

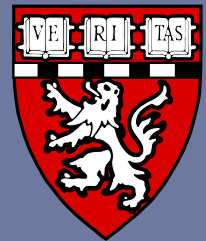
Diagnostic Considerations in Children with Severe Asthma

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Update on Severe Asthma 2026

March 16, 2026



Objectives

- To identify current diagnostic criteria for severe asthma in children
- To understand the evaluation of patients with severe asthma

Some definitions

ATS/ERS Severe Asthma 2014

- Asthma that requires treatment with **high dose inhaled corticosteroids** plus a **second controller** *throughout the previous year*
 - *OR*
- **Systemic corticosteroids** for **50%** *of the previous year*

To prevent asthma from becoming “uncontrolled” or asthma that remains “uncontrolled” despite these therapies

Chung KF, et al. (2014) ERJ



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Chung KF, et al. (2014) ERJ

GINA Severe Asthma 2025

- Uncontrolled asthma
 - *Poor symptom control*
 - *Frequent (≥ 2 /year) exacerbations*
- *Difficult to treat asthma*
 - *Uncontrolled despite medium/high dose ICS - LABA*
 - *May be due to modifiable factors*
- *Severe Asthma*
 - *Uncontrolled despite adherence to maximal optimized high-dose therapy and contributory factors or becomes uncontrolled when therapy is weaned*

GINA 2025



How to apply these to kids

How High is High Dose ICS?

Inhaled Corticosteroid	Threshold of daily dose in µg considered high	
	Age 6-11 years	Age ≥12 years
Beclomethasone	> 200 (HFA MDI)	> 400 (DPI) > 1000 (MDI)
Budesonide	> 400 (MDI or DPI) >1000 (Neb)	> 800 (MDI or DPI)
Ciclesonide	> 160 (MDI)	> 320 (MDI)
Fluticasone propionate	> 200 (MDI or DPI)	>500 (MDI or DPI)
Fluticasone furoate		>200
Mometasone furoate	> 200 (MDI)	> 400 (MDI)

What is Uncontrolled?

- Poor symptom control
 - “Not well controlled” by NAEPP or GINA asthma treatment guidelines
 - “Rule of 2s” (2 days/week, 2 nights/month)
 - Standardized assessments:
 - Asthma Control Questionnaire score consistently > 1.5
 - Asthma Control Test Score < 20
- Frequent severe exacerbations
 - ≥ 2 bursts of systemic corticosteroids in the previous 12 months

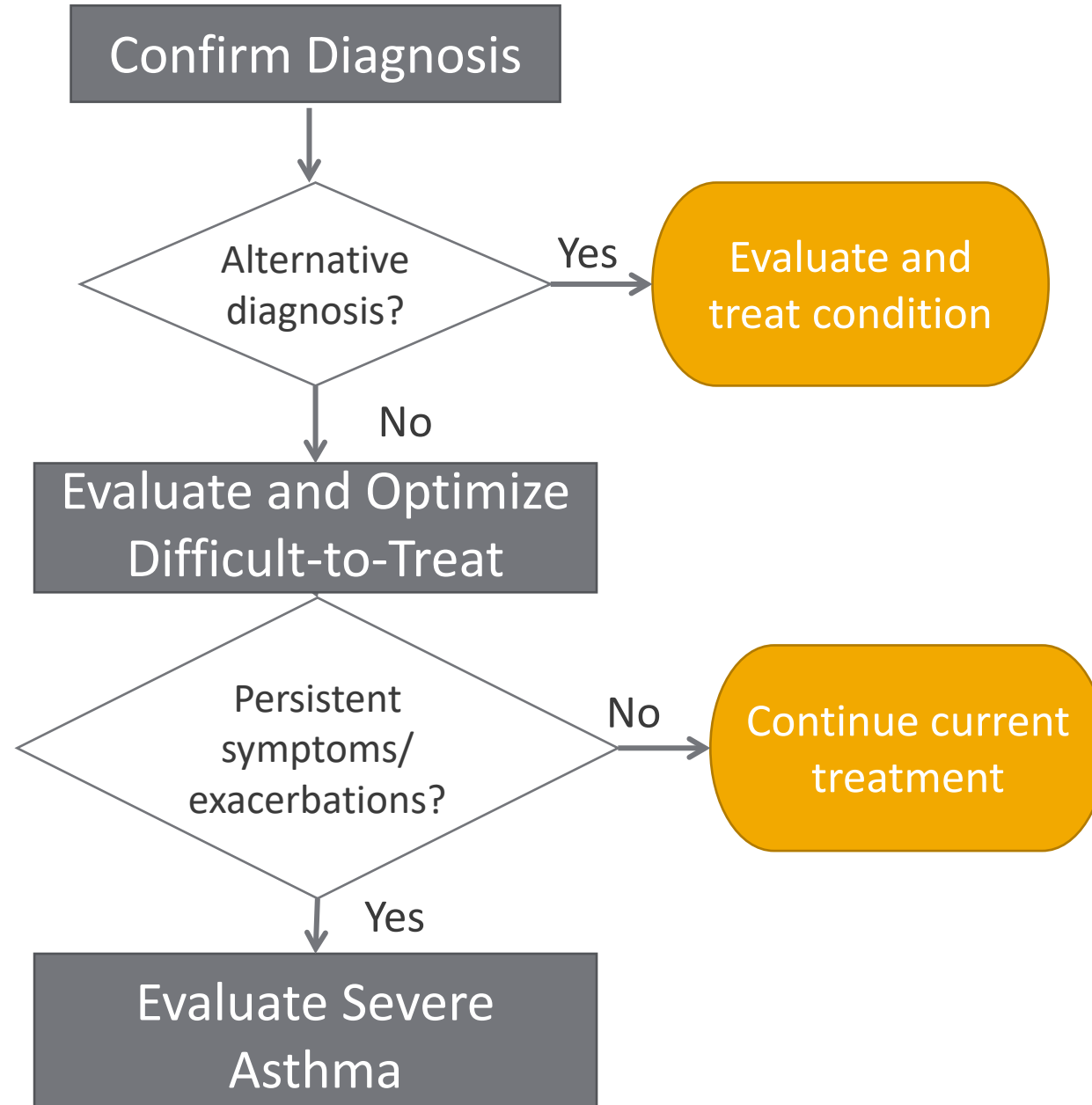
OR
- Serious exacerbations
 - at least one hospitalization, ICU stay or mechanical ventilation in the previous 12 months

OR
- Presence of airflow limitation evidenced by FEV1 < LLN predicted (in the context of reduced FEV1/FVC)

Approach to the Severe Asthma Patient

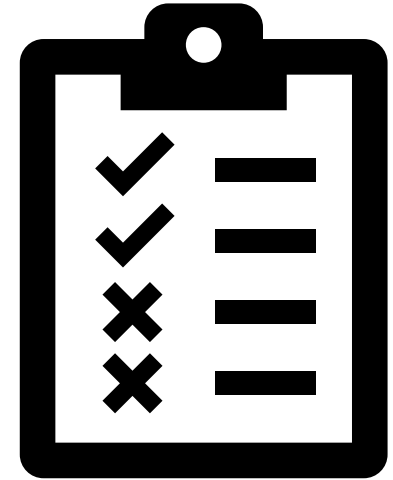
Barsky EE, Giancola LM, Baxi SN, Gaffin JM. A Practical Approach to Severe Asthma in Children. *Ann Am Thorac Soc*. 2018; Bush A, Fitzpatrick AM, Saglani S, Anderson WC 3rd, Szefler SJ. Difficult-to-Treat Asthma Management in School-Age Children. *J Allergy Clin Immunol Pract*. 2018





Confirm the Diagnosis of Asthma

- 12-30% of severe asthma referrals are misdiagnosed
- Initial evaluation
 - Careful history and examination
 - Wheeze vs stridor vs neither
 - Cough characteristics
 - Croupy, barking, honking, brassy
 - Triggers
 - Classic: infection, allergy, temperature, pollutants
 - Exercise, stress, anxiety
 - Eating/drinking
 - Dysphagia, food impaction, GERD symptoms
 - Recurrent sinopulmonary infections
 - Growth and development
 - Neonatal respiratory difficulties

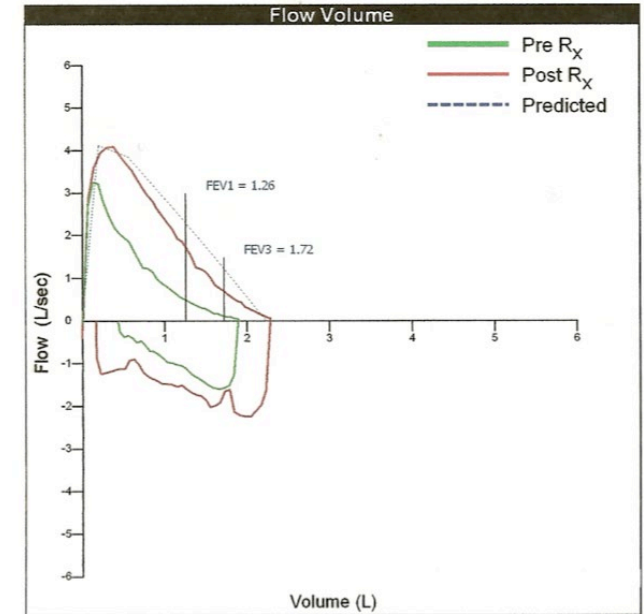


Lodrup Carlsen KC, et al. (2011) ERJ



Confirm the Diagnosis of Asthma

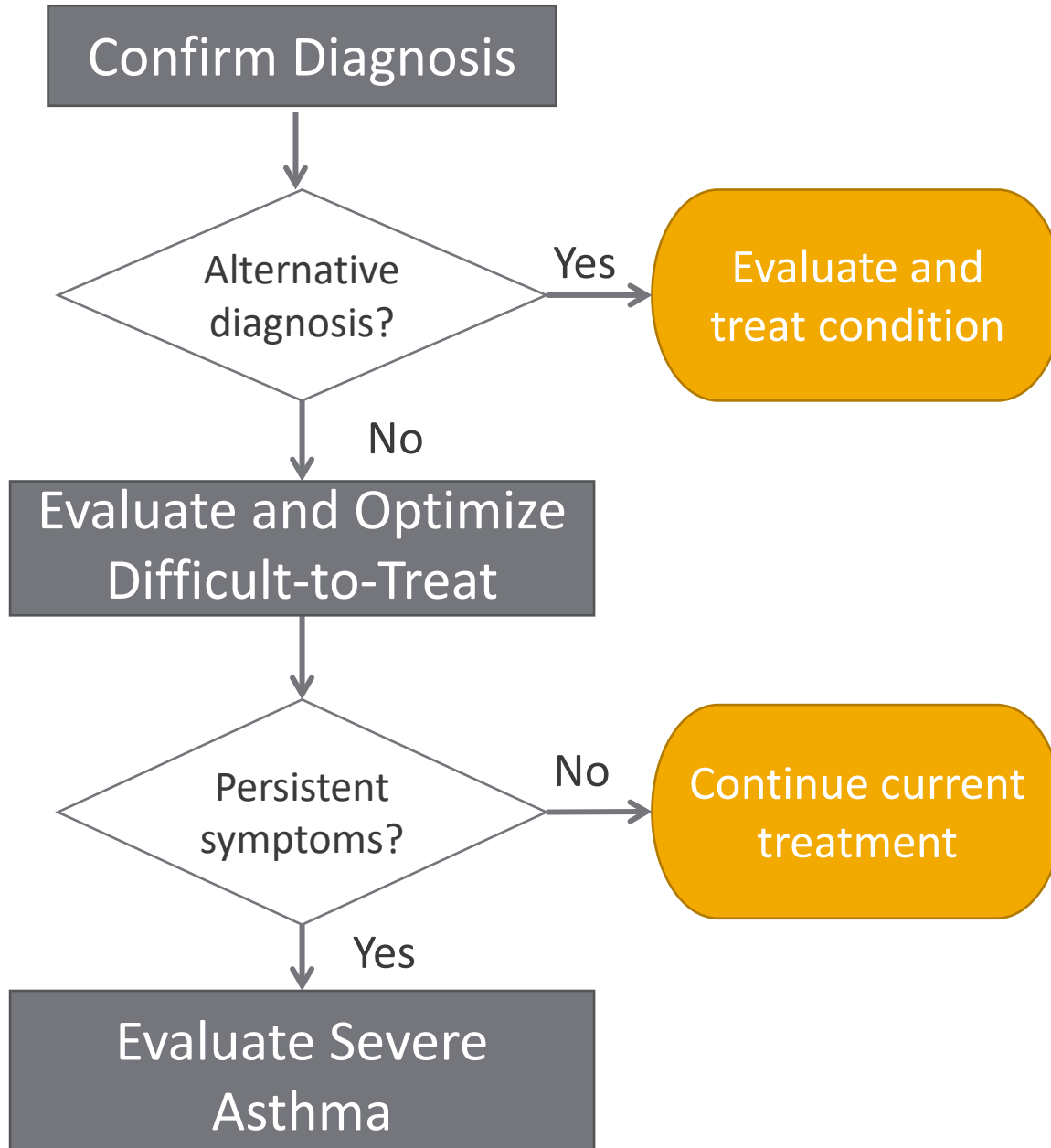
- Diagnostic testing
 - Spirometry: Expiratory AND Inspiratory
 - Bronchodilator reversibility
 - FeNO
 - Allergy assessment (specific IgE, skin prick)
 - Immune evaluation (for recurrent exacerbations/infections)
 - Chest x-ray



...And Rule Out Masqueraders

- **Suppurative lung diseases**
 - Cystic Fibrosis, Primary Ciliary Dyskinesia, Chronic infection
- **Dysfunctional breathing**
 - *Inducible laryngeal obstruction (ILO)*, Panic Attacks
- **Immune dysfunction/Rheumatologic disorders**
 - Hypogammaglobulinemia
 - EGPA
- **Anatomic abnormalities**
 - *Tracheobronchomalacia, Chronic aspiration*, TEF, Connective tissue disease
 - Congenital malformations, Vascular rings
- **Interstitial lung disease**
 - Bronchiolitis obliterans





Evaluate and Optimize Difficult-to-Treat

- “Difficult to Treat” is asthma that **can** be controlled with appropriate management if properly enacted
 - Up to 55% of severe asthma referrals
- Key components
 - Medication delivery
 - Environmental exposures (Home/School)
 - Psychosocial factors
 - Comorbid conditions

Bracken M, et al. (2009) *Arch dis child*

12



Medication Adherence and Delivery is Poor

- Adherence
 - <math><1/2</math> patients fill 80% prescriptions
 - 1/3 patients fill <math><50\%</math> prescriptions
- Supervision is poor
 - 20% of 7 year olds, 50% of 11 year olds are unsupervised
- Technique is frequently poor
 - Non-sustainable



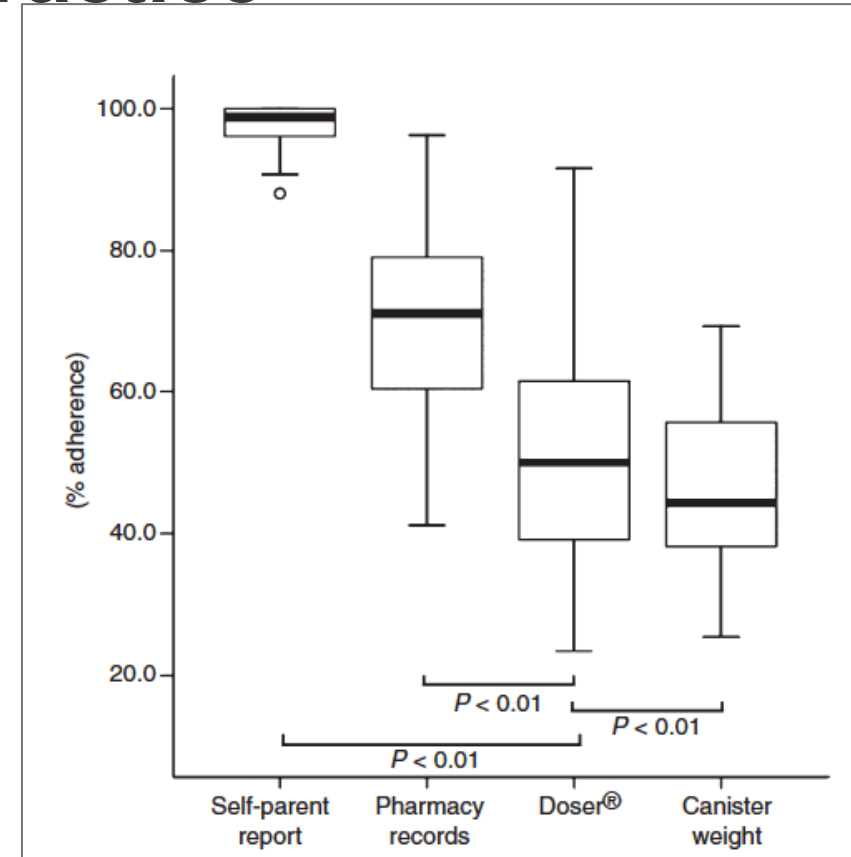
House MD, Fox/Universal, 2004-12

Bracken M, et al. (2009) *Arch dis child*
Orell-Valente JK, et al. (2008) *Pediatrics*



Assessing adherence in clinical practice

- Objective adherence assessment
 - Pharmacy refill data
 - Limitation
 - Samples/stockpiling
 - Personal use information
 - Electronic monitoring devices
 - Time-date-location data
 - Limitation
 - Costly
 - Lack of data improving adherence
- *Bring* medications and review technique at *each* visit
- Partner with school nurse



Jentsch, N.S., et al. (2009) Allergy
Gerald LB, et al. (2009) Pediatrics
Haltermann J, et al. (2012) J Pediatrics
De Keyser H, et al. (2020) Respir Med.

School asthma programs improve adherence and outcomes



Partner with School Nurse

- Evidence-based improved clinical outcomes
 - Increased medication adherence rates
 - Improved Symptoms
 - Decreased school absenteeism
 - **Reduction in ED/Hospitalization rate**

- Other benefits
 - Objective assessment of child daily
 - Knowledgeable about exposures/social issues
 - Normalizes the morning routine for patients and families

Sustained reduction in ED and Hospital Admissions for Participants in Asthma Link

Outcomes: mean (SD) <i>p</i> -value (n = 83)	Year prior to enrollment	0-1 Year after enrollment	1-2 Years after enrollment	2-3 Years after enrollment	3-4 Years after enrollment
Asthma-related ED visits	0.84 (1.22)	0.27 (0.59) <i><0.001</i>	0.34 (0.67) <i>0.003</i>	0.25 (0.71) <i><0.001</i>	0.42 (1.06) <i>0.002</i>
Asthma-related hospital admissions	0.29 (0.55)	0.04 (0.19) <i><0.001</i>	0.06 (0.29) <i><0.001</i>	0.07 (0.38) <i><0.001</i>	0.08 (0.42) <i><0.001</i>

Shillan H,...Trivedi MK. J Sch Nurs. 2024

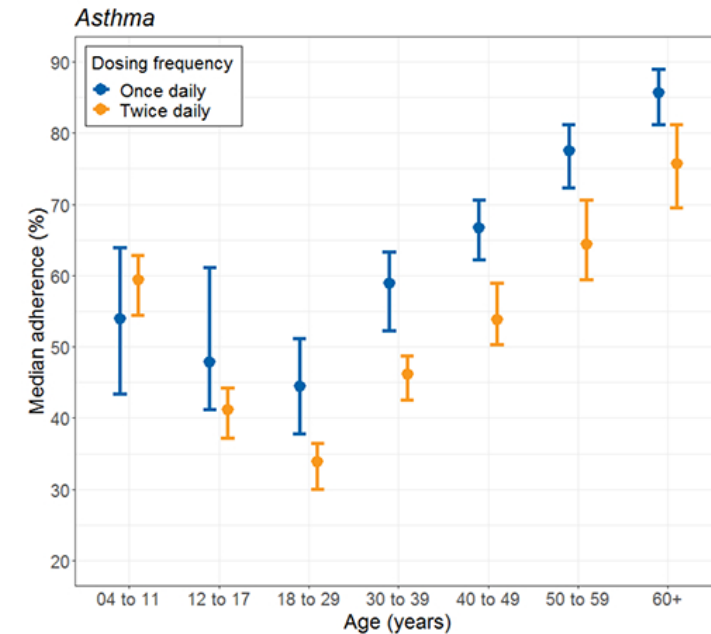
Gerald LB, et al. Pediatrics 2009
 Halterman J, et al. J Pediatrics 2012



Adjust medications to optimize technique and adherence

- Consider medications dosed once daily
- Consider DPIs or devices that do not require a spacer chamber for optimal deposition

Greater adherence with once daily dosing of inhalers



De Keyser H, et al. J Allergy Clin Immunol Pract. 2023



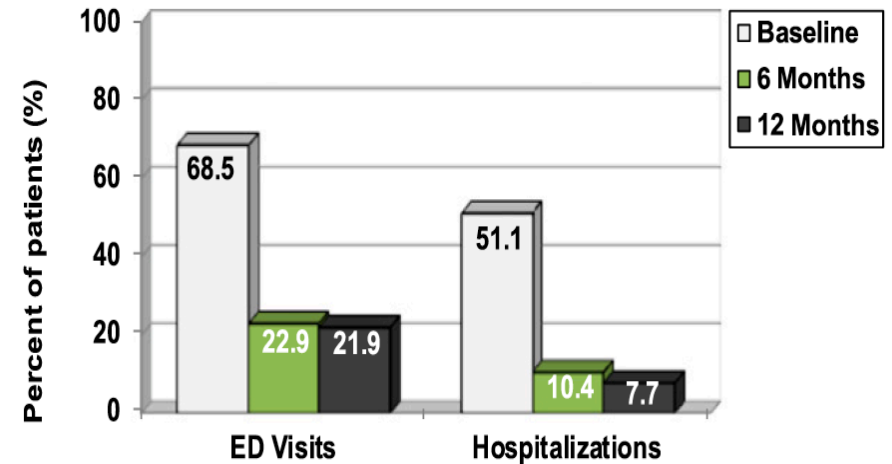
Home Assessment (& Intervention) improve ED and Hospitalization rates

■ Home visit

- Allergen exposure → Remediation
- Toxin exposure → Remediation
- Organization/clutter → support
- Social dysfunction → support
- Medicine accountability

➤ *Virtual* home visit can expand access

Home asthma visits reduce asthma morbidity



Woods ER, et al. (2012) Pediatrics



Home Asthma Evaluation Resources

- DPH list of asthma home visiting programs in MA, updated yearly
 - <https://www.mass.gov/info-details/community-health-worker-led-asthma-home-visiting>
- Referring directly to BPHC Breathe Easy Program: housing inspection. Boston only
 - <https://www.boston.gov/departments/public-health-commission/breathe-easy-home>

Organization	Organization Location	Primary Areas Served	Program Type		
			Pediatric	Adult	Older Adults
Boston Children's Hospital	Boston	Metro Boston	✓		
Boston Public Health Commission	Boston	Boston	✓	✓	✓
Caring Health Center	Springfield	Springfield; Hampden County	✓	✓	✓
East Boston Neighborhood Health Center	East Boston	Metro Boston	✓	✓	
Lowell Community Health Center	Lowell	Lowell; Merrimack Valley		✓	✓
Massachusetts General Hospital	Boston	Boston, Chelsea, Revere, Charlestown, Everett	✓	✓	✓
Pediatric Physician's Organization at Children's	Boston	Statewide	✓		
Revitalize CDC	Springfield	Springfield, Holyoke, Chicopee	✓	✓	✓
UMass Memorial Health	Worcester	Worcester County	✓		

eligibility for home visiting services may vary by program

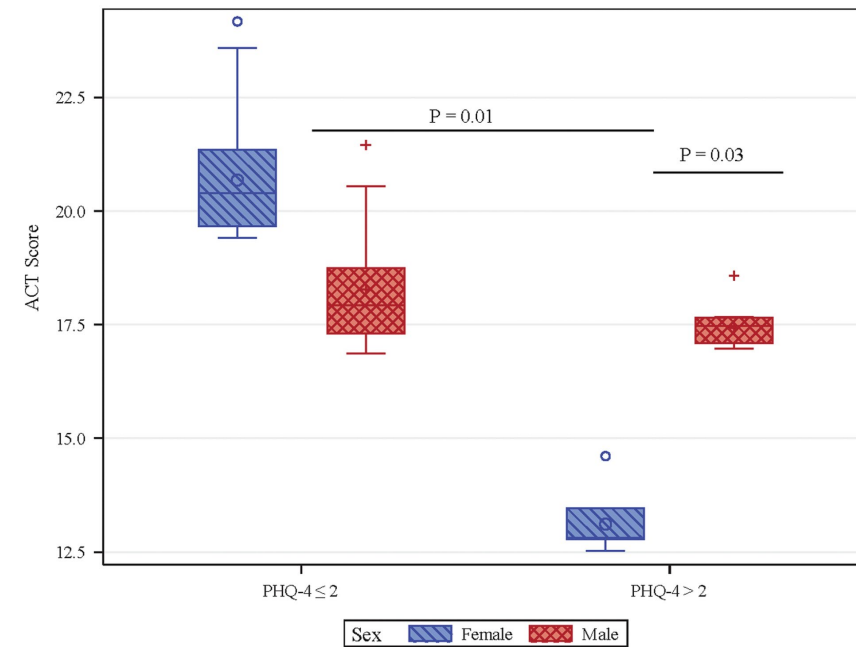




Psychosocial assessment

- Mental health evaluation (patient & caregiver)
 - Anxiety
 - Depression
 - ADHD
 - PTSD
 - Secondary gain
- Psychologist/Social worker
- Screening tools
 - Incomplete
 - Difficult to incorporate into visit

Increased anxiety/depressive symptoms associated greater asthma symptoms



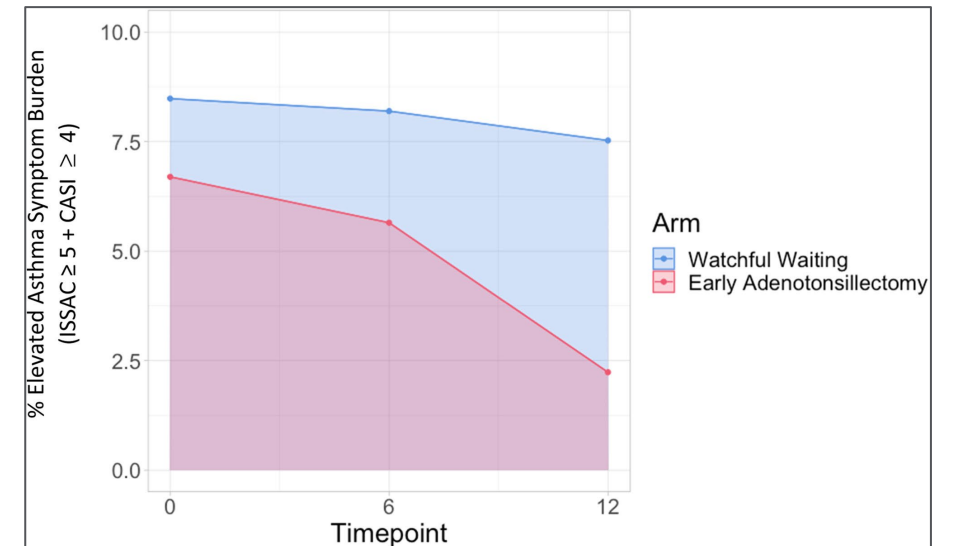
Griffiths D...Gaffin JM. Pediatr Pulmonol. 2021



Comorbidities

- Rhinosinusitis
- GERD (symptomatic)
- ILO (VCD)
- **Obesity**
- **OSA**
- ABPA
- EoE/dysphagia

Adenotonsillectomy improves asthma symptoms: Pediatric Adenotonsillectomy Trial for Snoring (PATS)

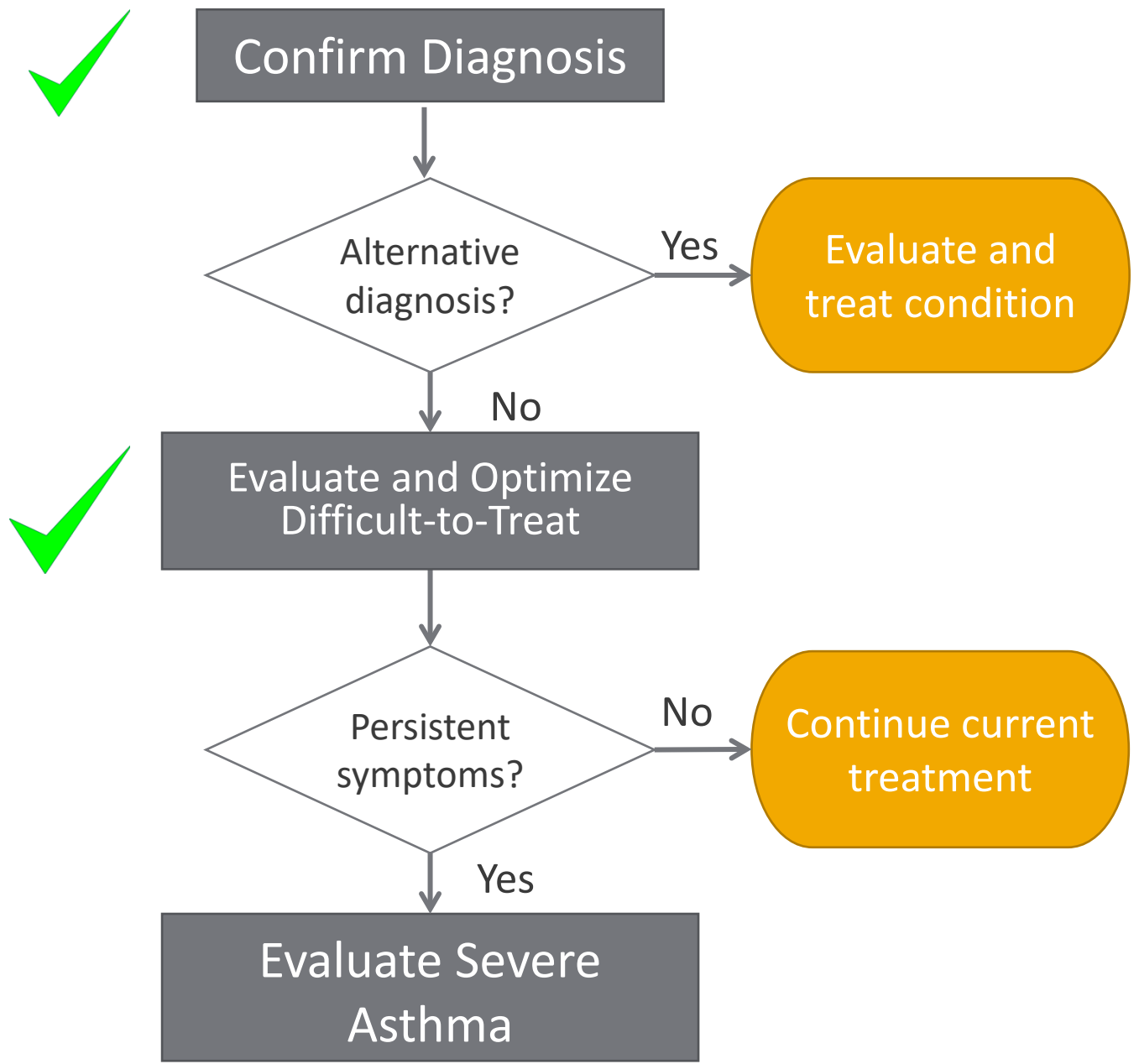


Gueye-Ndiaye S, et al. Pediatr Pulmonol. 2024

Gaffin JM, et al. JACI Pract. 2022

Gunnlaugsson S, ...Gaffin JM. J Asthma. 2022

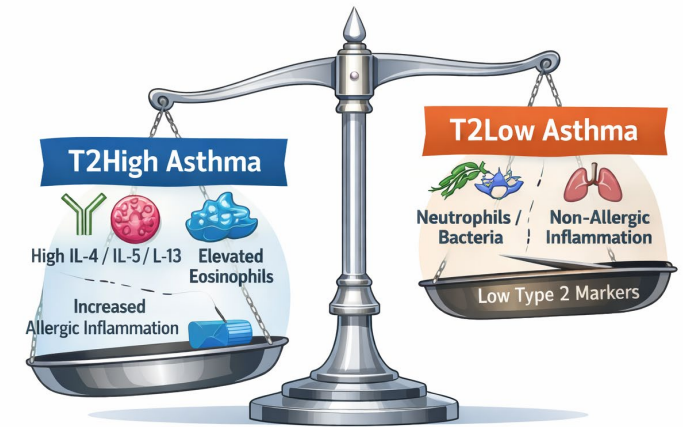




Advanced Evaluation for Severe Asthma

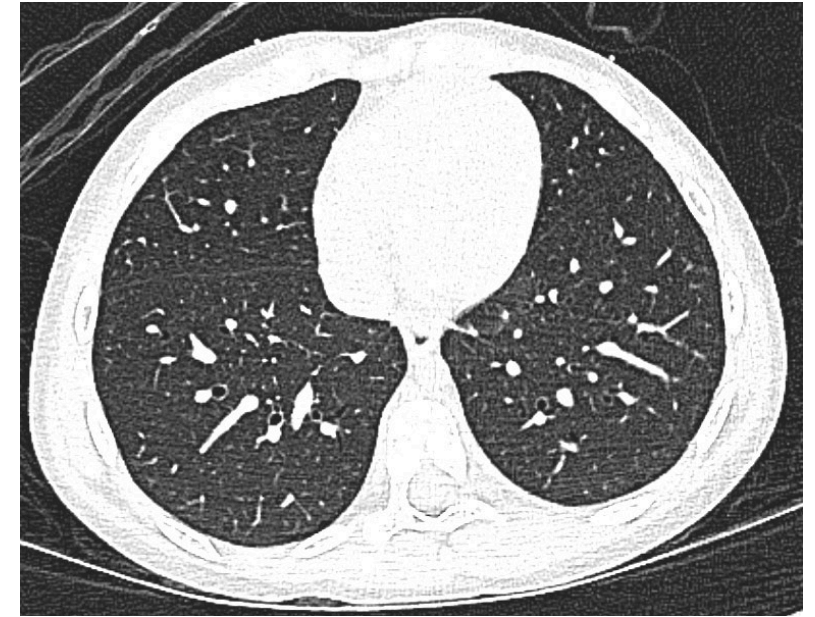
▪ Evaluate Severe Asthma Endotypes

- Total IgE, specific IgE/Skin Prick Testing (Perennial allergens)
- Blood Eosinophil Count
- FeNO (approximately 8% will have low eos)



When to get advanced imaging?

- Chest CT for atypical presentations
 - T2 low asthma
 - Suspicion of bronchiectasis
 - Recurrent pneumonia, persistent wet cough
 - Fixed airflow obstruction
 - Failure to respond to biologic in T2 high asthma
 - Atypical features
 - Monophonic wheeze
 - Symptoms or signs of vascular compression (cxr with right sided aortic arch or tracheal indentation)
- Modified Barium Swallow
 - Respiratory symptoms associated with feeds/eating
 - Symptoms since birth





Role for Bronchoscopy in pediatric asthma

- Anatomic evaluation
 - Dynamic bronchoscopy for tracheobronchomalacia
 - External compression (vascular) or fixed obstruction (tracheal ring)
 - Evaluation of bronchiectasis
 - Assess inflammation, cultures
- Direct Laryngoscopy and Bronchoscopy
 - Concern for chronic aspiration
 - Assess for laryngeal cleft
 - Tracheal pathology
- Esophagogastroduodenoscopy (EGD)
 - Assess comorbid EoE or esophageal dysmotility

Boston Children's Hospital Severe Asthma Program



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**BCH
Community
Asthma
Initiative**

Summary

- Evaluation of asthma should include confirmation of diagnosis, assessment of comorbidities, modifiable risk factors to address Difficult-to-Treat asthma
- Most Pediatric Severe Asthma is characterized as T2 high and can be controlled with adherence to ICS-based therapies
- For atypical presentations or concerning pointers noted during evaluation, advanced imaging and bronchoscopy should be considered



Thank You!

