

Please see appendix for abbreviations listed in this algorithm

Asthma Diagnosis and Management Algorithm for Primary Care

Patient Presents with Asthma Symptoms
(cough, dyspnea, chest tightness, wheezing, sputum production, nocturnal symptoms/awakenings)

Objectively Confirm Diagnosis: 2012 Asthma Guidelines and 2015 Preschool asthma guidelines: <http://www.respiratoryguidelines.ca/>

<p>Preschoolers - Children 1-5 yrs of age (Spirometry not possible) (2)* Diagnosis of asthma considered in children one to five years with frequent (≥8 days/month) asthma-like symptoms or recurrent (≥2) exacerbations showing <u>all</u> of the following:</p> <p>1. Airflow Obstruction:</p> <p>A) Wheezing documented by a trained HCP using stethoscope (preferred) B) Parents report 'wheezing' (alternative)</p> <p>2. Reversibility of airflow obstruction</p> <p>A) documented response to SABA (+/- oral steroids) by a trained physician or HCP during acute exacerbation (preferred) B) Parental report of symptomatic response to a 3 month therapeutic trial of medium dose ICS with SABA as needed (alternative)</p> <p>3. No clinical suspicion of alternate diagnosis</p> <p>Children ≥ 6 yrs to 11yrs:</p> <p>1. Preferred: Spirometry showing reversible airway obstruction:</p> <ul style="list-style-type: none"> • FEV₁/FVC ratio < LLN (approx. < 0.80-0.90) based on age, sex, height and ethnicity • And ≥12% change in FEV₁ post bronchodilator or after course of controller therapy <p>2. Alternative: Improvement in PEF**: ≥20% post bronchodilator or after course of controller therapy (diurnal variation not recommended)</p> <p>3. Alternative: Positive Challenge Test (if spirometry inconclusive): Methacholine challenge testing or Exercise challenge</p>	<p>Adults (≥ 12 yrs):</p> <p>1. Preferred: Spirometry showing reversible airway obstruction:</p> <ul style="list-style-type: none"> • FEV₁/FVC ratio < LLN (approx. < 0.75-0.80) based on age, sex, height and ethnicity • And ≥12% and min ≥200 mL change in FEV₁ post bronchodilator or after course of controller therapy <p>2. Alternative: Improvement in PEF**: 60L/min (min ≥20%) (post bronchodilator or after course of controller therapy) or diurnal variation >8% (based on 2 times/day reading), >20% (based on multiple daily readings)</p> <p>3. Alternative: Positive Challenge Test (if spirometry inconclusive): Methacholine challenge testing or Exercise challenge</p>
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Asthma Not Confirmed

Consider

- Was testing done when patient was not exposed to any triggers or asymptomatic? (If yes, consider repeat testing when patient exposed/symptomatic or consider methacholine and/or exercise challenge test) or allergy testing
- Differential diagnosis: examples include COPD, CF, IPF, VCD, GERD, CHF, primary ciliary dyskinesia, infectious/allergic rhinosinusitis, upper airway narrowing, bronchiectasis, pertussis, foreign-body inhalation, aspiration, pneumonia, atelectasis, tuberculosis, eosinophilic esophagitis, immune dysfunction, swallowing problem, pulmonary edema (2)

Asthma Confirmed

Patient Assessment

- Discuss:
- History of exacerbations
 - Family history of asthma/allergies
 - Smoking history (and exposure to smoke)
 - Respiratory medication history (check for β-blocker, NSAID/ASA use, medic alert bracelet, epinephrine auto injector) and client's drug plan
 - History of triggers (skin testing may be indicated)
 - Irritant triggers (especially colds in children)
 - Relevant co-morbidities (i.e., sinusitis, rhinitis, GERD, obesity)
 - Work-related triggers
 - Special considerations (i.e., adherence, cultural issues, financial issues, lack of support)

Management

Pharmacological (Baseline Maintenance Therapy):

Based on the CTS 2012 Asthma Management continuum (3) and the CTS 2015 Asthma guideline for preschoolers (2), to determine medication needed to achieve control (baseline maintenance therapy)

Adjust therapy to achieve and maintain control and prevent future risk:

1. All should be on a reliever on demand: SABA***
2. **Still Uncontrolled (refer to "Review Control" table):** Add regular controller therapy (ICSs are the first-line controller therapy for all ages)
3. **Still Uncontrolled:**
Children (1-5 yrs and 6-11yrs): increase low dose ICS to medium dose ICS
Adults and children ≥12 yrs : add LABA if on ICS (ideally in the same inhaler device)
4. **Still Uncontrolled:**
Children (1-5 yrs): referral to asthma specialist
Children (6-11yrs): add LABA or LTRA
Adults and children ≥12 yrs : Add LTRA
5. **Still Uncontrolled:**
Refer to specialist, consider adding prednisone

Pharmacological (Asthma Exacerbation):

CTS 2012 recommended controller step-up therapy when patient has acute loss of control on their baseline maintenance therapy (yellow zone of **ASTHMA ACTION PLAN)**

Children (1-5 yrs and 6-11yrs) Step-up

If the patient has no baseline maintenance medication: consider starting regular controller therapy
If baseline maintenance medication is ICS: add prednisone 1mg/kg x 3-5 days

Adults (≥12 years) Step-up

If the patient has no baseline maintenance medication: consider starting regular controller therapy
If baseline maintenance medication is ICS: 1st choice: Trial ≥ 4-fold ↑ in ICS (dosing should not exceed manufacturer's recommended maximum daily dose) for 7-14 days. 2nd choice: Add prednisone 30-50mg for at least 5 days

If baseline maintenance medication is ICS/LABA (BUD/FORM): 1st choice: ↑ to max 4 puffs BID for 7-14 days (Max 8 puffs/day). 2nd choice: Add prednisone 30-50mg for at least 5 days

If baseline maintenance medication is ICS/LABA (FP/SALM or MOM/FORM):
1st choice: Trial ≥ 4-fold ↑ in ICS for 7-14 days. 2nd choice: Add prednisone 30-50mg for at least 5 days

Note: Post-exacerbation, diligent follow-up should be done to consider stepping down add-on therapy

Non-Pharmacological (Education)

- Refer to Certified Asthma/Respiratory Educator, if available
- Discuss asthma pathophysiology, triggers, comorbidities, inhaler technique, reliever vs. controller, medication safety and side effects, adherence, asthma control
- Smoking cessation counselling when appropriate
- Create and review written **ASTHMA ACTION PLAN** (instruction for when there is loss of control) Note: If, after reviewing control, it is determined that the patient is uncontrolled on their baseline maintenance therapy, they are in the yellow zone and the CTS 2012 recommended controller step-up therapy should be started
- Prevention of exacerbations: environmental control (i.e. work, home and school environment), tobacco smoke exposure, environmental triggers, irritant triggers, vaccination (influenza), immunotherapy

Review Control

(Reassess at each visit)[§]

Resources: Asthma Action Plan (hcp.lunghealth.ca/clinical-tools)

Control indicates all of the following criteria are met

Daytime symptoms (dyspnea, cough, wheeze, chest tightness): < 4 days/week	Need for a reliever: < 4 doses/week (pre-exercise doses should be included in weekly limit)
Night time symptoms: < 1 night/week	FEV ₁ or PEF: ≥ 90% of personal best
Physical activity: normal	Diurnal variability in PEF < 10%-15% over a 2 week period (readings morning and night)
Asthma exacerbations within the last 12 months: mild, infrequent	Formula = $\frac{\text{Highest PEF} - \text{Lowest PEF}}{\text{Highest PEF}} \times 100$
No absence from school/work due to asthma	Sputum eosinophils† < 2-3%

† Consider as an additional measure of asthma control in individuals ≥ 18 years with moderate to severe asthma who are assessed in specialized centres. §preschoolers with ≥8 days/month of asthma symptoms or ≥2 severe exacerbations should be considered poorly controlled and should have ICS therapy initiated

Consider Referral to a Specialist:

- Not certain of diagnosis
- Sputum eosinophil monitoring
- Difficulty in determining baseline medication regimen
- Severe asthma requiring alternate therapy
- Recent ER/hospital admission or recurring exacerbations (≥2 for preschoolers [2])

Follow-Up

- Regularly reassess control (every 3-4 months for preschoolers[2]), inhaler technique, adherence, triggers, comorbidities, spirometry or PEF****
- Review medication regime and consider modifying maintenance therapy (consider stepping down add-on therapy or de-increase ICS dose if asthma is well-controlled between visits)
- Review/Revise written **ASTHMA ACTION PLAN**

*CTS guidelines for Preschoolers (2): Please refer to latest CTS guidelines for detailed diagnosis algorithm for preschoolers
**Spirometry is the preferred method of documenting airflow limitation (12)
***ICS/LABA, in a formulation approved for use as a reliever for 12 years of age and older (BUD/FORM), may be considered as a reliever in individuals with mod. asthma and poor control despite fixed-dose maintenance ICS/LABA combination or for exacerbation prone individuals with uncontrolled asthma despite high maintenance dose of ICS or ICS/LABA
**** Spirometry is the preferred objective measure to help objectively assess asthma control (9).

Appendix:
Acronym:
BUD: Budesonide
COPD: Chronic Obstructive Pulmonary Disease
CF: Cystic Fibrosis
CHF: Congestive Heart Failure
ER: Emergency room
FORM: Formoterol
GERD: Gastroesophageal Reflux Disorder **HCP:** Health care professional
ICS: Inhaled Corticosteroid
IPF: Idiopathic Pulmonary Fibrosis
LABA: Long-Acting Beta₂-Agonist
LTRA: Leukotriene-Receptor Antagonist

MOM: Mometasone
PEF: Peak Expiratory Flow
SABA: Short Acting Beta₂-Agonist
SALM: Salmeterol
VCD: Vocal Cord Dysfunction

Definitions:
FEV₁: volume of air expired in the first second of the FVC (used to assess flow resistive properties of airway)
FVC: Maximum volume of air that can be expired forcefully and completely after complete inspiration
FEV₁/FVC: used for the assessment of airflow obstruction
LLN (Lower Limit of Normal): the value below the 5th percentile for the normal population (8)

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