



## Asthma in Children – Diagnosis and Management

Effective Date: October 28, 2015

### Scope

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This guideline provides recommendations for the diagnosis and management of asthma in patients aged 1 – 18 years, in the primary care setting. For recommendations regarding asthma in patients aged  $\geq 19$  years see [BCGuidelines.ca – Asthma in Adults – Diagnosis and Management](#).

### Key Recommendations

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- Send children aged  $\geq 6$  years for spirometry when they are symptomatic to improve accuracy.
- Send patients for spirometry regularly as part of the assessment of asthma control.
- Prescribe controller medication daily and not intermittently.
- Controller medication does not need to be increased with an acute loss of asthma control in children.
- At each visit, assess for proper use of asthma medication devices and medication compliance as these are common reasons for poor asthma control.
- Prescribe an age-appropriate spacer device for patients using metered dose inhalers (MDI).
- Send all patients and families to an asthma education center to learn self-management (where available).
- Given that many children aged  $< 6$  years outgrow their asthma symptoms, reassess the persistence of symptoms every 6 months in this age group.
- There is insufficient evidence to recommend one inhaled corticosteroids (ICS) molecule over another with respect to efficacy or safety.
- Ensure children have normal activity levels and do not limit physical activity to control asthma symptoms.\*
- Complete a written asthma action plan with all patients and reassess this plan with the patient on a regular basis.

### Definition

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Asthma is a chronic inflammatory disease of the airways that is characterized by bronchial hyperreactivity and variable airway obstruction which results in recurrent episodes of wheezing, breathlessness, chest tightness and/or coughing that can vary over time and in intensity.

### Epidemiology

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In British Columbia, the prevalence of asthma in children ranges from 83 – 162 per 1000 and is highest in 5 – 9 year olds although likely there is underestimation of asthma in 0 – 5 years olds due to variable diagnostic labels used.<sup>1</sup>

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\* Refer to [www.csep.ca/CMFiles/Guidelines/CSEP\\_PAGuidelines\\_child\\_en.pdf](http://www.csep.ca/CMFiles/Guidelines/CSEP_PAGuidelines_child_en.pdf) for Canadian Physical Activity Guidelines for children aged 5 – 11 years.

## Diagnosis

### ► Clinical History

#### Patients < 6 years old

Diagnosing children < 6 years is difficult due to:

- lack of pulmonary function testing (as children < 6 typically cannot do the test reliably), and
- overlap of viral symptoms with asthma symptoms.

Diagnosis is based on:

1. a compatible history (recurrent episodes of wheezing, cough, difficulty breathing and chest tightness) (see Table 1. Clinical features to assess the probability of asthma in children),
2. a physical exam confirming airway obstruction (e.g., wheezing) that improves with short acting beta agonist (SABA), and
3. the absence of an alternative explanation (Refer to *Appendix A: Differential Diagnosis of Recurrent Respiratory Symptoms*).

Wheezing is the most specific sign of asthma

- it is a high-pitched whistling sound typically heard on expiration, and
- **confirm with a physical exam since wheezing is a term commonly used to describe many types of noisy breathing unrelated to asthma.**

Asthma symptoms can be triggered by irritants, allergens, respiratory infections, and exercise; although the most common trigger in this age group is respiratory infections.

A therapeutic trial can be used to clarify the diagnosis

- Suggest using a daily moderate dose of inhaled corticosteroids (ICS) and SABA as needed
- Trial should be at least 8 – 12 weeks
- Discuss with the family in advance expected clinical improvements
- Suggest that families record symptoms in a diary and discuss this with their care provider when assessing the response of the trial of treatment

#### Patients 6 – 18 years old

Diagnosis is based on:

1. a compatible clinical history (recurrent episodes of wheezing, cough, difficulty breathing and chest tightness) (see Table 1. Clinical features to assess the probability of asthma in children),
2. documented evidence of reversible obstruction or bronchial hyperreactivity with lung function testing (see *Investigations or Tests*), and
3. if lung function testing is not available, a physical exam finding of wheezing or signs of increased work of breathing that **definitively** improves with SABA can be used as a surrogate marker of reversible airway obstruction although lung function testing should be done when available.

**Table 1. Clinical features to assess the probability of asthma in children**

Clinical Features that...	
Increase the Probability of Asthma	Lower the Probability of Asthma
<ul style="list-style-type: none"> <li>• Episodes of wheeze that are recurrent or severe (requiring urgent care visits, emergency room (ER) visits, hospitalization or use of systemic steroids)</li> <li>• Symptoms are worse at night</li> <li>• Symptoms occur with and without viral illness*</li> <li>• History of improvement in symptoms or spirometry** in response to adequate therapy</li> <li>• Expiratory wheeze on auscultation</li> <li>• Personal or first degree relative with diagnosed asthma or atopy</li> <li>• Evidence of atopy on physical exam (swollen nasal turbinates, atopic eczema, dark circles under eyes, linear nasal crease)</li> </ul>	<ul style="list-style-type: none"> <li>• Isolated cough in absence of wheeze or difficulty breathing</li> <li>• History of moist or productive cough</li> <li>• Normal physical exam and spirometry** when patient is symptomatic</li> <li>• No response to a trial of asthma therapy</li> <li>• Symptoms present from birth</li> <li>• Finger clubbing</li> <li>• Nasal polyps</li> </ul>

Table adapted from the BTS/SIGN British Guideline on the Management of Asthma.<sup>2</sup>

\*children aged < 6 years with asthma often have viral induced symptoms only.

\*\*spirometry not applicable to children aged < 6 years.

## ► Investigations or Tests

### 1. Spirometry in children aged ≥ 6 years<sup>†</sup>

- Forced expiratory volume in 1 second (FEV<sub>1</sub>)/forced vital capacity (FVC) < 80% with a 12% improvement in FEV<sub>1</sub> after SABA is specific for the diagnosis of asthma.<sup>3</sup>
- **NOTE: Negative spirometry results do not necessarily exclude a diagnosis of asthma, particularly if a child is asymptomatic or is well controlled on asthma medication.**
- For diagnostic purposes, the most useful time to do this test is when patients are symptomatic.
- Performing spirometry is an important part of the diagnostic process to ensure an accurate diagnosis, as 30% of patients with a diagnosis of asthma have been found not to have asthma when lung function testing was done.<sup>2</sup>
- Spirometry is used as part of asthma control assessment, as patients with poor lung function are at risk for remodeling despite having well-controlled symptoms.

### 2. Tests of bronchial hyperreactivity

- If spirometry is normal and asthma is still suspected, methacholine challenge or an exercise challenge can be done, particularly if a child is not responding to standard asthma therapy (see *Indications for Referral*).
- Useful for ruling out a diagnosis of asthma in a symptomatic patient.<sup>2</sup>

### 3. Peak flow monitoring

- Not recommended for diagnosing asthma in children.
- Can be used in patients with an asthma diagnosis who are poor perceivers of their asthma symptoms, as part of an asthma management plan.
- Given the variability of normal values, determine a patient's personal best peak flow when well to establish a baseline.

### 4. Chest x-ray

- Not useful for diagnosing asthma but is useful to evaluate for an alternative diagnosis.

<sup>†</sup> Children aged < 6 years often cannot do spirometry reliably.

## Management

### ► Care Objectives

At each visit assess the following with the patient and caregivers (see *Associated Documents: Asthma Patient Care Flow Sheet: aged < 6 years* and *Asthma Patient Care Flow Sheet: aged 6 – 18 years*):

- asthma control (see table under *Asthma Symptom Control*),
- medication adherence (confirm through pharmacy records if possible) and inhaler technique (see *Asthma Education*),
- effectiveness and understanding of patient's written action plan (see *Associated Documents: Asthma Action Plan for Children: aged < 6 years* and *Asthma Action Plan for Children: aged 6 – 18 years*),
- height and weight of patient.

If a treatment plan is initiated or changed, schedule a follow-up visit within 3 months to evaluate the effectiveness of the plan.

Frequency of ongoing visits depends on the patient's severity of symptoms, their risk of a future asthma attack and their level of asthma symptom control.

### ► Assessment of Asthma Control

Assess asthma control and risk factors for asthma attacks at the time of diagnosis, when creating/modifying a treatment plan and when monitoring treatment outcomes.

#### 1. Asthma Symptom Control<sup>4,8</sup>

In the past 4 weeks, has the patient had:	Yes [1 point]	No [0 points]
Daytime asthma symptoms more than twice/week?		
Any night symptoms due to asthma?		
Reliever needed for symptoms more than twice/week?		
Any activity limitation due to asthma?		
FEV <sub>1</sub> or peak flow < 80% of personal best?*		
<b>TOTAL POINTS</b>		

\* Children aged < 6 years often cannot perform spirometry reliably.

0 points = well controlled asthma symptoms

1 – 2 points = partly controlled asthma symptoms

≥ 3 points = uncontrolled asthma symptoms

#### 2. Risk of a Future Asthma Attack<sup>4,8</sup>

Does the patient have any of the following risk factors:

- Uncontrolled asthma symptoms (see above)
- ≥ 1 severe attack (e.g., requiring systemic steroids, ER visit or hospitalization) in last year, previous intubation or intensive care unit (ICU) admission for asthma
- Not prescribed or not taking an ICS properly (used intermittently, poor adherence or inhaler technique)
- Low FEV<sub>1</sub> (especially if < 60%)
- Exposure to tobacco smoke
- Exposure to allergens that the patient is sensitized to
- Food allergy or past history of anaphylaxis

If the patient has any of these risk factors they are at risk for future asthma attacks. Consider strategies to eliminate modifiable risk factors (e.g., tobacco cessation programs, allergen avoidance, etc.).

## ► Self-Management

### 1. Asthma Education

Ensure patients and their caregivers understand:

- how to take their medication properly (have patient demonstrate this, not just describe it),
- the difference between a reliever and controller medication,
- how to use their written action plan (including when to seek help),
- how to monitor for symptom control, and
- what triggers their asthma and how to avoid their triggers when appropriate (e.g., irritants, allergens, respiratory infections, and exercise, although exercise should never be limited as the goal is to have asthma controlled such that there is no activity limitation). See *Appendix B: Timing of Environmental Aeroallergens in British Columbia*.

Refer patients and their caregivers to an **asthma education program** where available (see *Patient Resources*). Particularly if patients experience the following:

- poor medication compliance,
- poor understanding of proper use of medications,
- poor understanding of their action plans, or
- language barriers.

### Tobacco smoke

Consider the following messaging for patients and caregivers regarding a patient's exposure to tobacco smoke:

- children experience more viral infections,<sup>5</sup>
- steroid medications decrease in efficacy,<sup>6</sup>
- smoking outside of the home and car is better than smoking inside,
- third hand smoke (i.e., smoke residue left on clothes, hair etc.) has been found to increase respiratory symptoms in children,<sup>5</sup> and
- discuss quitting and offer assistance to patients and families who want to quit (see *Patient Resources*).

Recommend annual **influenza vaccination** for the patient and their family. Asthma patients should also receive pneumococcal vaccines<sup>‡</sup> as appropriate for their age.

### 2. Written Asthma Action Plan

Action plans help patients know:

- when to use their medications,
- what to do when asthma symptoms worsen, and
- when to seek medical help (see *Asthma Action Plan*).

Use symptom monitoring rather than peak flow in children because symptom monitoring has been shown to be as effective as monitoring peak flows. Peak flows are useful for children that are poor perceivers of their asthma symptoms.<sup>3</sup> If peak flow meters are used, the child's personal best peak flow should be used as their baseline as "normal" peak flows differ between devices.

<sup>‡</sup> For more information on pneumococcal vaccines see: [www.phac-aspc.gc.ca/naci-ccni/acs-dcc/2014/pvaa-vaaa\\_0414-eng.php](http://www.phac-aspc.gc.ca/naci-ccni/acs-dcc/2014/pvaa-vaaa_0414-eng.php) and [www.healthlinkbc.ca/healthfiles/hfile62b.stm](http://www.healthlinkbc.ca/healthfiles/hfile62b.stm).

## ► Pharmacological Management

### Medication Delivery Devices

- The most important factor in selecting a medication delivery device is to ensure that the patient uses it properly.

Recommend that metered dose inhaler (MDI) **always** be used with a spacer device in children and are as effective as nebulizers.<sup>7</sup> Spacers increase the amount of medication in the lungs and decrease side effects from medication (see *Table 3. Recommended inhaler device by age*).

**Table 3. Recommended inhaler device by age**

Choice of inhaler device	1st line	2nd line
Children 2 – 4yrs	MDI plus spacer with facemask	Nebulizer** with face mask
≥ 4 – 6yrs	MDI plus spacer with mouthpiece*	MDI with spacer plus facemask
≥ 6yrs	MDI plus spacer with mouthpiece OR Dry powder inhaler***	MDI with spacer plus facemask

\*To transition to a spacer with mouthpiece, children must be able to form a seal around the mouthpiece and breathe through their mouths

\*\*MDI with spacer is as effective as a nebulizer

\*\*\*Children must have enough inspiratory force to use a dry powder inhaler

### Stepwise approach to pharmacologic treatment<sup>2-4,8</sup>

(See *Appendix C: Asthma medication table for children aged ≤ 18 years* and *Appendix D: Asthma Inhaler Guide*)

Reliever	Inhaled short-acting beta agonist (SABA) as required			
Preferred Controller Choice	Step 1	Step 2	Step 3	Step 4
		Daily low dose inhaled corticosteroid (ICS)	Daily medium dose ICS (1 – 12yrs) Add long-acting beta agonists (LABA) to low dose ICS (>12yrs)	If asthma is not well controlled on step 3, consider referral to a specialist <i>(see Indications for Referral)</i>
Other controller options		Daily leukotriene receptor antagonist (LTRA) for patients who won't use ICS	Add ICS to LTRA	<b>AND/OR</b> LTRA or LABA in combination with medium dose inhaled steroids

## Ongoing Management

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Schedule a follow-up visit within 2 – 4 weeks of any severe exacerbation (requiring ER visit, hospitalization, systemic steroids).

- At this visit assess:
  - modifiable risk factors for the exacerbation (e.g., compliance with medication , inhaler technique),
  - whether they used their action plan correctly, and
  - whether changes need to be made to their action plan.

Assessing persistence of asthma symptoms in children < 6yrs

- 50% of preschool age children with wheeze outgrow this condition by age 6,<sup>38</sup> therefore the need for ongoing therapy should be re-evaluated every 6 – 12 months.
- Risk factors for the presence of asthma symptoms at 6 years of age include:<sup>38</sup>
  - a personal or family history of atopy,
  - onset of symptoms after 2 years of age, and
  - frequent or severe episodes of wheezing in childhood.

### ► Indications for Referral<sup>5</sup>

- Atypical asthma symptoms or diagnosis in question
- Poor asthma control (poor lung function, persistent asthma symptoms) or severe asthma exacerbations (≥ 1 course of systemic steroids per year) despite moderate doses of inhaled corticosteroids (with proper technique and good compliance)
- Patient requires detailed assessment and management of potential environmental triggers
- ICU admission for asthma

### ► Controversies in Care

#### 1. Intermittent vs. Daily Inhaled Corticosteroids (ICS)

In children with *persistent asthma*, daily use of inhaled steroids is strongly recommended as it improves asthma control and lung function and decreases frequency of reliever medication use.<sup>9-15</sup>

In children with *intermittent asthma* (brief exacerbations of symptoms with no interim symptoms), there is a weak recommendation to use daily inhaled steroids. Although a popular strategy, intermittent use of low-high doses of intermittent inhaled steroids have not been shown to be of benefit.

Trials of intermittent ICS have used very high doses (e.g., fluticasone 1500ug/day) and have found a decrease in systemic steroid use and duration of symptoms.<sup>19-21</sup> These studies have found a decrease in height and there are concerns about widely recommending this approach given the potential use of multiple courses of very high dose ICS in young children with frequent viral induced exacerbations.<sup>16, 21, 22</sup> In this group of children, there is only one comparative trial of intermittent versus daily ICS which did not find a benefit of daily ICS.<sup>14</sup> However, multiple trials of daily ICS versus placebo have shown an improvement in exacerbation rate and lung function,<sup>16</sup> with mixed results on symptom free days and symptom scores.<sup>16-18</sup>

#### 2. Increasing ICS with flares and viruses

It is strongly recommended that children on ICS **do not** increase their dose during acute loss of asthma control (i.e., in the yellow zone of an action plan), as this has not been shown to decrease the need for oral corticosteroids.<sup>23-29</sup>

#### 3. Choice of ICS

There is currently not enough evidence in terms of improved efficacy or safety profile to recommend one ICS molecule over another.<sup>30-37</sup>

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<sup>5</sup> Asthma specialists typically include pediatricians, pediatric respirologists, pediatric allergists, and pediatric asthma clinics.

### ► References

- 1 McLeod C, Bogyo T, Demers P, et al. Asthma in British Columbia. Vancouver, BC: Centre for Health Services and Policy Research; 2007.
- 2 British Thoracic Society, Scottish Intercollegiate Guidelines Network. British guideline on the management of asthma: A national clinical guideline. 2014.
- 3 Loughheed MD, Leniere C, Ducharme FM, et al. Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults: executive summary. *Can Respir J*. 2012;19:e81-8.
- 4 Global Initiative for Asthma. Global Strategy for Asthma Management and Prevention. 2015.
- 5 Duff AL, Pomeranz ES, Gelber LE, et al. Risk factors for acute wheezing in infants and children: viruses, passive smoke, and IgE antibodies to inhalant allergens. *Pediatrics*. 1993;92:535-540.
- 6 Chalmers GW, Macleod KJ, Little SA, Thomson LJ, McSharry CP, Thomson NC. Influence of cigarette smoking on inhaled corticosteroid treatment in mild asthma. *Thorax*. 2002;57:226-230.
- 7 Cates CJ, Crilly JA, Rowe BH. Holding chambers (spacers) versus nebulisers for beta-agonist treatment of acute asthma. *Cochrane Database Syst Rev*. 2006:000052.
- 8 National Asthma Education Prevention Program (NAEPP). Expert Panel Report 3: Guidelines for the diagnosis and management of asthma. Bethesda: National Heart, Lung, and Blood Institute (NHLBI); 2007.
- 9 Chauhan BF, Chartrand C, Ducharme FM. Intermittent versus daily inhaled corticosteroids for persistent asthma in children and adults. *Cochrane Database of Systematic Reviews*. 2013:CD009611.
- 10 Martinez FD, Chinchilli VM, Morgan WJ, et al. Use of beclomethasone dipropionate as rescue treatment for children with mild persistent asthma (TREXA): a randomised, double-blind, placebo-controlled trial. *Lancet*. 2011;377:650-657.
- 11 Papi A, Nicolini G, Baraldi E, et al. Regular vs prn nebulized treatment in wheeze preschool children. *Allergy*. 2009;64:1463-1471.
- 12 Papi A, Canonica GW, Maestrelli P, et al. Rescue use of beclomethasone and albuterol in a single inhaler for mild asthma. *N Engl J Med*. 2007;356:2040-2052.
- 13 Turpeinen M, Nikander K, Pelkonen AS, et al. Daily versus as-needed inhaled corticosteroid for mild persistent asthma (The Helsinki early intervention childhood asthma study). *Arch Dis Child*. 2008;93:654-659.
- 14 Zeiger RS, Mauger D, Bacharier LB, Guilbert TW, Martinez FD, Lemanske RF Jr, Strunk RC, Covar R, Szeffler SJ, Boehmer S, Jackson DJ, Sorkness CA, Gern JE, Kelly HW, Friedman NJ, Mellon MH, Schatz M, Morgan WJ, Chinchilli VM, Raissy HH, Bade E, Malka-Rais J, Beigelman A, Taussig LM. CARE Network of the National Heart, Lung, and Blood Institute. Daily or intermittent budesonide in preschool children with recurrent wheezing. *N Engl J Med*. 2011;365:1990-2001.
- 15 Boushey H, Sorkness C, King T, et al. Daily versus as-needed corticosteroids for mild persistent asthma. *N Engl J Med*. 2005;352:1519-1528.
- 16 Guilbert TW, Morgan WJ, Zeiger RS, et al. Long-term inhaled corticosteroids in preschool children at high risk for asthma. *N Engl J Med*. 2006;354:1985-1997.
- 17 Barrueto L, Mallol J, Figueroa L. Beclomethasone dipropionate and salbutamol by metered dose inhaler in infants and small children with recurrent wheezing. *Pediatr Pulmonol*. 2002;34:52-57.
- 18 Doull IJ, Lampe FC, Smith S, Schreiber J, Freezer NJ, Holgate ST. Effect of inhaled corticosteroids on episodes of wheezing associated with viral infection in school age children: randomised double blind placebo controlled trial. *BMJ*. 1997;315:858-862.
- 19 Connett G, Lenney W. Prevention of viral induced asthma attacks using inhaled budesonide. *Arch Dis Child*. 1993;68:85-87.
- 20 Wilson NM, Silverman M. Treatment of acute, episodic asthma in preschool children using intermittent high dose inhaled steroids at home. *Arch Dis Child*. 1990;65:407-410.
- 21 Ducharme FM, Lemire C, Noya FJD, et al. Preemptive Use of High-Dose Fluticasone for Virus-Induced Wheezing in Young Children. *N Engl J Med*. 2009;360:339-353.
- 22 Teper AM, Colom AJ, Kofman CD, Maffey AF, Vidaurreta SM, Bergada I. Effects of inhaled fluticasone propionate in children less than 2 years old with recurrent wheezing. *Pediatr Pulmonol*. 2004;37:111-115.
- 23 FitzGerald J, Becker A, Sears M, et al. Doubling the dose of budesonide versus maintenance treatment in asthma exacerbations. *Thorax*. 2004;59:550-556.
- 24 Foresi A, Morelli M, Catena E, Italian Study Grp. Low-dose budesonide with the addition of an increased dose during exacerbations is effective in long-term asthma control. *Chest*. 2000;117:440-446.
- 25 Garrett J, Williams S, Wong C, Holdaway D. Treatment of acute asthmatic exacerbations with an increased dose of inhaled steroid. *Arch Dis Child*. 1998;79:12-17.
- 26 Harrison T, Osborne J, Newton S, Tattersfield A. Doubling the dose of inhaled corticosteroid to prevent asthma exacerbations: randomised controlled trial. *Lancet*. 2004;363:271-275.
- 27 Osborne J, Mortimer K, Hubbard RB, Tattersfield AE, Harrison TW. Quadrupling the Dose of Inhaled Corticosteroid to Prevent Asthma Exacerbations A Randomized, Double-blind, Placebo-controlled, Parallel-Group Clinical Trial. *American Journal of Respiratory and Critical Care Medicine*. 2009;180:598-602.
- 28 Quon BS, Fitzgerald JM, Lemiere C, Shahidi N, Ducharme FM. Increased versus stable doses of inhaled corticosteroids for exacerbations of chronic asthma in adults and children. *Cochrane Database of Systematic Reviews*. 2010:(12)-2010.
- 29 Yousef E, Hossain J, Mannan S, Skorpinski E, McGeady S. Early intervention with high-dose inhaled corticosteroids for control of acute asthma exacerbations at home and improved outcomes: a randomized controlled trial. *Allergy Asthma Proc*. 2012;33:508-513.
- 30 Baran D. A comparison of inhaled budesonide and beclomethasone dipropionate in childhood asthma. *Br J Dis Chest*. 1987;81:170-175.
- 31 Gustafsson P, Tsanakas J, Gold M, Primhak R, Radford M, Gillies E. Comparison of the efficacy and safety of inhaled fluticasone propionate 200 micrograms/day with inhaled beclomethasone dipropionate 400 micrograms/day in mild and moderate asthma. *Arch Dis Child*. 1993;69:206-211.
- 32 Hoekx JC, Hedlin G, Pedersen W, Sorva R, Hollingworth K, Efthimiou J. Fluticasone propionate compared with budesonide: a double-blind trial in asthmatic children using powder devices at a dosage of 400 microg x day(-1). *Eur Respir J*. 1996;9:2263-2272.
- 33 Pedersen S, Garcia Garcia ML, Manjra A, Theron I, Engelstatter R. A comparative study of inhaled ciclesonide 160 microg/day and fluticasone propionate 176 microg/day in children with asthma. *Pediatr Pulmonol*. 2006;41:954-961.
- 34 Pedersen S, Engelstatter R, Weber HJ, et al. Efficacy and safety of ciclesonide once daily and fluticasone propionate twice daily in children with asthma. *Pulm Pharmacol Ther*. 2009;22:214-220.
- 35 Springer C, Avital A, Maayan C, Rosler A, Godfrey S. Comparison of budesonide and beclomethasone dipropionate for treatment of asthma. *Arch Dis Child*. 1987;62:815-819.
- 36 Zhang L, Prietsch SO, Ducharme FM. Inhaled corticosteroids in children with persistent asthma: effects on growth. *Evid Based Child Health*. 2014;9:829-930.
- 37 von Berg A, Engelstatter R, Minic P, et al. Comparison of the efficacy and safety of ciclesonide 160 microg once daily vs. budesonide 400 microg once daily in children with asthma. *Pediatr Allergy Immunol*. 2007;18:391-400.
- 38 Morgan WJ, Stern DA, Sherrill DL, et al. Outcome of asthma and wheezing in the first 6 years of life: follow-up through adolescence. *Am J Respir Crit Care Med*. 2005;172:1253-1258.



## ► Patient Resources

**BC Children's Hospital** – website provides handouts on trigger avoidance, use of asthma devices, asthma symptom diaries.

**Website:** [www.bcchildrens.ca/KidsTeensFam/A-ZPamphlets/default.htm](http://www.bcchildrens.ca/KidsTeensFam/A-ZPamphlets/default.htm)

**The Asthma Society of Canada** – website provides a variety of free educational materials about asthma.

**Website:** [www.asthma.ca/](http://www.asthma.ca/)

**About Kids Health** – website provides comprehensive information about asthma in children.

**Website:** [www.aboutkidshealth.ca](http://www.aboutkidshealth.ca)

**Alberta Health Services – ICAN** – website that provides asthma information including trigger avoidance and device instructions in 13 languages.

**Website:** [www.ucalgary.ca/icancontrolasthma/languagess](http://www.ucalgary.ca/icancontrolasthma/languagess)

**The Canadian Lung Association** – Provides listings of available Asthma Clinics across the province and videos on how to use asthma devices.

**Website:** [www.lung.ca/lung-health/get-help](http://www.lung.ca/lung-health/get-help)

**QuitNow** – an internet based quit smoking service, available free of charge to B.C. residents.

**Website:** [www.quitnow.ca](http://www.quitnow.ca)

**BC Smoking Cessation program** – A PharmaCare program that helps patients stop smoking or using other tobacco products by helping with the cost of smoking cessation aids.

**Website:** [www.health.gov.bc.ca/pharmacare/stop-smoking/](http://www.health.gov.bc.ca/pharmacare/stop-smoking/)

Cartoon for children on what asthma is and how medications work.

**URL:** [www.youtube.com/watch?v=Et\\_alsghel8](http://www.youtube.com/watch?v=Et_alsghel8)

## ► Diagnostic Code: 493 (Asthma)

## ► Appendices

- Appendix A: Differential Diagnosis of Recurrent Respiratory Symptoms
- Appendix B: Timing of Environmental Aeroallergens in British Columbia
- Appendix C: Asthma Medication Table for Children and Youth Aged ≤ 18 Years
- Appendix D: Asthma Inhaler Guide

## ► Associated Documents

The following documents accompany this guideline:

- Asthma Action Plan for Children: aged < 6 years
- Asthma Action Plan for Children: aged 6 – 18 years
- Asthma Patient Care Flow Sheet: aged < 6 years
- Asthma Patient Care Flow Sheet: aged 6 – 18 years

This guideline is based on scientific evidence current as of the Effective Date.

This guideline was developed by Child Health BC and the Guidelines and Protocols Advisory Committee, approved by the British Columbia Medical Association, and adopted by the Medical Services Commission.

### THE GUIDELINES AND PROTOCOLS ADVISORY COMMITTEE

**The principles of the Guidelines and Protocols Advisory Committee are to:**

- encourage appropriate responses to common medical situations
- recommend actions that are sufficient and efficient, neither excessive nor deficient
- permit exceptions when justified by clinical circumstances

**Contact Information:**

Guidelines and Protocols Advisory Committee  
PO Box 9642 STN PROV GOVT  
Victoria BC V8W 9P1

Email: [hlth.guidelines@gov.bc.ca](mailto:hlth.guidelines@gov.bc.ca)

Website: [www.BCGuidelines.ca](http://www.BCGuidelines.ca)

**Disclaimer**

The Clinical Practice Guidelines (the “Guidelines”) have been developed by the Guidelines and Protocols Advisory Committee on behalf of the Medical Services Commission. The Guidelines are intended to give an understanding of a clinical problem, and outline one or more preferred approaches to the investigation and management of the problem. The Guidelines are not intended as a substitute for the advice or professional judgment of a health care professional, nor are they intended to be the only approach to the management of clinical problem. **We cannot respond to patients or patient advocates requesting advice on issues related to medical conditions. If you need medical advice, please contact a health care professional.**



## Appendix A: Differential Diagnosis of Recurrent Respiratory Symptoms

### Infections

- Recurrent respiratory tract infections
- Chronic rhino-sinusitis
- Tuberculosis

### Congenital problems

- Tracheomalacia
- Cystic fibrosis
- Bronchopulmonary dysplasia
- Congenital malformation causing narrowing of the intrathoracic airways
- Primary ciliary dyskinesia syndrome
- Immune deficiency
- Congenital heart disease

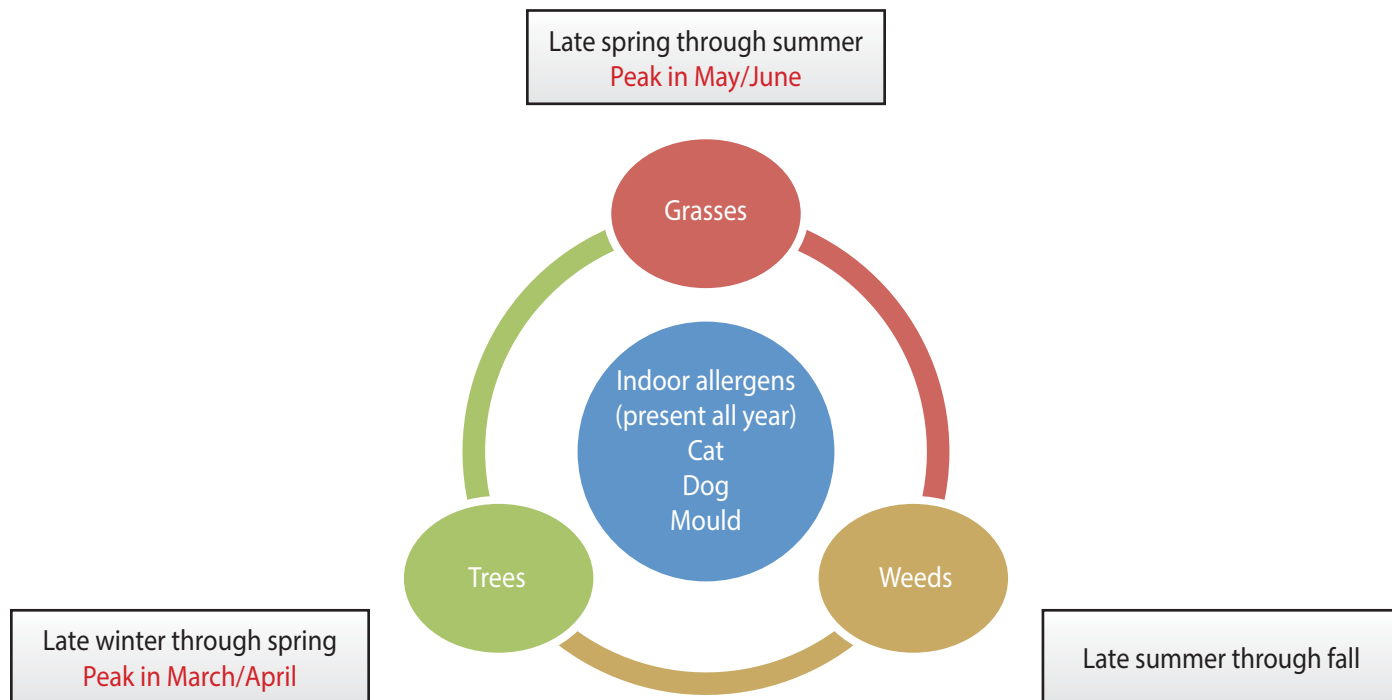
### Mechanical problems

- Foreign body aspiration
- Gastroesophageal reflux

**Source:** Table from the Global Strategy for Asthma Management and Prevention in Children 5 Years and Younger, 2009, © Global Initiative for Asthma (GINA) all rights reserved



## Appendix B: Timing of Environmental Aeroallergens in British Columbia<sup>1,2</sup>



### References:

- 1 Middleton's Allergy Principles & Practice 7th edition. 2009 Elsevier Inc.
- 2 Manual of Allergy and Immunology Fourth edition. 2002 Lippencott, Williams & Wilkins.



## Appendix C: Asthma Medication Table for Children and Youth Aged ≤18 Years

Note: see *Appendix D: Asthma Inhaler Guide* for pictures of the medications listed below.

Generic Name Trade name (formulation), Doses per device. Dose per inhalation.	Pediatric Dosage Information (ages < 6 years old) <sup>1-3</sup>	Pediatric Dosage Information (ages 6 – 18 years old) <sup>1-3</sup>	Cost per device (cost per dose)	PharmaCare Coverage <sup>†</sup>	Therapeutic Considerations <sup>2</sup>
<b>RELIEVER MEDICATIONS</b>					
<b>Short acting beta-agonists</b>					
<b>Salbutamol</b> Airomir™, Ventolin®, Generics (pMDI), 200 doses. 100mcg/dose.	1 – 4 puffs up to q4h prn*	1 – 4 puffs up to q4h prn*	\$6.50 (\$0.03)	MDI: Regular Coverage	If ventolin is required every 4 hours, patient should be instructed to see a practitioner within 24 – 48 hours, if needed more than every 4 hours patient should go to the closest ER
<b>Salbutamol</b> Ventolin® Diskus® (DPI), 60 doses. 200mcg/dose.	DPI not recommended for children <6y	1 – 2 puffs up to q4h prn*	\$13 (\$0.22)	Diskus: No Coverage	Regular need for ventolin (>1 time/week) indicates poor asthma control.
<b>Terbutaline</b> Bricanyl Turbuhaler® (DPI), 100 or 200 doses. 500mcg/dose.	DPI not recommended for children <6y	1 – 2 puffs up to q4h prn	\$8 (\$0.80)	Regular Coverage	If terbutaline is required every 4 hours, patient should be instructed to see a practitioner within 24 – 48 hours.  Regular need for terbutaline (>1 time/ week) indicates poor asthma control.

Generic Name Trade name (formulation), Doses per device. Dose per inhalation.	Pediatric Dosage Information (ages < 6 years old) <sup>1-3</sup>	Pediatric Dosage Information (ages 6 – 18 years old) <sup>1-3</sup>	Cost per device (cost per dose)	PharmaCare Coverage <sup>†</sup>	Therapeutic Considerations <sup>2</sup>
<b>CONTROLLER MEDICATIONS</b>					
<b>Inhaled Corticosteroid (ICS)**</b>					
<b>beclomethasone dipropionate</b> Qvar™ HFA (pMDI), 200 doses. 50mcg, 100mcg/dose.	<b>Low</b> 50mcg bid <b>Med</b> 100mcg bid <b>High</b> refer to specialist <i>Approved age by Health Canada ≥ 5y</i>	<b>Low</b> 50-100mcg bid <b>Med</b> >100mcg bid <b>High</b> >200mcg bid	50mcg: \$34 (\$0.17) 100mcg: \$67 (\$0.34)	Regular Coverage	Symptom improvement is usually evident within 1 – 2 weeks after start of therapy, pulmonary function can take months to improve.  Once asthma is well controlled for 3 months, consider stepping down to lowest effective dose.
<b>Budesonide</b> Pulmicort Turbuhaler® (DPI), 200 doses. 100, 200, 400 mcg/ dose.	DPI not recommended for children <6y	<b>Low</b> 100mcg bid <b>Med</b> 200-400mcg bid <b>High</b> >400mcg bid <i>Approved age by Health Canada ≥ 6y</i>	100mcg: \$34 (\$0.17) 200mcg: \$69 (\$0.34) 400mcg: \$100 (\$0.50)	Regular Coverage	Dysphonia, oral thrush (low with ciclesonide and can be reduced by rinsing mouth or using spacer device), sore mouth, sore throat.
<b>Ciclesonide</b> Alvesco® (pMDI), 120 doses. 100, 200 mcg/dose.	<b>Low</b> 100cg once daily <b>Med</b> 200mcg daily <b>High</b> refer to specialist	<b>Low</b> 100mcg once daily <b>Med</b> 200-400mcg daily <b>High</b> >400mcg daily <i>Approved age by Health Canada ≥ 6y</i>	100mcg: \$49 (\$0.41) 200mcg: \$81 (\$0.68)	Regular Coverage	High dose treatment should not be stopped abruptly, but tapered.
<b>fluticasone propionate</b> Flovent® HFA (pMDI), 120 doses. 50, 125, 250mcg/dose.  Flovent Diskus (DPI), 60 doses. 50, 100, 250, 500mcg/dose.	<b>Low</b> 50mcg bid <b>Med</b> 100-125mcg bid <b>High</b> refer to specialist <i>Approved age by Health Canada ≥ 1y for MDI, ≥ 4y for Diskus</i>	<b>Low</b> ≤100mcg bid <b>Med</b> >100-200mcg bid <b>High</b> ≥200mcg bid	For 120 dose MDI: 50 mcg: \$26 (\$0.22) 125mcg: \$45 (\$0.37) 250mcg: \$89 (\$0.74) 50mcg: \$16.35 (\$0.27) For 60 dose Diskus: 100mcg: \$26 (\$0.43) 250mcg: \$45 (\$0.74) 500mcg: \$76 (\$1.49)	Regular Coverage	
<b>Mometasone</b> Asmanex Twisthaler™(DPI), 60 doses. 200, 400mcg per dose.	<b>DPI is not recommended for children &lt;6y</b>	<b>Low</b> ≤200 daily <b>Med</b> >100-200mcg bid <b>High</b> >200mcg bid <i>Approved age by Health Canada ≥ 12y</i>	200mcg \$35 (\$0.58) 400mcg \$69 (\$1.15)	Regular Coverage	

Generic Name Trade name (formulation), Doses per device. Dose per inhalation.	Pediatric Dosage Information (ages < 6 years old) <sup>1-3</sup>	Pediatric Dosage Information (ages 6 – 18 years old) <sup>1-3</sup>	Cost per device (cost per dose)	PharmaCare Coverage <sup>†</sup>	Therapeutic Considerations <sup>2</sup>
<b>Inhaled Corticosteroid / Long-acting Beta-2 Agonist Combination (ICS/LABA)**</b>					
<b>budesonide/ formoterol</b> Symbicort® Turbuhaler® (DPI), 120 doses. 100/6, 200/6mcg per dose.	Refer to specialist	<b>Low</b> 100/6mcg 1 doses bid <b>Med</b> 100/6 2 doses bid, 200/6mcg 1-2 doses bid <b>High</b> >200/6mcg 2 doses bid <i>Approved age by Health Canada ≥ 12y</i>	100/6mcg: \$69 (\$0.57) 200/6mcg: \$90 (\$0.75) per 120 dose turbuhaler (unit dose)	Limited Coverage  <i>Special Authority Criteria:</i>  <i>Diagnosis of asthma PLUS inadequate response on optimal dose of inhaled corticosteroid.</i>	Only prescribe for patients not adequately controlled on daily ICS treatment.  High dose treatment should not be stopped abruptly, but tapered.
<b>Fluticasone/ salmeterol</b> Advair® (pMDI), 120 doses. 125/25, 250/25mcg per dose.  <b>Fluticasone/ salmeterol</b> Advair® Diskus® (DPI), 60 doses. 100/50, 250/50, 500/50 mcg per dose.	Refer to specialist <i>Approved age by Health Canada ≥ 4y for Diskus</i>	<b>Low</b> 100mcg/50mcg bid <b>Med</b> >100-200mcg bid <b>High</b> ≥250/50mcg bid <i>Approved age by Health Canada ≥ 12y for MDI</i>	For 120 dose MDI: 125/25mcg: \$105 (\$0.88) 250/25mcg: \$149 (\$1.25)  For 60 dose DPI: 100/50mcg: \$88 (\$1.47) 250/50mcg: \$105 (\$1.75) 500/50mcg: \$149 (\$2.49)	See: <a href="http://www.health.gov.bc.ca/pharmacare/sa/saindex.html#list">www.health.gov.bc.ca/pharmacare/sa/saindex.html#list</a>	
<b>Mometasone/ formoterol</b> Zenhale™(pMDI), 120 doses. 50/5, 100/5, 200/5mcg per dose.	Refer to specialist	<b>Low</b> 50/5 µg -100/5 µg 1 dose bid <b>Med</b> 100/5mcg 2 doses bid 200/5mcg 1-2 doses bid <b>High</b> 200/5 µg <i>Approved age by Health Canada ≥ 12y</i>	50/5mcg: \$66 (\$0.88) 100/5mcg: \$86 (\$0.55) 200/5mcg: \$105 (\$0.72)		
<b>Leukotriene receptor agonists</b>					
<b>Montelukast</b> Singulair®, Generic (4 chew, granules, 5mg chew) (10mg tab)	4mg po daily <i>Approved age by Health Canada ≥ 2y</i>	5mg po daily (6 – 14y) 10mg po daily (≥15y)	4mg: \$36 (\$1.18) 5mg: \$39 (\$1.31) 10mg: \$58 (\$1.91) per 30 days (unit dose)	No Coverage	

**Abbreviations:** **bid:** twice daily; **cg:** centigrams; **DPI:** dry power inhaler; **ICS:** inhaled corticosteroids; **LABA:** long acting beta agonist; **MDI:** metered dose inhaler; **mcg:** micrograms; **mg:** milligrams; **pMDI:** pressurized metered dose inhaler; **po:** oral; **prn:** as needed; **q4h:** every 4 hours; **qid:** 4 times a day; **µg:** micrograms; **y:** years of age.

\* Maximum approved dosing for salbutamol is 2 puffs qid however with asthma attacks, this dose can be increased as part of a patient's action plan.

\*\*Dosing categories for ICS and ICS/LABA combinations are approximate and are based on a combination of approximate dose equivalency as well as safety and efficacy data.<sup>1,2</sup>

**Note:** Please review product monographs at <http://hc-sc.gc.ca/dhp-mps/prodpharma/databasdon/index-eng.php> and regularly review current Health Canada advisories, warnings and recalls at [www.hc-sc.gc.ca/ahc-asc/media/advisories-avis/index\\_e.html](http://www.hc-sc.gc.ca/ahc-asc/media/advisories-avis/index_e.html).

Pricing is approximate as per PharmaNet 2015/05/01 and does not include dispensing fee or additional markups.

<sup>†</sup> **PharmaCare Coverage Definitions**

**Regular Coverage:** also known as regular benefit; does not require Special Authority. Regular benefits may be fully or partially covered.Ω

**Limited Coverage:** requires Special Authority for coverage. Limited Coverage benefits approved by Special Authority may be fully or partially covered. Ω

**No Coverage:** also known as non-benefit; does not fit the above categories.

Ω Information on which products PharmaCare covers can be obtained using the B.C. PharmaCare Formulary Search ([www.health.gov.bc.ca/pharmacare/benefitslookup](http://www.health.gov.bc.ca/pharmacare/benefitslookup)). In all cases, coverage is subject to drug price limits set by PharmaCare and to the patient's PharmaCare plan rules and deductibles. See: [www.health.gov.bc.ca/pharmacare/plans/index.html](http://www.health.gov.bc.ca/pharmacare/plans/index.html) and [www.health.gov.bc.ca/pharmacare/policy.html](http://www.health.gov.bc.ca/pharmacare/policy.html) for further information.

**References**

- Loughheed MD, Lemiere C, Ducharme FM, et al. Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults. *Can Respir J* 2012; 19(2):127-64.
- U.S. Department of Health and Human Services, National Institutes of Health, National Heart, Lung and Blood Institute. Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma. Full Report 2007.
- Global Initiative for Asthma. Global Strategy for Asthma Management and Prevention. 2015.








## Appendix D: Asthma Inhaler Guide

### RELIEVER MEDICATIONS

Salbutamol				Terbutaline
				
Generics (e.g., Apo-Salvent Salbutamol) 100mcg/dose 200 doses	Ventolin <sup>®</sup> 100mcg/dose 200 doses	†Ventolin <sup>®</sup> Diskus 200ug/dose 60 doses	AiroMir™ 100mcg/dose 200 doses	†Bricanyl Turbuhaler <sup>®</sup> 0.5mcg/dose 100 or 200 doses



### Controller Medications

#### Inhaled Corticosteroids



Beclomethasone DP	Budesonide	Ciclesonide	Fluticasone propionate	Mometasone
				
Qvar™ 50mcg, 100*mcg/dose 200 doses	† Pulmicort Turbuhaler <sup>®</sup> 100*, 200, 400mcg/ dose 200 doses	Alvesco <sup>®</sup> 100, 200*mcg/dose 120 doses	Flovent <sup>®</sup> 50, 125*, 250mcg/dose 120 doses	†Asthmanex™ Twisthaler 200, 400*mcg/dose 60 doses



## Inhaled Corticosteroid/ Long-acting Beta-2 Agonist Combination

Budesonide/formoterol	Fluticasone/ salmeterol		Mometasone/formoterol
			
<sup>†</sup> Symbicort® 100/6, 200/6*mcg/dose 120 doses	<sup>†</sup> Advair® 125/25*, 250/25mcg/dose 120 doses	<sup>†</sup> Advair® Diskus 100/50, 250/50*, 500/50mcg/dose 60 doses	<sup>†</sup> Zenhale™ 50/5, 100/5*, 200/5mcg/dose 120 doses

## Leukotriene Receptor Antagonist

Montelukast	
	
Generic (e.g., apo-Montelukast) 4mg granules, 4, 5mg chewable, 10mg tab*	Singular® 4mg granules, 4, 5mg chewable, 10mg tab*

### Notes:

\*dose is depicted in picture

<sup>†</sup>dispenser has dose counter