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Evidence Based Clinical Practice Guideline:

Evaluation & Management of Pediatric Asthma (Chronic)

June 2022 V1.2

Purpose & Background

Childhood asthma is one of the most common chronic diseases in children, affecting more than 5 million children in the US as of 2019. Asthma is a heterogeneous disease diagnosed based on a clinical presentation of recurrent episodes of wheeze, cough, shortness of breath, and chest tightness with expiratory airflow limitation. Symptoms typically vary over time in terms of frequency and intensity. The underlying pathobiology includes airway inflammation, airway smooth muscle hyper-reactivity, and airway remodeling. There are multiple phenotypes of asthma characterized by varying degrees of involvement of inflammatory cell types including eosinophils, neutrophils, mast cells, lymphocytes, and epithelial cells. Atopy is the strongest predisposing risk factor for childhood asthma.

Symptoms are usually due to triggers such as viral respiratory infections, allergen or irritant exposures, exercise, or weather changes. Asthma symptoms and airflow limitation may be chronic and/or episodic and pose a significant burden to patients, their families, and the healthcare community. Early treatment of inflammation improves symptoms but does not change the natural history of asthma. Making the diagnosis of asthma and assessing severity and control are important in order to avoid under-treatment, over-treatment, and to not miss alternative diagnoses.

Key Practice Changes Include:

- A new strategy for recurrent wheezing triggered by respiratory tract infection in children ages 1-4 years with a recommendation to begin a short course of daily inhaled corticosteroid (ICS) at the onset of a respiratory tract infection with as-needed short acting beta$_2$-agonist (SABA).
- A recommendation to incorporate the use of intermittent ICS into quick relief treatment across steps and ages.
- A recommendation to use ICS/formoterol (Symbicort® or Dulera ®) for quick relief treatment rather than SABA for older children and adolescents, either alone or in combination with daily ICS/formoterol based on asthma severity.

Inclusion & Exclusion Criteria

- Recurrent wheezing is defined as 3 or more episodes of wheezing triggered by apparent respiratory tract infections in a child's lifetime or 2 episodes in the past year.[1]
- Asthma is defined as chronic inflammatory disorder of the airways that causes recurrent episodes of wheezing, breathlessness, chest tightness, cough due to bronchoconstriction and airflow limitation that is at least partly reversible, either spontaneously or with treatment.
- Exercise induced bronchoconstriction (EIB) is defined as episodes of cough, wheeze, or excessive fatigue when a person exercises. Symptoms usually begin during or after more prolonged or vigorous activity (not immediately after exercise starts).

INCLUSION CRITERIA

a. Recurrent wheezing in 0-4 years old
b. Pediatric patients with a new or known diagnosis of asthma
c. Exercise induced bronchoconstriction

EXCLUSION CRITERIA

a. Patients with other underlying chronic lung disease, cardiac conditions, or complex neurological disorders
b. Patients requiring treatment for acute asthma exacerbation in ED or urgent care settings

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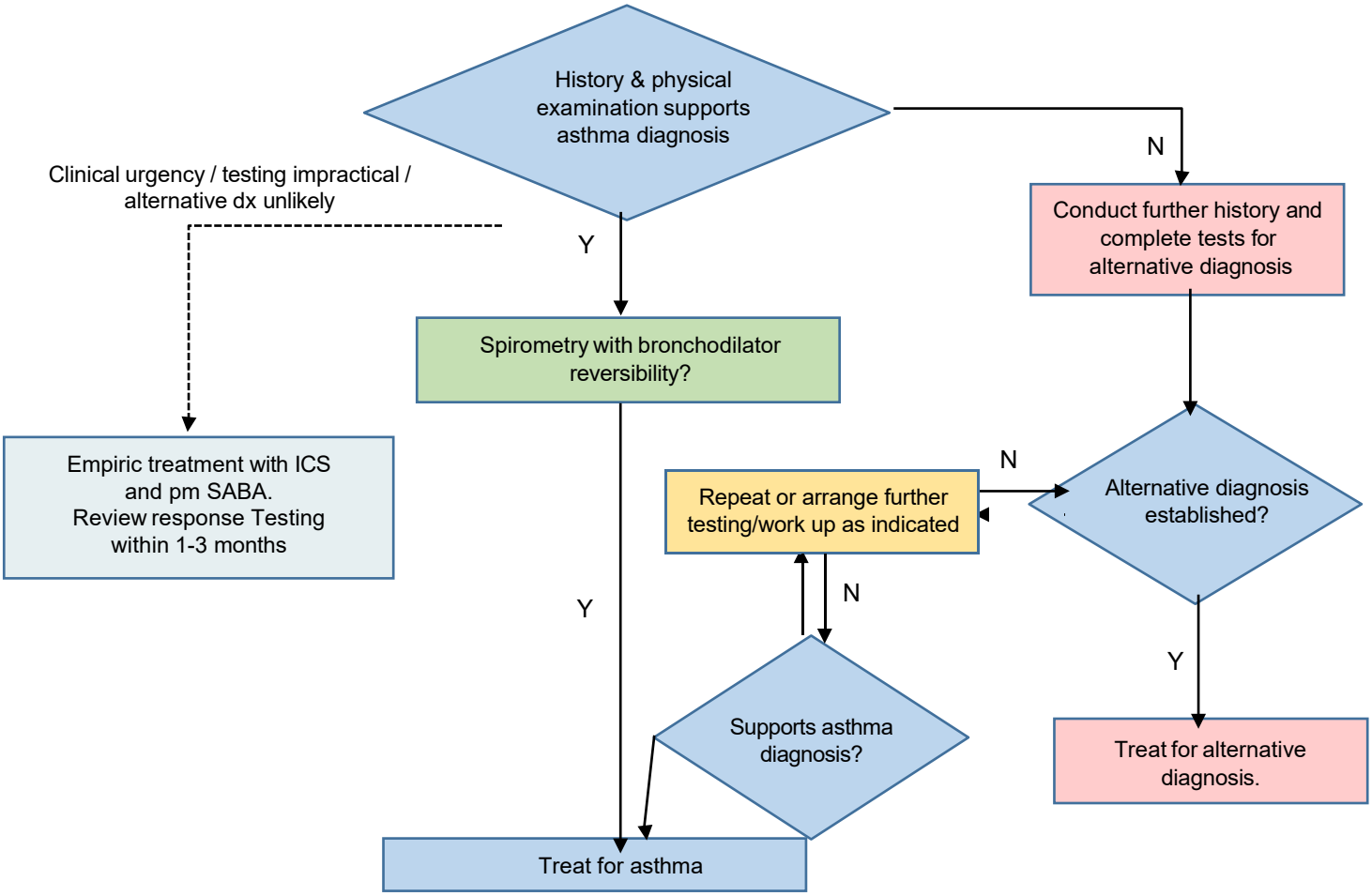
Acronyms and Abbreviations

Establish the Asthma Diagnosis

- Asthma is diagnosed when there is both a characteristic pattern of respiratory symptoms (wheezing, shortness of breath, chest tightness or cough) and variable expiratory airflow limitation on pulmonary function testing (when available). Ascertaining that the pattern of symptoms and response to therapy are consistent with asthma is important as other acute or chronic respiratory diseases can present with similar respiratory symptoms.[2]
- When establishing the diagnosis, the history and physical examination must suggest asthma supported with spirometry testing with bronchodilator that demonstrates reversibility of airway constriction (when available).
- Other diagnostic studies such as laboratory or radiologic studies may be considered as indicated.



- Differential Diagnosis (this list is not exhaustive)

  - Tracheomalacia or bronchomalacia
  - Retained foreign body
  - Vocal cord dysfunction / Exercise Induced
  - Laryngeal Obstruction
  - Dysfunctional breathing
  - Lower respiratory tract infection
  - Extrinsic airway compression
  - Congenital airway anomaly
  - Airway masses/tumors
  - Oropharyngeal dysfunction and aspiration
  - Immune deficiency
  - Primary ciliary dyskinesia
  - Childhood diffuse lung disease
  - Pulmonary vascular disease
  - Pulmonary eosinophilic syndrome
  - Hypersensitivity pneumonitis
  - Cardiac disease
  - Anxiety/panic disorder
  - Deconditioning

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Four Components of Asthma Care

- Assess asthma severity and monitor asthma control
- Educate families for a partnership in asthma care
- Control environmental factors and comorbid conditions
- Prescribe medications to prevent symptoms and manage exacerbations

Initial Visit: Assess Asthma Severity
Severity is the intrinsic intensity of the disease process. Severity is measured most easily and directly in a patient not receiving long-term-control therapy

Component	Intermittent	Persistent								
		Mild			Moderate			Severe		
	All age groups	0-4 y	5-11 y	+12 y	0–4 y	5–11 y	+12 y	0–4 y	5–11 y	12 y +
Assess Impairment: *Frequency and intensity of symptoms and functional limitations the patient is experiencing or has recently experienced*										
Daytime symptoms and/or SABA use for symptoms (not to prevent exercise-induced symptoms)	Less than or equal to 2 days per week	Greater than 2 days per week but not daily			Daily			Several times per day		
Sleep disturbance due to asthma symptoms	Less than or equal to 2 times per month	1 – 2 times per month	3 – 4 times per month		3 – 4 times per month	Greater than 1 time per week but not nightly		Greater than 1 time per week	Nightly	
Physical Activity	No limitations	Minor limitation			Some limitation			Extremely limited		
Asthma Control Test Score	> 19	> 19			15 – 19			< 15		
Lung function	Normal	N/A	Normal		N/A	FEV1 60 – 80% FEV1/FVC < 80		N/A	FEV1 < 60% FEV1/FVC < 75	
Risk: *the likelihood of either asthma exacerbations, progressive decline in lung function (for children, also risk for reduced lung growth), or risk of adverse effects from medication*										
Exacerbations *requiring oral corticosteroids* (OCS)	0 – 1 per year with OCS	≥ 2 in 6 months with OCS or ≥4 wheezing episodes in 1 year lasting > 1 day	Greater than or equal to 2 per year with OCS Generally more frequent and intense events indicate greater severity							
Stepwise Approach to Asthma Therapy *Guidelines to initiate therapy based on severity, not meant to replace clinical judgment*	**Intermittent Step 1**	**Mild Persistent Step 2**			**Moderate Persistent Step 3 or 4**			**Severe Persistent Step 5 or 6**		
	➢ Stepwise Approach for Asthma Therapy 0-4 years ➢ Stepwise Approach for Asthma Therapy 5-11 years ➢ Stepwise Approach for Asthma Therapy 12+ years									
Educating Families	➢ Review inhaler and device technique; request familty to perform teach-back ➢ Develop plan with family to avoid known triggers (e.g., pets, smoke) ➢ Consider comorbidities that may be influencing symptoms (e.g., allergies, obesity, GERD, OSA) ➢ Provide family with an Asthma Home Management Plan to help identify symptoms early, initiate treatment for exacerbations at home, and recognize symptoms that require emergency treatment									
Responsiveness to Treatment: *the ease with which asthma control is achieved by therapy* **Control:** *the degree to which the manifestations of asthma (symptoms, functional impairments) are minimized and the goals of therapy are met*										
Follow-Up & Re-assessment	➢ Follow up in 4 – 6 weeks to assess the level of control achieved and adjust therapy as needed ➢ If no clear benefit in 4 – 6 weeks of therapy, consider adjusting therapy or alternate diagnosis									

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Follow-up Visits: Assess Control and Adjust Therapy

Responsiveness to treatment is the ease with which asthma control is achieved by therapy.
Asthma control is the degree to which the manifestations of asthma (symptoms, functional impairments) are minimized and the goals of therapy are met. Control assessment involves both impairment and risk.

Component	Well-controlled			Not well-controlled			Poorly controlled		
	0–4 y	5–11 y	±12 y	0–4 y	5–11 y	±12 y	0–4 y	5–11 y	±12 y
Assess Impairment: *Frequency and intensity of symptoms and functional limitations the patient is experiencing or has recently experienced*									
Daytime symptoms and/or SABA use for symptoms (not to prevent exercise-induced symptoms)	Less than or equal to 2 days per week			Greater than 2 days per week but not daily			Daily throughout the day		
Sleep disturbance due to asthma symptoms	≤ 1 month	≤ 2x/month		> 1x/ month	≥ 2x/ month	1 – 3 x/ week	> 1x/week	≥ 2x/ week	≥ 4x/ week
Physical activity	None or Minor limitation			Some limitation			Extremely limited		
Asthma Control Test	N/A	≥ 20		N/A	15 – 19		N/A	≤ 14	
Lung function	n/a	Normal		n/a	FEV1 60 – 80% predicted FEV1/FVC 75 – 80		N/A	FEV1 < 60% predicted FEV1/FVC < 75	
Risk: *the likelihood of either asthma exacerbations, progressive decline in lung function (for children, also risk for reduced lung growth), or risk of adverse effects from medication*									
Exacerbations requiring oral corticosteroids	0 – 1/year			2 – 3/year	≥ 2/year		> 3/year	≥ 2/year	
				Consider intensity and interval since last exacerbation					
Adverse effects of treatment	Side effects vary from minimal to very bothersome/worrisome. The level of intensity does not correlate to control but should be considered in the overall assessment of risk								
Follow Up & Reassessment	➢ Review Asthma Control Test, exacerbations requiring OCS, and healthcare utilization ➢ Consider adjusting therapy (see Stepwise Approach for age) or consider alternative diagnosis								
Educating Families *Repetition is necessary and health literacy of the parent/guardian affects adherence and compliance*	➢ Review inhaler and device technique; request familty to perform teach-back - How to use an MDI - How to use an MDI with spacer and mouthpeice - How to use an MDI with spacer and facemask ➢ Review adherence to currently prescribed therapy ➢ Develop or review plan with family to avoid known environmental triggers (e.g., pets, smoke) - What are Asthma Triggers ➢ Consider comorbidities that may be influencing symptoms (e.g.., allergies, obesity, GERD, OSA) ➢ Provide family with an Asthma Home Management Plan or Viral Wheezing Plan to help identify symptoms early, initiate treatment for exacerbations at home, and recognize symptoms that require emergency treatment								
Stepwise Approach to Asthma Therapy *Guidelines to initiate therapy based on severity, not meant to replace clinical judgment*	➢ Stepwise Approach for Asthma Therapy 0-4 years ➢ Stepwise Approach for Asthma Therapy 5-11 years ➢ Stepwise Approach for Asthma Therapy 12+ years								

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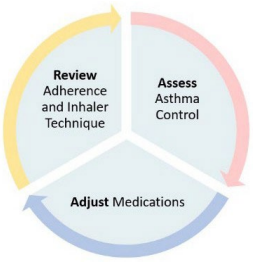

Stepwise Approach to Asthma Therapy (Ages 0-4)

	Step 1	Step 2	Step 3	Step 4
	Intermittent or Viral Wheezing	Mild Persistent	Moderate Persistent	
When to see an Asthma Specialist		***Consultation with Asthma Specialist is recommended at Step 3 or higher; consider at Step 2 in children ages 0-4 years***		
Preferred (0-4)	*SABA as needed for symptoms AND At the onset of RTI add short course of ICS for 7-10 days then stop	**Daily low dose ICS and SABA as needed	**Daily medium dose ICS and SABA as needed	**Daily medium dose ICS-LABA and SABA as needed
Alternative (0-4)		**At the start of RTI add short course of ICS for 7-10 days then stop	**Daily low dose ICS + LTRA **If ≥ 4 years old: Daily and as needed combination low-dose ICS-formoterol	**Daily medium dose ICS +LTRA and SABA as needed
Conditional (0-4)		**Daily LTRA^	**If ≥ 4 years old: Daily and as needed combination low-dose ICS-formoterol ("SMART" therapy with max 8 puffs per day)	If ≥ 4 years old: Daily and as needed combination medium-dose ICS-formoterol ("SMART" therapy with max 8 puffs per day)
Quick Relief Preferred	Use SABA as needed for symptoms			
Assess Control	➢ Before stepping up - Check adherence and inhaler technique - Review environmental factors and exposures - Check for alternative diagnosis and consider comorbid conditions ➢ Reassess in 2-6 weeks ➢ Step down if possible (asthma is well controlled for at least 3 consecutive months)			
Inhaled ICS Dosing for Children 0-4 Ages				
*Adopted from 2020 NHLBI Asthma Focused Update **Adapted from 2020 NHLBI Asthma Focused Updates with consideration of 2021 GINA Asthma Guideline				
^Montelukast is the only LTRA recommended for pediatric patients; daily ICS is more effective than LTRA monotherapy. Montekulast also carries a FDA black box warning for potential adverse effects on behavior and sleep				
Viral Wheezing: wheezing episode that is triggered by a viral respiratory tract infection				
"SMART" Therapy: stands for "Single Maintenance And Reliever Therapy" and means that one combination inhaler is used daily to prevent asthma exacerbations AND is used as needed for quick relief therapy				
The preferred inhaler device for this age group is a pressurized meter dose inhaler plus spacer with facemask. Nebulizers with a facemask are alternate devices.				

SABA = short acting beta agonist
RTI = respiratory tract infection
LABA = long acting beta-agonist

ICS = inhaled corticosteroid
LTRA = leukotriene receptor antagonist
SMART = single maintenance and reliever therapy with ICS formoterol *only*

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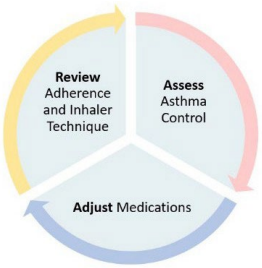

Stepwise Approach to Asthma Therapy (Ages 5-11)				
	Step 1	**Step 2**	**Step 3**	**Step 4**
	Intermittent	Mild Persistent	Moderate Persistent	
When to see an Asthma Specialist		***Consider consultation with Asthma Specialist when poor adherence is a concern***	***Consultation with Asthma Specialist is recommended at Step 3 or higher in children ages 5-11 years***	
Preferred (5-11)	*SABA as needed for symptoms	Daily low dose ICS **AND** SABA as needed for symptoms	***Daily combination low-dose ICS-Formoterol **AND** as needed for symptoms (max 8 puffs per/ day)	*Daily combination medium-dose ICS-Formoterol **AND** as needed for symptoms (max 8 puffs per/ day)
Alternative (5-11) *Consider alternative therapy when "stepping down" and based on the inhaler the patient/family has access to*	**SABA as needed for symptoms **AND** add low dose ICS when SABA taken	**Daily montelukast AND SABA as needed for symptoms; **OR** ** SABA as needed for symptoms **AND** add low dose ICS when SABA taken	**Daily medium-dose ICS **AND** as needed SABA; **OR** Daily low-dose ICS-LABA AND as needed SABA; **OR** ICS-Formoterol	*Daily medium-dose ICS-LABA **AND** as needed SABA; **OR** Daily medium-dose ICS + LTRA **AND** as needed SABA
Conditional (5-11)		***In patients with poor adherence to daily treatment, consider combination low dose ICS-formoterol as needed for symptoms (max 8 puffs per day)		
Quick Relief Preferred	Use SABA as needed for symptoms		In Steps 3 and 4, the preferred option is ICS-formoterol 1-2 puffs as needed up to a maximum daily maintenance and rescue dose of 8 puffs if < 12 yo	
Quick Relief Alternative			Use SABA as needed for symptoms	
Assess Control	➢ Before stepping up - Check adherence and inhaler technique - Review environmental factors and exposures - Check for alternative diagnosis and consider comorbid conditions ➢ Reassess in 2-6 weeks ➢ Step down if possible (asthma is well controlled for at least 3 consecutive months)			
Inhaled ICS Dosing for Children 5-11 Ages				

*Adopted from 2020 NHLBI Asthma Focused Update
**Adapted from 2020 NHLBI Asthma Focused Updates with consideration of 2021 GINA Asthma Guideline
***Based on expert consensus, extrapolated from *Bateman, et al. As-needed Budesonide-Formoterol for Mild Asthma. 2021*

Symptom Driven "SMART" Therapy: SMART Therapy: stands for "Single Maintenance And Reliever Therapy" and means that one combination inhaler is used daily to prevent asthma exacerbations AND is used as needed for quick relief therapy

Alternative Symptom Driven Step 1 and Step 2 ICS Therapy: based on the TREXA study, which stands for "TReating Children to Prevent EXacerbations of Asthma"; recommended for patients ≥ 5 years who can be managed safely without a daily ICS; therapy that calls for low dose ICS to be administered each time 1 puff of SABA is needed based on symptoms (requires 2 different inhalers)

Poor Adherence: defined as failure to adhere to a regular self-management plan (including taking preventative therapies) resulting in poor asthma control evidenced by exacerbations, decreased quality of life, and increased hospitalization and emergency department visits.[WHO]

Inhaler device options for this age group include spacer with mask or spacer with mouthpiece. A spacer with mouthpiece is typically used by children 5-6y and older, provided they are developmentally able to transition to a mouthpiece spacer. Examples of readiness to transition to mouthpiece include: able to form a seal around mouthpiece and able to follow directions to take and hold a deep breath.

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Stepwise Approach to Asthma Therapy (Ages 12+)				
	Step 1	**Step 2**	**Step 3**	**Step 4**
	Intermittent	Mild Persistent	Moderate Persistent	
When to see an Asthma Specialist			***Consultation with Asthma Specialist is recommended at Step 3 or higher in children ages 12+***	
Preferred (≥12)	**As needed combination low-dose ICS-Formoterol (max 12 puffs per day)	*Daily low dose ICS **AND** SABA as needed; **OR** **As needed combination low-dose ICS-Formoterol (max 12 puffs per day)	**Daily **AND** as needed combination low-dose ICS-Formoterol (max 12 puffs per/ day)	*Daily **AND** as needed combination medium-dose ICS-Formoterol (max 12 puffs per/ day)
Alternative (≥12) *Consider alternative therapy when "stepping down" and based on the inhaler the patient/family has access to*	** SABA as needed for symptoms **AND** add low dose ICS when SABA taken	** SABA as needed for symptoms **AND** add low dose ICS when SABA taken	**Daily medium-dose ICS **AND** as needed SABA; **OR** Daily low-dose ICS-LABA **AND** as needed SABA; **OR** Daily low-dose ICS + LTRA **AND** as needed SABA	*Daily medium-dose ICS-LABA **AND** as needed SABA; **OR** Daily medium-dose ICS + LTRA **AND** as needed SABA
Quick Relief Preferred	The preferred reliever for as needed symptoms option is ICS-formoterol 1-2 puffs as needed up to a maximum daily maintenance and rescue dose of 12 puffs if ≥12 years old. *(NOTE: ICS-formoterol should not be used as the reliever for patients taking a different ICS-LABA maintenance treatment)*			
Quick Relief Alternative	Use SABA as needed for symptoms			
Assess Control	➢ Before stepping up - Check adherence and inhaler technique - Review environmental factors and exposures - Check for alternative diagnosis and consider comorbid conditions ➢ Reassess in 2-6 weeks ➢ Step down if possible (asthma is well controlled for at least 3 consecutive months)			
Inhaled ICS Dosing for Children 12+ Ages				
*Adopted from 2020 NHLBI Asthma Focused Update **Adapted from 2020 NHLBI Asthma Focused Updates with consideration of 2021 GINA Asthma Guideline				
Symptom Driven "SMART" Therapy: SMART Therapy: stands for "Single Maintenance And Reliever Therapy" and means that one combination inhaler is used daily to prevent asthma exacerbations AND is used as needed for quick relief therapy				
Alternative Symptom Driven Step 1 and Step 2 ICS Therapy: based on the TREXA study, which stands for "TReating Children to Prevent EXacerbations of Asthma"; recommended for patients > 5 years who can be managed safely without a daily ICS; therapy that calls for low dose ICS to be administered each time 1 puff of SABA is needed based on symptoms (requires 2 different inhalers)				

SABA = short acting beta agonist
RTI = respiratory tract infection
LABA = long acting beta-agonist

ICS = inhaled corticosteroid
LTRA = leukotriene receptor antagonist
SMART = single maintenance and reliever therapy with ICS-formoterol *only*

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Exercise Induced Bronchoconstriction

- Exercise induced bronchoconstriction (EIB) is when a patient experiences cough, wheeze, or excessive fatigue when they exercise. Symptoms typically begin during or after prolonged or vigorous activity.
- Symptoms do not typically begin within the first few minutes of exercise.
- A diagnosis of EIB is made based on cough, shortness of breath, chest pain or tightness, wheezing, and/or endurance problems during exercise that are responsive to asthma treatments. A more definitive diagnosis can be made with an exercise challenge test in a formal laboratory setting in which exercise results in acute and reversible airway obstruction. Exercise testing may be warranted in some cases, such as when other etiologies including deconditioning or vocal cord dysfunction/exercise induced laryngeal obstruction (VCD/EILO), are being considered.

Management strategies: In general, EIB should not limit participation in physical activities when properly treated. Frequent EIB may indicate poorly controlled asthma, which should be treated with optimized dosing of daily controller therapy. If symptoms are isolated to exercise, start SABA or ICS-formoterol just prior to exercise, depending on their age.[1]

Recommendations on Non-pharmacological Interventions to Improve Asthma Symptom Control

Only select interventions listed that are evidence-based per GINA or EPR-3

Allergen Mitigation strategies	❖ Single-component strategies to mitigate allergens are not generally recommended (low certainty evidence and small benefits) with the exception of integrated pest management (cockroaches and mice) for which evidence supports this intervention. ❖ Impermeable mattress and pillow covers, integrated pest management, HEPA vacuum cleaners, and mold mitigation are potentially beneficial when used as part of a multicomponent allergen mitigation strategy, but the benefits are small. ❖ For patients sensitized to house dust mite and/or pets, there is limited evidence of clinical benefit for asthma with avoidance in strategies in children only.
Smoking Cessation	❖ All parents and caregivers of children with asthma should receive advice and support to not smoke in the home or cars. ❖ Advise those with asthma to avoid environmental smoke exposure. ❖ Strongly encourage people with asthma who smoke or vape to quit.
Avoidance of air pollution	❖ Indoor: encourage those with asthma to use non-polluting heating and cooking sources and for adequate ventilation ❖ Outdoor: children with asthma should be advised to stay indoors and to avoid strenuous outdoor physical activity during unfavorable environmental conditions/air quality alert days (www.airnow.gov).
Weight reduction	❖ For obese individuals with asthma, include weight reduction strategies in the treatment plan

When to Refer an Asthma Specialist

- Life-threatening asthma exacerbation (use of non-invasive ventilation or intubation for asthma)
- Unable to meet goals of asthma therapy after 3–6 months of treatment
- Signs and symptoms are atypical and other diagnoses are being considered as the cause
- Other conditions complicate asthma or its diagnosis
- Any patient that requires step 3 or higher in asthma management (consider referral at step 2 or higher in children 0-4 years old)
- Exacerbations requiring more than two bursts of oral corticosteroids or one hospitalization in the prior year hospitalization

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History and Physical Examination

- History of:
  - Recurrent episodes of cough, chest tightness, wheezing, dyspnea
  - Symptoms triggered or worsened by viral illnesses, allergens, secondhand smoke, pollution, dust, exercise, chemicals, stress, or menstrual cycle
  - Symptoms tend to be worse at night
  - Symptoms tend to be worse during allergy seasons/seasons with more viral respiratory illnesses
  - Symptoms usually start in early childhood
  - Symptoms usually improve with rescue therapy with short-acting beta agonists
  - In children ages 6 and up, spirometry is normal or demonstrates airway obstruction that is at least partially reversible
  - Other causes of symptoms/obstruction have been considered with further evaluation as warranted
- Physical Exam:
  - Growth parameters/general appearance
  - Allergic stigmata (allergic shiners, conjunctival injection, nasal polyps, rhinitis, cobblestoning of oropharynx)
  - Chest wall shape
  - Work of breathing, lung sounds
  - Cardiac exam
  - Clubbing
- Skin exam for atopic dermatitis, hemangiomas

Laboratory Studies

Laboratory testing is not routinely indicated unless the diagnosis of asthma is uncertain. In that instance, other laboratory studies may be indicated based on individuals patient's history and physical examination

- Consider allergy testing to assess for allergic sensitization

Lung Function Testing

Spirometry is recommended for children $\geq$ 5 years of age; most children are capable of performing reproducible spirometry if coached by an experienced technician and with the use of visual incentives. GINA

Radiologic Studies

Routinely not recommended unless the doubt about the diagnosis of asthma in a wheezing or coughing child[GINA]

- Chest x-ray may help to exclude structural abnormalities, chronic infections, inhaled foreign body, or other diagnoses

Other imaging investigations per differential diagnosis under consideration

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Were prescription insurance benefits considered in the guideline recommendations?

- The guideline team reviewed the medication formulary and personal costs for patients and families covered by Ohio Medicaid and Navitas, the pharmacy benefits manager for individuals covered by UH employee insurance.
- As of May 2022, preferred and alternative therapies were covered with varied cost and allowed for flexible options for both insurers.
- Nativas Medication Formulary Look-Up: https://www.myuhhr.org/US/EN/ResourceLibrary/Benefits/Prescription/Navitus Formulary Docs/University Hospitals_Complete.pdf
- Ohio Medicaid Medication Formulary Look-Up: https://pharmacy.medicaid.ohio.gov/sites/default/files/20220415_UPDL_FINAL_.pdf#overlay-context=unified-pdl

How was this guideline developed?

- This guidance document was developed by a multi-disciplinary group of caregivers involved in the Asthma Clinical Effectiveness Team (CET) led by pulmonary services. The final recommendations in this document reflect the consensus from the Asthma CET based on review of the guidelines referenced below with consideration of application to local community.
- This guidance document is an adoption and adaption of both the 2007 and 2020 focused update from the Expert Panel Report (EPR) of the National Asthma Education and Prevention Program (NAEPP) coordinated by the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health with consideration to the 2021 Global Initiative for Asthma's Global Strategy for Asthma Management and Prevention (GINA).
- The NAEPP published its first EPR on the diagnosis and management of asthma in 1991 with periodic updates (1997 and 2007). The EPR-4 published 2020 was a focused update on six priority topics. The expert panel conducted a systematic review and used the Grading of Recommendations Assessment, Development and Evaluation GRADE) methodology to deliberate and develop their recommendations.
- The GINA guideline is an international consensus that integrates evidence-based strategy with a focus on translation into clinical practice, placing high value on achieving asthma control, reducing exacerbations, and death. This panel strongly considers human behavior of patients and health care professionals. The GINA guidelines have been updated annually since 2002.

Major References:

1. 2020 Focused Updates to the Asthma Management Guidelines: A report from the national asthma education and prevention program coordinating committee expert panel working group
2. 2021 GINA Report, Global Strategy for Asthma Management and Prevention

Acronyms and Abbreviations

ACT	Asthma Control Test
EIB	exercise inducted bronchoconstriction
EPR	Expert Panel Report
GINA	Global Initiative for Asthma
GRADE	Grading of Recommendations Assessment, Development, and Evaluation
ICS	inhaled corticosteroid
ICS-LABA	inhaled corticosteroid and long-acting beta$_2$-agonist combination (typically in a single device)
LAMA	long-acting muscarinic antagonist
LTRA	leukotriene receptor antagonist
NAEPP	National Asthma Education and Prevention Program
NHLBI	National Heart, Lung, and Blood Institute
SMART	Single Maintenance And Reliever Therapy

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Disclaimer: Practice recommendations are based upon the evidence available at the time the clinical practice guidance was developed. Clinical practice guidelines (including summaries and pathways) do not set out the standard of care and are not intended to be used to dictate a course of care. Each physician/practitioner must use his/her independent judgement in the management of any specific patient and is responsible, in consultation with the patient and/or the patient's family to make the ultimate judgment regarding care.

If you have questions about any of the clinical practice guidelines or about the guideline development process please contact the Rainbow Evidence-Based Practice Program at RainbowEBPprogram@uhhospitals.org

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Inhaled Corticosteroid (ICS) dosing for Asthma Age 0-4 years old				
Medication	**Formulations & Available Products**	**Low dose**	**Medium dose**	**High dose**
Budesonide *≥12 month old*	**Pulmicort Respules (nebulized)**: (Use with a Pari-nebulizer cup)	0.25-0.5 mg/day	0.5-1 mg/day	*Consult with Asthma Specialist for high dose daily ICS in this age group*
	0.25 mg/2 mL suspension	1-2 nebs/day	---	
	0.5 mg/2 mL suspension	1 neb/day	2 nebs/day	
	1 mg/2 mL suspension	---	1 neb/day	
Fluticasone Propionate	**Flovent HFA:**	88 mcg BID	132-176 mcg BID	
	44 mcg/actuation	2 puffs BID	---	
	110 mcg/actuation	---	1 puff BID	
	220 mcg/actuation	---	---	

BID: twice daily; DPI: dry powder inhaler; HFA: hydrofluoroalkane propellant; ICS: inhaled corticosteroid; LABA: long-acting beta agonist; N/A: not applicable; pMDI: pressurized metered dose inhaler (ICS by pMDI should preferable be used with a spacer); VHD: Valved-holding device

Back to Stepwise Approach Age 5-11

Inhaled Corticosteroid (ICS) dosing for Asthma Age 5-11 years old				
Medication	**Formulations & Available Products**	**Low dose**	**Medium dose**	**High dose***
		For most patients, the increase from medium to high dose ICS generally provides little additional benefit and there is an increased risk of side-effects, including adrenal suppression		
Beclomethasone dipropionate	**Qvar Redihaler (DPI)**: (Do NOT use with a spacer or VHD)	40-80 mcg BID	>80-160 mcg BID	>160 mcg BID
	40 mcg/actuation (10.6 g)	2 puffs BID	---	---
	80 mcg/actuation (10.6 g)	1 puff BID	2 puffs BID	≥3 puffs BID
Budesonide	**Pulmicort Flexhaler (DPI)**:	90-180 mcg BID	270-360 mcg BID	>360 mcg BID
	90 mcg/actuation	2 puffs BID	---	---
	180 mcg/actuation	1 puffs BID	2 puffs BID	≥3 puffs BID
	Pulmicort Respules (nebulized): (Use with a Pari-nebulizer cup)	0.5 mg daily	1 mg daily	2 mg BID
	0.25 mg/2 mL suspension	1 neb BID	---	---
	0.5 mg/2 mL suspension	1 neb daily	1 neb BID	---
	1 mg/2 mL suspension	---	1 neb daily	1 neb BID

Inhaled Corticosteroid (ICS) dosing for Asthma Age 5-11 years old, cont.				
Ciclesonide	**Alvesco Inhalation Aerosol**:	80 mcg daily	160 mcg daily	>160 mcg/day
	80 mcg/actuation	1 puff daily	2 puffs daily	---
	160 mcg/actuation	---	1 puff daily	≥2 puffs daily
Fluticasone furoate	**Arnuity Ellipta (DPI)**:	50 mcg daily	---	---
	50 mcg/actuation	1 puff daily	---	---
Fluticasone Propionate	**Flovent HFA:**	88 – 110 mcg BID	220 mcg BID	≥220 mcg BID
	44 mcg/actuation	2 puffs BID	---	---
	110 mcg/actuation	1 puff BID	2 puffs BID	---
	220 mcg/actuation	---	---	≥1 puff BID
	Flovent Diskus (DPI):	100 mcg BID	200 mcg BID	250 mcg BID
	50 mcg/actuation	2 puffs BID	---	---
	100 mcg/actuation	1 puff BID	2 puffs BID	---
	250 mcg/actuation	---	---	1 puff BID
Mometasone furoate	**Asmanex Twisthaler (DPI)**:	110 mcg daily	220-440 mcg daily	≥660 mcg BID
	110 mcg/actuation	1 puff daily	---	---
	220 mcg/actuation	---	1-2 puffs daily	≥3 puffs divided BID
	Asmanex HFA:	100 mcg BID	200 mcg BID	---
	100 mcg/actuation	1 puffs BID	2 puffs BID	---
Combination Products				
Budesonide + Formoterol (LABA)	**Symbicort (HFA):**	160 mcg BID	160 mcg BID	---
	Budesonide 80 mcg/Formoterol 4.5 mcg	2 puffs BID	2 puffs BID	---
Fluticasone + salmeterol (ICS/LABA)	**Advair Discus, Wixela Inhub (DPI):**		100 mcg BID	---
	Fluticasone 100 mcg/salmeterol 50 mcg	---	1 puff BID	---
Mometasone furoate + Formoterol (LABA)	**Dulera:**	100 mcg BID	200 mcg BID	---
	Mometasone 50 mcg/Formoterol 5 mcg	2 puffs BID	---	---
	Mometasone 100 mcg/Formoterol 5 mcg	---	2 puffs BID	---

BID: twice daily; DPI: dry powder inhaler; HFA: hydrofluoroalkane propellant; ICS: inhaled corticosteroid; LABA: long-acting beta agonist; N/A: not applicable; pMDI: pressurized metered dose inhaler (ICS by pMDI should preferable be used with a spacer); VHD: Valved-holding device

Back to Stepwise Approach 12+

Inhaled Corticosteroid (ICS) dosing for Asthma Age ≥12 years old				
Medication	**Formulations & Available Products**	**Low dose**	**Medium dose**	**High dose***
		For most patients, the increase from medium to high dose ICS generally provides little additional benefit and there is an increased risk of side-effects, including adrenal suppression		
Beclometasone dipropionate	**Qvar Redihaler (DPI)**: (Do NOT use with a spacer or VHD)	80 mcg daily	120-240 mcg BID	---
	40 mcg/actuation	2 puffs BID	---	---
	80 mcg/actuation	1 puff BID	2 puffs BID	---
Budesonide	**Pulmicort Flexhaler (DPI)**:	90-180 mcg BID	360-540 mcg BID	---
	90 mcg/actuation	2 puffs BID	---	---
	180 mcg/actuation	1 puff BID	2 puffs BID	---
Ciclesonide	**Alvesco Inhalation Aerosol**:	80-160 mcg BID	160-320 mcg BID	---
	80 mcg/actuation	1 puff daily	2 puffs daily	---
	160 mcg/actuation	1 puff daily	2 puffs daily	---
Fluticasone furoate	**Arnuity Ellipta (DPI)**:	100 mcg daily	200 mcg daily	---
	100 mcg/actuation	1 puff daily	---	---
	200 mcg/actuation		1 puff daily	---
	Flovent HFA:	88 – 110 mcg BID	220 mcg BID	440 mcg BID
Fluticasone Propionate	44 mcg/actuation	2 puffs BID	---	---
	110 mcg/actuation	1 Puff BID	2 puffs BID	---
	220 mcg/actuation	---	1 puff BID	2 puffs BID
	Flovent Diskus (DPI):	100 mcg BID	200-250 mcg BID	500 mcg BID
	50 mcg/actuation	2 puffs BID	---	---
	100 mcg/actuation	1 puff BID	2 puffs BID	---
	250 mcg/actuation	---	1 puff BID	2 puffs BID
	Asmanex Twisthaler (DPI):	110-220 mcg QPM	440 mcg daily	≥330 mcg BID
Mometasone furoate	110 mcg/actuation	1-2 puffs daily	---	---
	220 mcg/actuation	1 puff daily	2 puffs daily	≥3 puffs divided in 2 doses
	Asmanex HFA:	100 mcg BID	200 mcg BID	400 mcg BID
	100 mcg/actuation	1 puff BID	2 puffs BID	---
	200 mcg/actuation	---	1 puff BID	2 puffs BID
Combination Products				
	Symbicort HFA	160 mcg BID	320 mcg BID	320 mcg BID
Budesonide and Formoterol (ICS/LABA)	Budesonide 80 mcg/Formoterol 4.5 mcg	2 puffs BID	---	---
	Budesonide 160 mcg/Formoterol 4.5 mcg	---	2 puffs BID	2 puffs BID
	Advair Discus, Wixela Inhub (DPI):	100 mcg BID	250 mcg BID	500 mcg BID

Inhaled Corticosteroid (ICS) dosing for Asthma Age ≥12 years old, cont.				
Fluticasone propionate and salmeterol (ICS/LABA)	Fluticasone 100 mcg/salmeterol 50 mcg	1 puff BID	---	---
	Fluticasone 250 mcg/salmeterol 50 mcg	---	1 puff BID	---
	Fluticasone 500 mcg/salmeterol 50 mcg	---	---	1 puff BID
	Advair HFA:	90 mcg BID	230 mcg BID	460 mcg BID
	Fluticasone 45 mcg/salmeterol 21 mcg	2 puffs BID	---	---
	Fluticasone 115 mcg/salmeterol 21 mcg	---	2 puffs BID	---
	Fluticasone 230 mcg/salmeterol 21 mcg	---	---	2 puffs BID
	Dulera:	200 mcg BID	400 mcg BID	400 mcg BID
Mometasone furoate and Formoterol (ICS/LABA)	Mometasone 100 mcg/Formoterol 5 mcg	2 puffs BID	---	---
	Mometasone 200 mcg/Formoterol 5 mcg	---	2 puffs BID	2 puffs BID

BID: twice daily; DPI: dry powder inhaler; HFA: hydrofluoroalkane propellant; ICS: inhaled corticosteroid; LABA: long-acting beta agonist; N/A: not applicable; pMDI: pressurized metered dose inhaler (ICS by pMDI should preferable be used with a spacer); VHD: Valved-holding device

Quality Care Network

University Hospitals Rainbow Babies & Children's

Childhood Asthma Control Test (For Ages 4 – 11 Years)

Patient name _____ Date _____

Please have your child answer questions 1 – 4. Ask your child to fill in the circle under the picture that matches how he/she feels.

1. How is your asthma today?

○ Very Bad = 0

○ Bad = 1

○ Good = 2

○ Very Good = 3

2. How much of a problem is your asthma when you play sports?

○ It's a problem; I can't do what I want = 0

○ It's a problem; I don't like it = 1

○ It's a little problem but it's OK = 2

○ It's not a problem = 3

3. Do you cough because of your asthma?

○ Yes, all of the time = 0

○ Yes, most of the time = 1

○ Yes, some of the time = 2

○ No, none of the time = 3

4. Do you wake up during the night because of your asthma?

○ Yes, all of the time = 0

○ Yes, most of the time = 1

○ Yes, some of the time = 2

○ No, none of the time = 3

Continued on reverse side

As your child's caregiver, please complete the following questions:

5. **During the past four weeks, how many days did your child have daytime asthma symptoms?**
   - Not at all = 5 points
   - 1 – 3 days/mo = 4 points
   - 4 – 10 days/mo = 3 points
   - 11 – 18 days/mo = 2 points
   - 19 – 24 days/mo = 1 point
   - Everyday = 0 points

6. **During the past four weeks, how many days did your child wheeze during the day because of asthma?**
   - Not at all = 5 points
   - 1 – 3 days/mo = 4 points
   - 4 – 10 days/mo = 3 points
   - 11 – 18 days/mo = 2 points
   - 19 – 24 days/mo = 1 point
   - Everyday = 0 points

7. **During the past four weeks, how many days did your child wake up during the night because of asthma?**
   - Not at all = 5 points
   - 1 – 3 days/mo = 4 points
   - 4 – 10 days/mo = 3 points
   - 11 – 18 days/mo = 2 points
   - 19 – 24 days/mo = 1 point
   - Everyday = 0 points

Total Score: _____

If your score is 19 or less, your asthma may not be controlled as well as it could be.

Adapted from Asthma Control Test™ developed by GlaxoSmithKline.

As your child's caregiver, please complete these additional questions:

1. **Has your child taken steroids by mouth (such as prednisone, prednisolone, Decadron or dexamethasone) more than once in the past 12 months?**
   - Yes – How many times? _____
   - No

2. **Has your child been to the emergency department because of an asthma attack more than once in the past 12 months?**
   - Yes – How many times? _____
   - No

3. **Has your child spent the night in the hospital in the past 12 months because of an asthma attack?**
   - Yes – How many times was he/she admitted? _____
   - No

University Hospitals
Rainbow Babies & Children's

216-UH4-KIDS (216-844-5437)
UHRainbow.org

University Hospitals
Rainbow Babies & Children's

Asthma Control Test (For Ages 12 and Up)

Patient name _____ Date _____

Patient birth date (MM/DD/YYYY) _____

This survey was designed to help you describe your asthma and how your asthma affects how you feel and what you are able to do.

To complete it, please color the bubble for the number that best describes you.

1. **In the past four weeks, how much of the time did your asthma keep you from getting as much done at school or at home?**
   - ◯ None of the time = 5 points
   - ◯ A little of the time = 4 points
   - ◯ Some of the time = 3 points
   - ◯ Most of the time = 2 points
   - ◯ All of the time = 1 point

2. **During the past four weeks, how often have you had shortness of breath?**
   - ◯ Not at all = 5 points
   - ◯ Once or twice a week = 4 points
   - ◯ 3 to 6 times a week = 3 points
   - ◯ Once a day = 2 points
   - ◯ More than once a day = 1 point

3. **During the past four weeks, how often did your asthma symptoms (wheezing, coughing, shortness of breath, chest tightness or pain) wake you up at night or earlier than usual in the morning?**
   - ◯ Not at all = 5 points
   - ◯ Once or twice = 4 points
   - ◯ Once a week = 3 points
   - ◯ 2 to 3 nights a week = 2 points
   - ◯ 4 or more nights a week = 1 point

4. **During the past four weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?**
   - ◯ Not at all = 5 points
   - ◯ Once a week or less = 4 points
   - ◯ 2 or 3 times per week = 3 points
   - ◯ 1 or 2 times per day = 2 points
   - ◯ 3 or more times per day = 1 point

5. **How would you rate your asthma control during the past four weeks?**
   - ◯ Completely controlled = 5 points
   - ◯ Well-controlled = 4 points
   - ◯ Somewhat controlled = 3 points
   - ◯ Poorly controlled = 2 points
   - ◯ Not controlled at all = 1 point

Total Score: _____

If your score is 19 or less, your asthma may not be controlled as well as it could be.

Please complete these additional questions:

1. **Have you taken steroids by mouth (such as prednisone, prednisolone, Decadron or dexamethasone) more than once in the past 12 months?**
   - ◯ Yes – How many times? _____
   - ◯ No
2. **Have you been to the emergency department because of an asthma attack more than once in the past 12 months?**
   - ◯ Yes – How many times? _____
   - ◯ No
3. **Have you spent the night in the hospital in the past 12 months because of an asthma attack?**
   - ◯ Yes - How many times were you admitted?
   - ◯ No

Adapted from Asthma Control Test™ developed by GlaxoSmithKline.