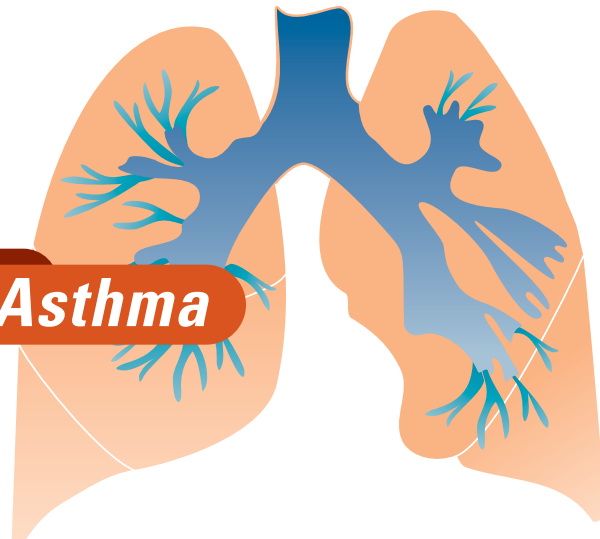


Decision Support Tool

in the Treatment of Asthma



CONFIRMING DIAGNOSIS^(1,5)

- Suspect asthma when the following paroxysmal or persistent symptoms are present: *dyspnea, chest tightness, wheezing, cough and sputum production*. Typically, these symptoms increase at night, during physical activity or during exposure to allergens or irritants;
- Follow through each step of the overall management of asthma (Table 1).

TABLE 1 OVERALL MANAGEMENT OF ASTHMA ^(1, 5)

Suspected asthma	Diagnostic components
Confirm the diagnosis and assess initial severity	<ul style="list-style-type: none"> • Evaluate symptoms, personal and family history; <ul style="list-style-type: none"> - For persons under 6 years of age: view opposite box. - For persons 6 years of age or over: also measure pulmonary function (Table 2); • Keep in mind that coughing does not necessarily indicate asthma.
Identify possible triggers	<ul style="list-style-type: none"> • Assess exposure to tobacco smoke, animals, dust mites, pollens, molds, strong odors, sensitizing agents in the workplace or presence of respiratory infections, etc.; • Obtain the results of allergy tests.
Confirmed asthma	Treatment
Initiate treatments: non pharmacological and pharmacological	<ul style="list-style-type: none"> • Recommend environment control measures and smoking cessation; • Prescribe medication providing rapid asthma control (Table 3); • Treat associated conditions (e.g. gastro-esophageal reflux disease, rhinitis, sinusitis, etc.).
Initiate education	<ul style="list-style-type: none"> • Discuss key elements (Table 4) and refer to asthma educator, when available (www.rqam.ca or 1-877-441-5072).
Aim for the best achievable results	<ul style="list-style-type: none"> • Check asthma control criteria, including pulmonary function (Table 5); • Determine the reasons for loss of control and suggest possible solutions (Table 6, figure 1).
Determine the minimum medication required for asthma control	<ul style="list-style-type: none"> • Gradually reduce medication while checking asthma control.
Devise and provide a written action plan (WrAP)	<ul style="list-style-type: none"> • On the <i>WrAP</i>, record minimum medication allowing for asthma control (maintenance therapy); • On the <i>WrAP</i>, provide guidance in the event of aggravating symptoms or respiratory infections or a brief exposure to an allergen; • Provide the <i>WrAP</i>: view opposite box.
Ensure regular follow-up	<ul style="list-style-type: none"> • Regularly assess control criteria including pulmonary function (Table 5); • Determine the reasons for loss of control and suggest possible solutions (Table 6, figure 1).

CONFIRMING DIAGNOSIS (UNDER 6 YEARS OF AGE) ⁽³⁻⁴⁾

Factors increasing the probability of asthma diagnosis:

- Presence of personal atopy;
- Family history of asthma;
- *Severe* episode of dyspnea or wheezing;
- Dyspnea or wheezing in a child over 1 year of age;
- Three or more episodes of wheezing since birth;
- Persistent cough mainly during exercise or nocturnal cough;
- Symptom improvement after trial of inhaled short-acting β_2 agonist (SABA) or inhaled corticosteroid (ICS).

WRITTEN ACTION PLAN (WrAP)

- Provide the *WrAP* to patient or ask asthma educator or pharmacist to do so;
- For copies of a model action plan: www.cdm.gouv.qc.ca.

CONFIRMING DIAGNOSIS (≥6 YEARS)

TABLE 2 ASSESSING AIRFLOW OBSTRUCTION BY OBJECTIVE MEASURES (5-7)

Spirometry	<ul style="list-style-type: none"> • ≥12% (≥180 mL) improvement in FEV₁, 15 minutes after use of an SABA; • ≥20% (≥250 mL) improvement in FEV₁ after intake of inhaled or oral corticosteroid for 10-14 days; • "Spontaneous variability" ≥20% in baseline FEV₁ over several visits.
Peak flow meter (PEF)	<ul style="list-style-type: none"> • ≥20% improvement in PEF 15 minutes after use of an SABA; • Diurnal variation* in PEF ≥20% over several weeks (change over time).
Airway hyperresponsiveness	<ul style="list-style-type: none"> • Methacholine challenge can sometimes be useful to confirm asthma diagnosis or to assess airway responsiveness when other tests have failed.

FEV₁= forced expiratory volume in one second.

SABA = inhaled short-acting β₂ agonist.

PEF = peak expiratory flow obtained with a portable peak flow meter.

* Diurnal variation = $\frac{PEF_{max} - PEF_{min}}{PEF_{max}} \times 100$
(morning and night)

ASSESSING ASTHMA CONTROL

TABLE 5 ASTHMA CONTROL CRITERIA* (1-7)

Daytime symptoms < 4 days/week
Nighttime symptoms < 1 night/week
Normal physical activity
Mild, infrequent exacerbations
No absenteeism due to asthma
Use of less than 4 doses/week of a fast-acting bronchodilator†‡
FEV ₁ or PEF 90% of personal best or greater
Diurnal variability§ in PEF not over 10-15%

* An ICS can be considered early on in the treatment even if symptoms occur less than three times a week.

† Excluding one dose per day for prevention of exercise-induced symptoms.

‡ According to experts, if exercise-induced symptoms require almost daily use of an SABA, the possibility of introducing preventive therapy such as low dose ICS or a leukotriene receptor antagonist (LTRA) should be discussed with the patient.

§ Diurnal variability (morning and night) on a two-week period.

INITIAL TREATMENT

TABLE 3 TREATMENT PROVIDING RAPID CONTROL* (5, 7)

Infrequent symptoms and normal FEV₁ or PEF	<ul style="list-style-type: none"> • SABA as needed (less than 4 doses/week†) (Table 8).
Symptoms or SABA† needed 4 times/week or more, or abnormal pulmonary function	<ul style="list-style-type: none"> • ICS, low to moderate daily dose, and an SABA as needed (Tables 7-8).
Frequent symptoms and FEV₁ or PEF < 60% of predicted value	<ul style="list-style-type: none"> • Oral prednisone or equivalent should be considered, <ul style="list-style-type: none"> - Adult: 30-50 mg daily for 7-14 days or more‡; - Child under 12 years of age: 1-2 mg/kg daily (max: 50 mg) for 3-5 days or more; with a daily dose of ICS taken concurrently or subsequently and an SABA as needed.

ICS = inhaled corticosteroid.

* Other treatments can be used during emergency department visits or hospitalizations.

† Excluding one dose per day for prevention of exercise-induced symptoms.

‡ Various doses and durations have been suggested with or without dose tapering (e.g. 50 mg daily for 5 days, then 25 mg daily for 5 days or 30 mg daily for 5 days, then decrease daily by 5 mg to 0).

FOLLOW-UP CARE

Follow-up care is complex since the severity of this chronic disease can fluctuate with external factors such as environment, associated conditions, etc. Moreover, false beliefs on asthma and its treatment are widespread, and stages of coping with the chronic disease can vary for each individual and over time.

TABLE 6 REASONS FOR LOSS OF CONTROL AND POSSIBLE SOLUTIONS (1-8)

Reasons for loss of control	Possible solutions
New triggers	<ul style="list-style-type: none"> • Education; • Environmental control measures; • On occasion, temporarily intensifying drug therapy (medication must not replace environmental control measures).
Non-compliance	<ul style="list-style-type: none"> • Education; • Identical or simplified treatment.
Poor inhaler technique	<ul style="list-style-type: none"> • Education.
Comorbidity	<ul style="list-style-type: none"> • Treatment of comorbidity (e.g. gastro-esophageal reflux disease, rhinitis, sinusitis, etc.); • Temporarily intensifying drug therapy.
Exacerbation (allergic, infectious...)	<ul style="list-style-type: none"> • Use of higher doses of inhaled corticosteroids, introduce oral corticosteroids or increase the dose (Written Action Plan).
Increase in asthma severity	<ul style="list-style-type: none"> • Intensifying drug therapy.

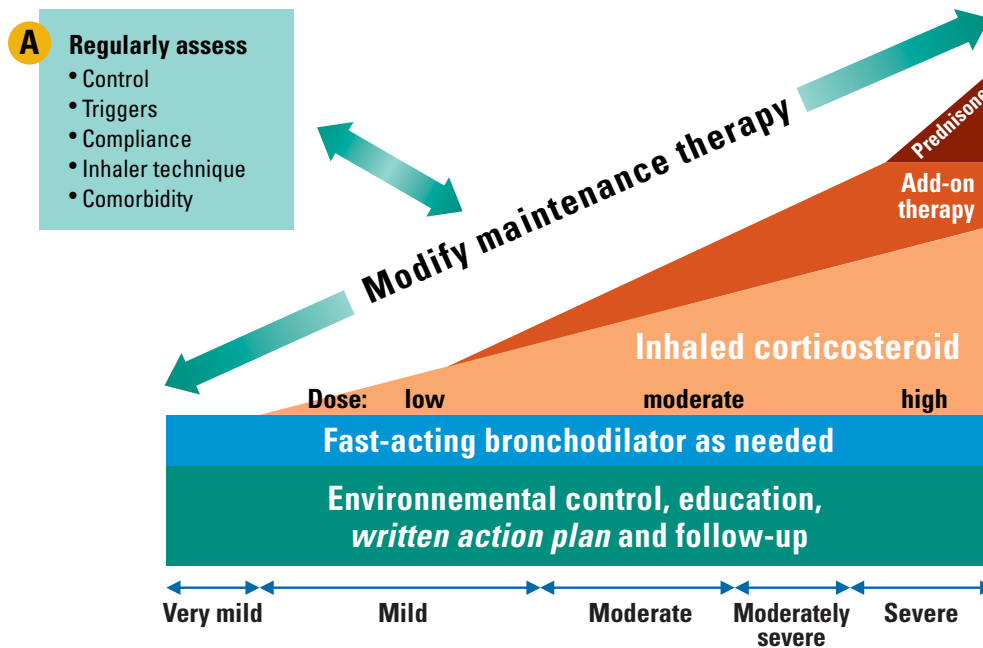
EDUCATION

TABLE 4 DISCUSSING KEY ELEMENTS WITH PATIENT (1-9)

<ul style="list-style-type: none"> • Asthma: a controllable chronic disease;
<ul style="list-style-type: none"> • Awareness of triggers (allergens or irritants): "What has triggered your asthma?"
<ul style="list-style-type: none"> • Exercise to be encouraged (e.g. walking, biking, swimming);
<ul style="list-style-type: none"> • Role of the two main categories of medication and compliance: "What do you know about these medications?" "Do you think you can take them as I suggest?";
<ul style="list-style-type: none"> • Inhaler and PEF technique, according to current use;
<ul style="list-style-type: none"> • Written action plan: "Describe your last attack", "What will you do next time you get a cold?"

FIGURE 1 CONTINUUM OF ASTHMA MANAGEMENT (1-3)

Asthma control should be assessed at *each visit* and maintenance therapy modified as required. All *changes* to drug therapy should be considered as *therapeutic trials* and efficacy reassessed within reasonable time (4-6 weeks). *When asthma is adequately controlled, the dose of the medication should be reduced to the minimum needed to maintain control.* (Tables 7-8).



Adapted with the publisher's permission: Lemière C, Bai T, Balter M, et al. Adult Asthma Consensus Guidelines Update 2003. *Can Respir J* 2004; 11 (Suppl A): 9A-18A.

- Inhaled fast-acting bronchodilators are used *as needed* (less than 4 doses/week*) for very mild asthma.
- A **low daily dose** of an inhaled corticosteroid (ICS) may be introduced as initial maintenance therapy for **mild** asthma *even if symptoms are fewer than three times a week.*
 - For a patient who cannot or will not use ICSs, a leukotriene receptor antagonist (LTRA) is an alternative even if less effective than a low-dose of ICS.
- When asthma is not adequately controlled with a **low daily dose** of ICS and each component listed in box **A** above has been **reassessed**, *intensifying drug therapy* should be considered as follows.

Intensifying drug therapy

• **Adults**

- First of all, consider adding an inhaled long-acting β_2 agonist (LABA);
- Next, consider adding an LTRA or increasing to a moderate dose of ICS;
- Finally, consider adding theophylline.

• **Children and adolescents (under 18 years of age)** (3-4)

- There is poor evidence supporting add-on therapies in this age group. Experts recommend to:
- First, consider increasing the ICS to a moderate dose, the efficacy of which is well established;
 - Then, consider adding an LABA or an LTRA.

- Severe asthma may require adding oral prednisone or the equivalent.

* : Excluding one dose per day for prevention of exercise-induced symptoms.

DRUG THERAPY

TABLE 7 INHALED CORTICOSTEROIDS: PROPOSED DOSE EQUIVALENCIES (1-7, 10-11)

Generic name (Trade name)	Inhalation device	Daily dose (μg /day)		
		Low*	Moderate	High
HFA Beclomethasone [†] (Qvar ^{MC})	MDI with or without spacer [‡]	≤ 250	251-500	> 500
HFA Fluticasone (Flovent [®])	MDI with or without spacer [‡]			
Fluticasone (Flovent [®])	Diskus [®]			
Budesonide (Pulmicort [®])	Turbuhaler [®]	≤ 400	401-800	> 800

MDI = metered-dose inhaler HFA = hydrofluoroalkane-134a (propellant)

* **In children under 12 years of age**, a low dose is defined as $<200 \mu\text{g}/\text{day}$ of HFA beclomethasone administered with an MDI and a spacer, $<400 \mu\text{g}/\text{day}$ of budesonide or $<200 \mu\text{g}/\text{day}$ of fluticasone.

[†] Beclomethasone administered with an MDI containing chlorofluorocarbons (CFC) (propellant) is no longer available in Canada.

The dose equivalencies were: low: $\leq 500 \mu\text{g}/\text{day}$; moderate: $501-1000 \mu\text{g}/\text{day}$; high: $>1000 \mu\text{g}/\text{day}$.

[‡] When administering medication to children and the elderly with an MDI, it is universally recommended to use a spacer.

DRUG THERAPY (CONTINUED)

TABLE 8 MAIN DRUGS USED IN THE TREATMENT OF ASTHMA (1, 5-7, 10-11)

Generic name (Trade name)	Inhalation device Dosage form	Dosage	Cost*
RESCUE MEDICATION			
Inhaled β_2 agonists/ Fast-acting bronchodilators[†]			Cost/dose*
Inhaled Short-acting β_2 agonists (SABA)			
CFC Fenoterol (Berotec [®])	MDI 100 μ g/inh.	2 inh. as needed	\$0.10/2 inh.
HFA Salbutamol (Airmir ^{MC} , Apo [®] -Salvent without CFC, Ratio-Salbutamol HFA) (Ventolin [®] HFA)	MDI 100 μ g/inh.	2 inh. as needed	\$0.08/2 inh. ‡
Salbutamol (Ventodisk [®]) (Ventolin [®])	Diskhaler [®] 200 μ g/blister 400 μ g/blister Diskus [®] 200 μ g/blister	2 inh. as needed 1 inh. as needed	\$0.34/2 inh. \$0.24/1 inh. ‡
Terbutaline (Bricanyl [®])	Turbuhaler [®] 500 μ g/inh.	1 inh. as needed	\$0.07/1 inh.
CONTROLLER MEDICATION			
Inhaled corticosteroids (ICS)		Low daily dose	Monthly cost*
HFA Beclomethasone (Qvar ^{MC})	MDI 50 μ g/inh. 100 μ g/inh.	<12 years of age: 1 inh. BID ≥ 12 years of age: 1 inh. BID	\$8.50 \$17.01
Budesonide (Pulmicort [®])	Turbuhaler [®] 100 μ g/inh. 200 μ g/inh. 400 μ g/inh.	<12 years of age: 1 inh. BID ≥ 12 years of age: 1 inh. BID ≥ 12 years of age: 1 inh. DIE	\$8.87 \$17.73 \$15.95
HFA Fluticasone (Flovent [®] HFA)	MDI 50 μ g/inh. Diskus [®] 50 μ g/blister 100 μ g/blister MDI 125 μ g/inh. MDI 250 μ g/inh. Diskus [®] 250 μ g/blister	<12 years of age: 1 inh. BID ≥ 12 years of age: 1 inh. BID ≥ 12 years of age: 1 inh. DIE	\$10.95 \$13.20 \$21.90 \$18.00 \$18.00
Add-on therapy[§]			Monthly cost*
Inhaled Long-acting β_2 agonists (LABA)			
Formoterol (Foradil [®]) Formoterol (Oxeze [®])	Aerolizer [®] 12 μ g/caps Turbuhaler [®] 6 μ g/inh. 12 μ g/inh.	≥ 6 years of age: 1 inh. BID	\$42.30 \$31.75 \$42.30
Salmeterol (Serevent [®])	MDI 25 μ g/inh. Diskus [®] 50 μ g/blister	≥ 4 years of age: 2 inh. BID 1 inh. BID	\$49.80
Inhaled combination therapies		ICS low or moderate daily dose	
Formoterol/ budesonide (Symbicort [®])	Turbuhaler [®] 6-100 μ g/inh. 6-200 μ g/inh.	≥ 12 years of age: 1 or 2 inh. BID	\$30.00 or \$60.00 \$39.00 or \$78.00
Salmeterol/ fluticasone (Advair [®])	Diskus [®] 50-100 μ g/blister MDI 25-125 μ g/inh. Diskus [®] 50-250 μ g/blister	≥ 4 years of age: 1 inh. BID ≥ 12 years of age: 2 inh. BID ≥ 12 years of age: 1 inh. BID	\$71.70 \$85.80
Leukotriene-receptor antagonists (LTRA)			
Montelukast (Singulair [®])	4 mg/chew. tab. or granules 5 mg/chew. tab. 10 mg/tab.	2-5 years of age: 1 tab. or 1 packet HS 6-14 years of age: 1 tab. HS ≥ 15 years of age: 1 tab. HS	\$38.04 \$42.00 \$61.80
Zafirlukast (Accolate [®])	20 mg/tab.	≥ 12 years of age: 1 tab. BID on an empty stomach	\$42.00
Others[¶]			

CFC = chlorofluorocarbons (propellant)
MDI = metered-dose inhaler

inh. = inhalation
HFA = hydrofluoroalkane-134a (propellant)

* Cost of drugs according to the *Liste de médicaments* (drug list) published by the Régie de l'assurance maladie du Québec (RAMQ) (2005); this does not include the cost of certain inhalation devices, the wholesaler's mark-up if any, and the pharmacist's dispensing fee.

† Formoterol dihydrate fumarate (Oxeze[®]), an LABA with rapid onset, is rarely used *as needed* because of its cost (\$0.53 for one 6 μ g inh., \$0.71 for one 12 μ g inh.), and because of the possible confusion in its administration if used both as maintenance medication and as needed.

‡ Product not included on the *Liste de médicaments* published by RAMQ (2005).

§ When intensifying drug therapy in children and adolescents under 18 years of age, adding an LABA or an LTRA to an ICS is recommended only if a trial of a moderate dose of ICS has failed. (Figure 1, table 7).

|| Combination therapies are not indicated for use *as needed* to relieve symptoms during exacerbations or to prevent exercise-induced symptoms.

¶ Other medications such as cromoglycate, nedocromil or ketotifen are used less frequently because of their lower anti-inflammatory potency compared to ICSs and their more complicated dosage schedule. Theophylline is seldom used because of its narrow therapeutic index and its high incidence of adverse effects.

Published by: Conseil du médicament (CdM)
www.cdm.gouv.qc.ca (418) 644-8282.

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Graphic Design and Electronic Publishing by: Graphidée.

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This tool gives rapid guidelines for the diagnosis, treatment and follow-up of asthma. The health professional retains sole responsibility for determining appropriate treatment in light of each patient's clinical situation. The information presented here must not be considered complete. Since drug therapy is constantly changing, the health professional is responsible for taking new information into account.

Translated from the original french version.

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This guide has been endorsed by the Québec professional orders (CMQ, OPQ), the federations (FMOQ, FMSQ), the pharmacist associations as well as the Réseau québécois de l'asthme et de la MPOC.

January 2006