

Asthma Diagnosis & Management Algorithm

FOR PRIMARY CARE (algorithm abbreviations are listed in the appendix below)

PATIENT PRESENTS WITH ASTHMA SYMPTOMS
(cough, dyspnea, chest tightness, wheezing, sputum production, nocturnal symptoms/awakenings)

OBJECTIVELY CONFIRM DIAGNOSIS

(CTS asthma guidelines cts-sct.ca/guideline-library)

Preschoolers to Children 1-5 years 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 all of the following:

- Airflow Obstruction**
 - Wheezing documented by a trained HCP using stethoscope (preferred)
 - Parents report 'wheezing' (alternative)
- Reversibility of airflow obstruction**
 - Documented response to SABA (+/- oral steroids) by a trained physician or HCP during acute exacerbation (preferred)
 - Parental report of symptomatic response to a 3 month therapeutic trial of medium dose ICS with SABA as needed (alternative)
- No clinical suspicion of alternate diagnosis**

Children ≥ 6 years to 11 years

- Preferred: Spirometry showing reversible airway obstruction**
 - FEV₁/FVC ratio < LLN (approx. < 0.80 - 0.90) based on age, sex, height and ethnicity
 - And $\geq 12\%$ change in FEV₁ post bronchodilator or after course of controller therapy
- Alternative: Improvement in PEF****
 - $\geq 20\%$ post bronchodilator or after course of controller therapy (diurnal variation not recommended)
- Alternative: Positive Challenge Test (if spirometry inconclusive)**
 - Methacholine challenge testing or Exercise challenge

Adults (≥ 12 yrs)

- Preferred: Spirometry showing reversible airway obstruction**
 - FEV₁/FVC ratio < LLN (approx. < 0.75 - 0.80) based on age, sex, height and ethnicity
 - And $\geq 12\%$ and min ≥ 200 mL change in FEV₁ post bronchodilator or after course of controller therapy
- Alternative: Improvement in PEF****
 - 60L/min (min $\geq 20\%$) (post bronchodilator or after course of controller therapy)
 - OR diurnal variation > 8% (based on 2 times/day reading), > 20% (based on multiple daily readings)
- Alternative: Positive Challenge Test (if spirometry inconclusive)**
 - Methacholine challenge testing or Exercise challenge

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

- History and risk 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)

ASTHMA MANAGEMENT

Pharmacological (Baseline Maintenance Therapy)

Based on the latest CTS guidelines - A focused update on the management of very mild and mild asthma
Adjust therapy to achieve and maintain control and prevent future risk:

- All should be on a reliever on demand:** SABA or bud/form***
- Still Uncontrolled (refer to "Review Control" table):** Change to daily ICS + SABA prn or PRN bud/form***
- Still Uncontrolled:**
 - Children (1-5 years and 6-11 years):** increase low dose ICS to medium dose ICS
 - Adults and children ≥ 12 years:** add LABA if on ICS (ideally in the same inhaler device)
- Still Uncontrolled:**
 - Children (1-5 years):** referral to asthma specialist
 - Children (6-11 years):** add LABA or LTRA
 - Adults and children ≥ 12 years:** Add LTRA and/or tiotropium
- Still Uncontrolled:**
 - Consider severe asthma diagnosis and refer to specialist

Pharmacological (Asthma Exacerbation)

CTS recommended controller step-up therapy (2,3,12) when patient has acute loss of control on their baseline maintenance therapy (yellow zone of [Asthma Action Plan](#)).

Children (1-5 years and 6-11 years) 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 \uparrow in ICS (dosing should not exceed manufacturer's recommended maximum daily dose) for 7-14 days. **2nd choice:** Add prednisone 30-50mg for for at least 5 days.
- If baseline maintenance medication is ICS/LABA (bud/form):** **1st choice:** \uparrow 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 \uparrow 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 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, vaccinations, immunotherapy

Review Control

(Reassess at each visit)[†]

Control indicates all of the following criteria are met:

Daytime symptoms (dyspnea, cough, wheeze, chest tightness): ≤ 2 days/week	Need for a reliever: ≤ 2 doses/week (pre-exercise doses should be included in weekly limit)
Night time symptoms: < 1 night/week and mild	FEV ₁ or PEF: $\geq 90\%$ 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%

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

[†] 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 preschoolers²), inhaler technique, adherence, triggers, comorbidities, spirometry or PEF****
- Review medication regime and consider modifying maintenance therapy (consider stepping down add-on therapy or decrease ICS dose if asthma is well-controlled between visits)
- Review/Revise written [Asthma Action Plan](#)

APPENDIX:

ACRONYMS:
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)

[†] In individuals ≥ 15 years of age with a history of severe acute loss of asthma control in the preceding year.

* 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).

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