

Indian Academy of Pediatrics (IAP)



STANDARD TREATMENT GUIDELINES 2022

Bronchial Asthma

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Bronchial Asthma

What is Bronchial Asthma?

Heterogeneous disease characterized by symptoms of recurrent wheeze, cough, shortness of breath, and chest tightness, which vary over time and intensity, and the airways show:

- ☑ Chronic inflammation
- ☑ Hyperresponsiveness
- ☑ Airflow limitation which is reversible, recurrent, variable.

Ascertain Diagnosis

- ☑ Essentially clinical—history of cough, wheeze, breathing difficulty, chest tightness, bilateral polyphonic wheeze
- ☑ And if possible documentation of variable expiratory airflow limitation by spirometry (FEV1, FVC, FEV1/FVC) and peak flowmetry (inferior to spirometry).

Clinical Evaluation in the Pediatrician's Office

Ask for:

- ☑ *Cough*: Mainly nocturnal and early morning dry/wet//relation with exercise/recurrent or persistent/Seasonal or year-round symptoms
- ☑ Breathlessness/chest tightness/whistling sound in the chest
- ☑ Personal or family history of atopy? (Eczema, allergic rhinitis,)
- ☑ Response to medicines? (Bronchodilators, inhaled/oral steroids)
- ☑ Emergency room visits for difficult breathing?/Previous hospitalizations for asthma? (PICU or ward)

Clinical Evaluation of Bronchial Asthma in Children

Clinical Evaluation of Bronchial Asthma in Children

Ascertain Diagnosis

Clinical Diagnosis

- ☑ More than 3 episodes of wheeze/year
- ☑ Wheezing reversed spontaneously or with bronchodilator
- ☑ Rule out other cause of wheezing

Look for:

- ☑ Bilateral polyphonic wheeze/widespread Rhonchi
- ☑ Unilateral or signs localized to one area/side—unlikely asthma
- ☑ Failure to thrive, poor weight gain, chronic diarrhea, draining ears and sinusitis, clubbing—unlikely asthma
- ☑ Chronic wet cough productive of sputum—unlikely asthma
- ☑ High fever—unusual association
- ☑ Involvement of multiple systems—gastrointestinal, hematological, cardiac, neurological manifestations—unlikely asthma

- ☑ Onset in early infancy—congenital airway/cardiac/vascular anomaly
- ☑ Unilateral wheeze—foreign body/congenital anomaly
- ☑ Infection—Recurrent viral infection/PBB/endobronchial TB/immunodeficiency
- ☑ Rare diseases—CF/PCD/hypersensitivity pneumonia

Caution—Asthma unlikely:

- ☑ <6 months of age
- ☑ Localizing signs
- ☑ Wet productive cough
- ☑ Fever and poor weight gain
- ☑ Poor response to bronchodilators

Rule Out Mimics

Identify Comorbid Conditions

- ☑ Allergic rhinosinusitis (associated in 75–80% cases of bronchial asthma)
- ☑ *Obesity:* It is an inflammatory condition of the body, reduction of even 5–10% of weight helps in better control of asthma
- ☑ GERD
- ☑ Adenoidal hypertrophy
 - Obstructive sleep Apnea syndrome
 - Anxiety, depression

Identify
Triggers

- ☑ **Aeroallergens:** Dust mite, pollens, pet animals, dog, cat, cockroaches and molds
- ☑ **Irritants:** Cigarette smoke, mosquito repellants, agarbati, automobile exhaust, smoke from firewood.

Spirometry: Recommended for Children >6 Years Age

- ☑ *Look for:* FEV1 (will be reduced in asthma), FVC, and FEV1/FVC
- ☑ In bronchial asthma FEV1/FVC will be <80%
- ☑ *Positive bronchodilator reversibility:* Increase in FEV1 of >12% (and/or increase by 200 mL) postbronchodilator, change measured 10–15 minutes after 200–400 µg salbutamol or equivalent, compared with pre-bronchodilator readings.

Peak Flowmetry

- ☑ Not a good tool for diagnosis, as it has a low sensitivity.
- ☑ *Good for monitoring* in those who experience recurrent exacerbations, particularly “under-perceivers” of asthma.
- ☑ Children: average daily diurnal PEF variability >12% indicates asthma. -
- ☑ After starting ICS, personal best PEF (from twice daily readings) is reached on average within 2 weeks.
- ☑ Always better to compare the current PEF value with the personal best PEF reading, for interpretation

FeNO: The fractional concentration of exhaled nitric oxide (FeNO) is modestly associated with levels of sputum and blood eosinophils. FeNO has not been established as useful for ruling in or ruling out a diagnosis of asthma. (GINA 2021)

Chest X-ray: To rule out alternative conditions, (chest X-ray may be normal or show hyperinflation due to airways outflow obstruction and air trapping, or may show atelectasis of a part of a lobe due to mucus plug.

However, routine chest X-ray is not required for diagnosis of asthma.

Blood tests:

- ☑ *Complete blood count:* May be normal, or show eosinophilia in atopy.
- ☑ *Serum total IgE:* Not useful, does not help in the diagnosis of asthma.

Allergy tests: Detailed history should guide choice of allergen to be tested and not the fixed panels

Recommended in allergic rhinitis, food allergy, difficult to control asthma.

- ☑ Allergy tests are of 2 types:
 - *In vivo test:* Skin prick test—gold standard
 - *In vitro test:* Blood test—To find out allergen specific IgE
- ☑ Positive skin test or positive sIgE does not mean that it is causative
- ☑ The presence of a positive skin test or positive sIgE, however, does not mean that the allergen is causing symptoms—the relevance of allergen exposure and its relation to symptoms must be confirmed by the patient’s history.
- ☑ *Allergy testing is not routinely recommended in asthma.*

To initiate treatment we must assess the level of control:

- Asthma control has two domains: Symptom control and future risk of adverse outcomes.
- Both should always be assessed.
 - If the child’s asthma is partly or well controlled then the child can be placed in the step 1 or step 2 of treatment, provided there is no other serious risk for future exacerbation.
 - If the child’s asthma is uncontrolled then the child will be in the step 3–5 of treatment.

GINA assessment of asthma control in adults, adolescents and children 6–11 years:

<i>Asthma symptoms control</i>	<i>Level of asthma symptoms control</i>		
<i>In the past 4 weeks, has the patient had</i>	<i>Well controlled</i>	<i>Partly controlled</i>	<i>Uncontrolled</i>
	Yes	Yes	Yes
<input checked="" type="checkbox"/> Day time asthma symptoms more than twice/week? Yes/No			
<input checked="" type="checkbox"/> Any night waking due to asthma? Yes/No	None of those	1–2 of those	3–4 of those
<input checked="" type="checkbox"/> SABA reliever for symptoms more than twice/week? Yes/No			
<input checked="" type="checkbox"/> Any activity limitation due to asthma? Yes/No			

GINA assessment of asthma control in children 5 years and younger:

<i>Symptoms control</i>	<i>Level of asthma symptoms control</i>		
<i>In the past 4 weeks, has the child had</i>	<i>Well controlled</i>	<i>Partly controlled</i>	<i>Uncontrolled</i>
	Yes	Yes	Yes
<input checked="" type="checkbox"/> Day time asthma symptoms more than few minutes/more than once a week? Yes/No			
<input checked="" type="checkbox"/> Any activity limitation due to asthma? Yes/No	None of those	1–2 of those	3–4 of those
<input checked="" type="checkbox"/> Reliever medications needed more than once a week? Yes/No			
<input checked="" type="checkbox"/> Any night waking or coughing due to asthma? Yes/No			

Modifiable

- Uncontrolled asthma symptoms
- Psychological problems and poor adherence
- Seasonal ‘flare-up’
- Comorbidities
- Exposure to irritants and triggers

Non-modifiable

- Ever intubated or PICU admissions or
- >1 severe exacerbations requiring hospitalization in the last 12 months.

Personalized management for children 6–11 years to control symptoms and minimize future risk of asthma exacerbations.

Few very important considerations:

- ☑ In children (>6 years) with asthma, steroid is advised upfront even in step 1 or step 2
- ☑ Because though approximately 75–80% of pediatric asthma belong to mild group, but many of them need ER visit for moderate to severe exacerbations
- ☑ Taking only SABA even for 1 week increases airway hyperresponsiveness, and reduces bronchodilator response
- ☑ Patients with infrequent symptom adherence to daily ICS is very poor, so ICS recommended whenever SABA is given

Long-term management of children 6–11 years old						
Age	Options	Step I	Step II	Step III	Step IV	Step V
06 to 11 years		Symptoms < twice a month	Symptoms >twice a month	Symptoms most days or waking with asthma once a week or more	Symptoms most days or waking with asthma once a week or more and low lung function	Short course OCS may also be needed for patients presenting with severely uncontrolled asthma
	Preferred controller	Low dose ICS taken whenever SABA taken	Daily low dose 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 advised)	Refer for Phenotypic assessment + higher dose ICS-LABA or add on therapy, e.g., Anti-IgE
	Alternative controller	Consider dialy low dose ICS	Dialy LTRA or low dose ICS taken whenever SABA taken	Low dose ICS + LTRA	Add Tiotropium or add LTRA	Add on anti-IL5, or add on low dose OCS, but consider side effects
<i>Reliever:</i> As needed SABA or ICS-formoterol reliever for MART						

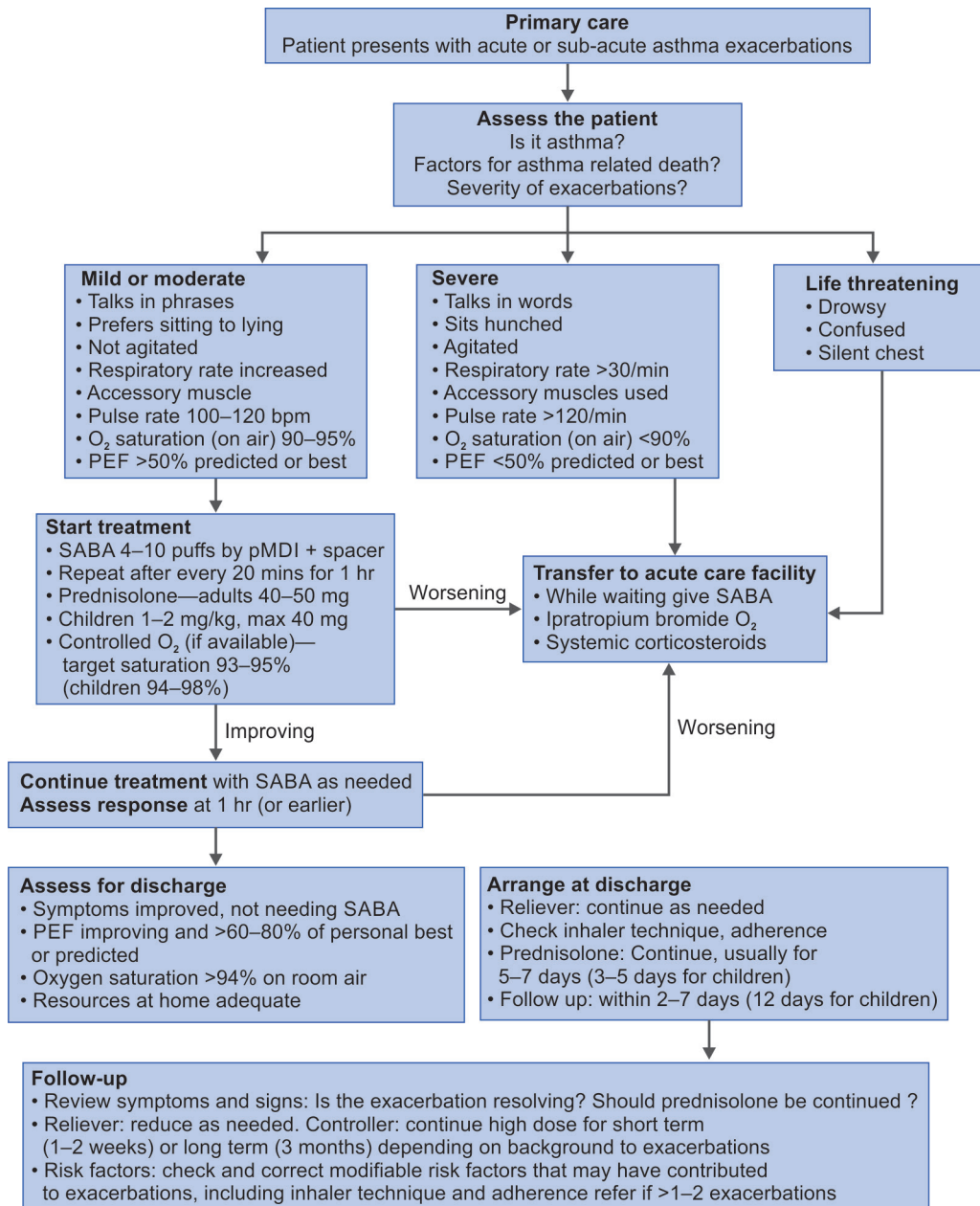
(Very low dose budesonide-formoterol 100/6 µg; Low dose budesonide-formoterol 200/6 µg)

Personalized management for adults and adolescents to control symptoms and minimize future risk.

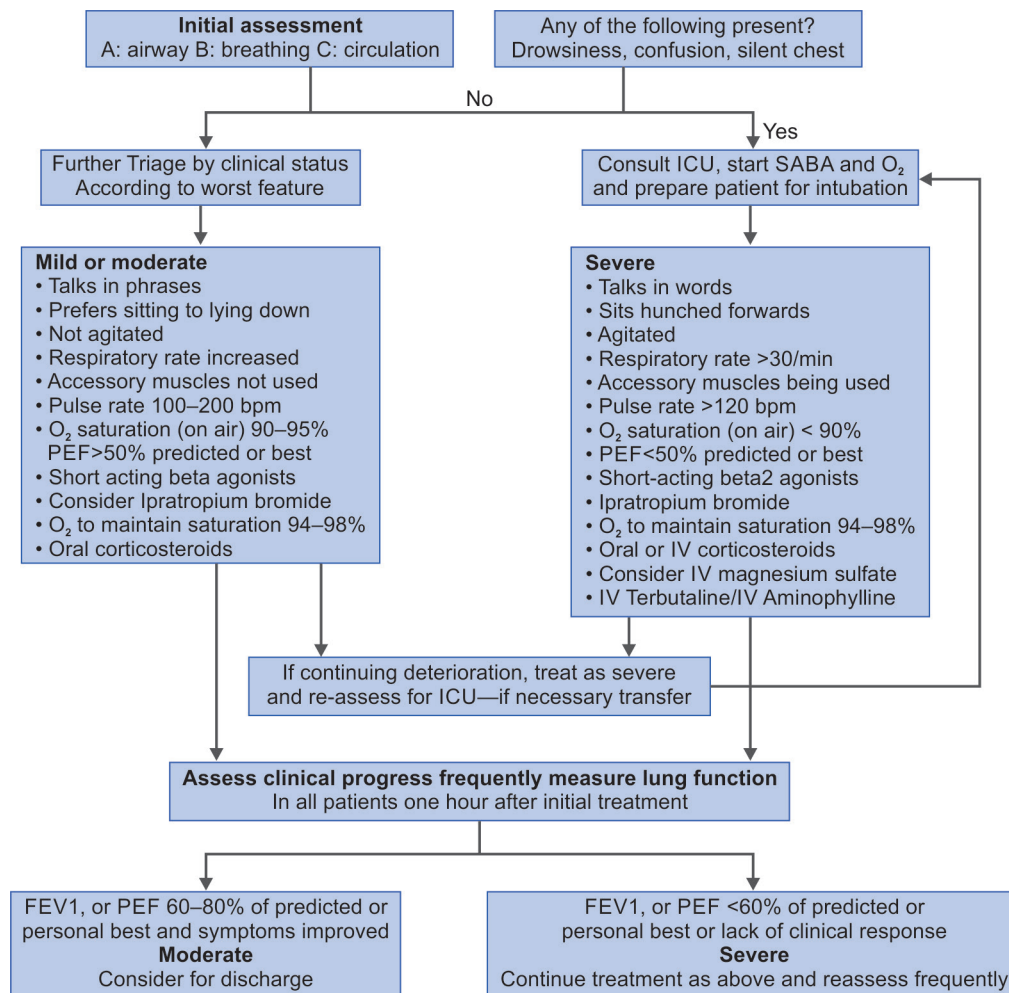
- ☑ The historic distinction between so-called ‘intermittent’ and ‘mild persistent’ asthma is arbitrary, with no evidence of difference in response to ICS. A large reduction in risk of severe exacerbations with as-needed ICS-formoterol, compared with as-needed SABA was seen even in patients with SABA use twice a week or less at baseline.
- ☑ Track 1 ICS and formoterol used as controller and reliever.
- ☑ Track 2 ICS and alternative reliever, i.e., SABA.

Long-term management of children 12 years and older						
Age	Options	Step I	Step II	Step III	Step IV	Step V
12 years onward		Symptoms less than 4–5 days a week	Symptoms less than 4–5 days a week	Symptoms most days or waking with asthma once a week or more	Daily symptoms or waking with asthma once a week or more and low lung function	Short course OCS may also be needed for patients presenting with severely uncontrolled asthma
	Controller and preferred reliever	As needed low dose ICS-formoterol	As needed low dose ICS-formoterol	Low dose maintenance ICS-formoterol	Medium dose maintenance ICS-formoterol	Add on LAMA refer for phenotypic assessment +/- anti-IgE, anti-IL5/5 hours, anti-IL4 Rconsider high dose ICS-formoterol
	<i>Reliever:</i> As needed low dose ICS-formoterol.					
		Symptoms less than twice a month	Symptoms twice a month or more but less than 4–5 days a week	Symptoms most day or waking with asthma once a week or more	Daily symptoms or waking with asthma once a week or more, and low lung function	Short course OCS may also be needed for patients presenting with severely uncontrolled asthma
	Controller and alternative reliever	Take ICS whenever SABA taken	Low dose maintenance ICS	Low dose maintenance ICS - LABA	Medium/ high dose maintenance ICS-LABA	Add on LAMA refer for phenotypic assessment +/- anti-IgE, anti-IL5/5 hours, anti-IL4R consider high dose ICS-formoterol
<i>Reliever:</i> As needed SABA						

Management of asthma exacerbations in primary care (adults, adolescents, children 6–11 years).



Management of asthma exacerbations in acute care facility.



IV Salbutamol Infusion

- ☑ IV salbutamol can be used in patients with severe asthma who fail to respond to other treatments, mainly to prevent intubation.
- ☑ In patients with severe attacks, there is very limited evidence that IV beta 2-agonists reduce recovery time or improve pulmonary function.
- ☑ The rationale to support IV salbutamol is that inhaled drugs may have a limited effect in patients with nearly complete airway obstruction and have practical limitations in ventilated patients.
- ☑ Cardiac responses, such as arrhythmia and tachycardia, increased lactate and anxiety are significant side effects, which may increase respiratory workload and exacerbate respiratory failure.
- ☑ Patients receiving IV salbutamol should be in a PICU setting.

IV Aminophylline

- ☑ Most guidelines do not recommend use of IV aminophylline because of its low efficacy and safety profiles.
- ☑ It improves diaphragmatic contractility.
- ☑ If used, this bronchodilator should be reserved solely for children with a severe asthma exacerbation, who have failed to improve despite maximal therapy (continuous inhaled beta 2-agonists, IV corticosteroids, IV magnesium sulfate) and generally in a PICU setting.
- ☑ The risk-benefit balance of IV aminophylline is unfavorable.

Endotracheal Intubation and Ventilation

- ☑ Intubation and mechanical ventilation can be life-saving interventions but their use in pediatric patients with asthma has been associated with significant adverse effects. Up to 45% of patients intubated due to asthma have complications, including pneumonia, pneumothorax, pneumomediastinum, and cardiovascular collapse.
- ☑ This risk highlights the importance of adequate, rapid, and aggressive initial management of acute exacerbations.
- ☑ In these situations, ketamine is generally considered the agent of choice for induction and ongoing sedation.
- ☑ Only 0.55% children admitted with acute severe asthma may require ventilation.

Further Reading

- ☑ Asthma training module, revised version 2021, IAP National Respiratory Chapter.
- ☑ Canadian Pediatric Society, position paper, managing an acute asthma exacerbation in children, updated; 2021.
- ☑ Guidelines for the management of childhood asthma 2021 (GINA) 2021.