient education resources with the patients:
 1. <https://foundation.chestnet.org/patient-education-resources/asthma/>
 2. <https://www.aafa.org/asthma.aspx>
 3. https://www.nhlbi.nih.gov/files/docs/public/lung/SoYouHaveAsthma_PRINT-reduced-filesize.pdf
 4. <https://ginasthma.org/gina-patient-guide-you-can-control-your-asthma/>

- Counsel patient for asthma even if the patient has visited the clinic for some other condition and provide vital information related to asthma.^{5,7}
- Check for drug compliance and patient adherence to asthma treatment.^{5,7}

Indications to Refer Patients with Asthma to a Specialist

- Failure to respond to treatment⁵
- In case of frequent exacerbations⁵
- When diagnosis is unclear⁵
- In comorbid conditions⁵

Annexure

GP Checklist for Educating & Counselling Patients with Asthma ^{5,7}		
Questions	YES	NO
1. Is the patient well informed about asthma?		
2. Has the patient been provided rationale for prescribed inhaled drugs?		
3. Has the patient been adequately trained for using proper inhaler technique?		
4. Has the patient been informed about the importance of usage of spacer for pMDI?		
5. Has the patient been provided enough information regarding importance of medication adherence?		
6. Has the patient been advised for lifestyle modification (i.e. quit smoking, encouragement of physical activity)?		
7. Has the patient been advised about preventive measures (i.e. avoidance of allergen exposure and air pollution)?		
8. Has the patient been provided training for self-monitoring of symptoms?		
9. Is further referral required for this patient?		

In addition to above

- Ask patient to keep an asthma diary if possible
- An asthma diary can help the patient to monitor their asthma. They can track their asthma symptoms, medication use, peak flow meter readings and asthma triggers
- Make sure that at each visit the patient comes with the inhaler device and demonstrates the technique, correct the technique if required
- Keep atleast pulse oximeter and peak flow meter in the clinic for early diagnosis and follow-up

Care to be Taken while Managing Asthma in Surgery^{5,7}

- Discuss patient's asthma treatment plan with the surgical team

- Take follow up from the surgical team post-surgery
- **In patients on long-term high dose ICS/>2 weeks' oral corticosteroids in past 6 months:** Intra-operative hydrocortisone to reduce risk of adrenal crisis
- **In minor surgery (without general anaesthesia):** No modification of treatment required
- **In major surgery:** Prior optimization of asthma control/lung function
- **If preoperative FEV1 <80% predicted:** Short course of oral steroid advisable
- **In patients with history of steroid use/acute severe asthma in previous six months with moderate/severe persistent asthma:** Systemic steroids usage is advisable



- **Recommended schedule:** Hydrocortisone 100 mg IV eight hourly and tapered after 24 hours of surgery

Drugs to Avoid in Pregnancy for Asthma^{5,7}

- LTRAs
- Systemic glucocorticoids, especially during the first and second trimesters
- Use prostaglandin F_{2α} with extreme caution in women with asthma because of the risk of inducing bronchoconstriction
- Theophylline (during pregnancy and lactation)

Drugs to Avoid in Hypertension and CVD while Managing Asthma^{5,7}

- Beta-blockers (even topical preparations)
- Angiotensin-converting enzyme inhibitors

- Theophylline along with macrolide and fluoroquinolone antibiotics (cytochrome enzyme inhibitors) as it leads to fatal cardiac arrhythmias
- Short acting beta-2 agonists and theophylline use in patients with coronary artery disease can be associated with arrhythmias and must be carefully used
- Aspirin can precipitate asthma attack

Advantages of Inhalation Therapy over Oral Medications^{7,15,16}

1. Rapid onset of action than oral medications
2. Direct delivery of the drug to the target organ (lung)
3. Less severe and less frequent systemic adverse effects
4. Smaller inhaled doses required than oral medications
5. Painless and relatively comfortable
6. Convenient & patient friendly

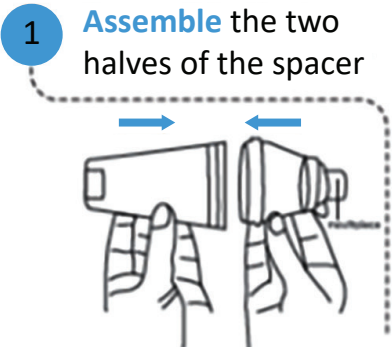
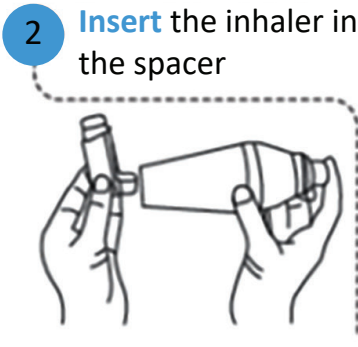
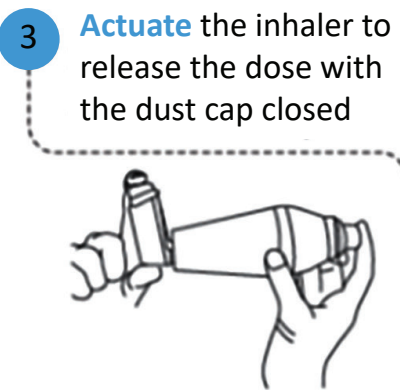
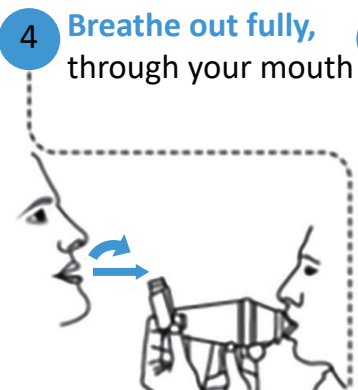

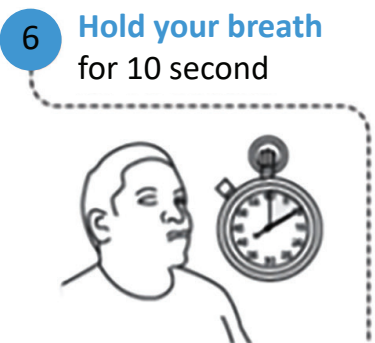

Simple Dos and Don'ts to Manage Asthma Better for the Patients¹⁷

Do's	Don'ts
<ul style="list-style-type: none"> • Be aware of your symptoms • Always keep your inhaler handy • Take adequate training for using proper inhaler technique • Use spacer so that medication reaches the lung easily • Always disassemble the spacer after use • Clean spacer before first use and then nearly once a month • Dismantle spacer and wash all parts in clean warm water with a mild detergent 	<ul style="list-style-type: none"> • Don't smoke • Don't be around dust and pollution • Don't stop exercising • Don't delay from getting immediate help during an asthma attack • Don't stop medicines even if you feel better • Don't dry spacer parts with a cloth/paper towel (allow the spacer parts to air dry without wiping) • Don't stop follow up visits with your general physician • Don't neglect your comorbid conditions e.g. hypertension, diabetes and cardiovascular diseases

Clinical Tips on Managing Asthma While Travelling for the Patients (In Flights/Trekking/High Altitude)¹⁸

- **Self-monitoring:** Recognize and monitor your symptoms and triggers of asthma during transit
- **Keep asthma travel kit handy:** Keep spare controller and reliever inhaler medications in hand luggage
- **Regular medication:** Remain compliant to your medicines even if you are going on a holiday
- **Prevention:** Stay up-to-date on immunizations and avoid infections
- **Plan & travel:** Consider the weather of your destination and what your asthma triggers are
- **Action plan:** Prepare for temperature changes (in hot or humid climates try to stay indoors, while in extremely cold areas bundle up and cover nose and mouth, especially above 9000 feet, as air becomes colder and dryer)
- **Consultation:** Have an emergency action plan from your doctor before planning for long travels/ trekking/high altitude

Simple Steps to Use a pMDI with Spacer¹⁹

- 1 Assemble** the two halves of the spacer

- 2 Insert** the inhaler in the spacer

- 3 Actuate** the inhaler to release the dose with the dust cap closed

- 4 Breathe out fully,** through your mouth

- 5 Open the dust cap and inhale** through the spacer

- 6 Hold your breath** for 10 second

- 7 Rinse your mouth** with water & spit it out


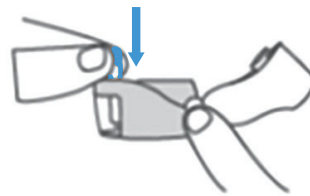


Simple Steps to Use a Dry Powder Inhaler¹⁹

1 **Open** the mouthpiece
(till both the arrows meet)



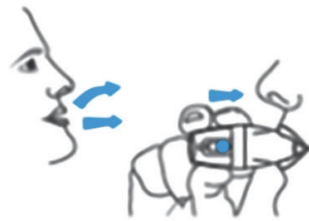
2 **Insert** a rotacap



3 **Close** the
Revolizer



4 **Breathe out fully,**
place the mouthpiece
between your teeth
and close your lips



5 **Inhale** rapidly &
deeply



6 **Hold your breath**
for 10 second



7 **Rinse your mouth**
with water & spit it out



Multiple Breath Technique²⁰

- Step 1: Remove cap, shake inhaler and insert into device
- Step 2: Place mouthpiece in mouth
- Step 3: Start breathing in and out slowly and gently (This will make a clicking sound as the valve opens and closes)
- Step 4: Once breathing pattern is well established, depress canister and leave device in same position as you continue to breathe (tidal breathing) several more times
- Step 5: Remove device from mouth
- Step 6: Wait about 30 seconds before repeating steps 1-5

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