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Asthma in Children



Tom Kovesi M.D., F.R.C.P.C.

PEDIATRIC RESPIROLOGIST, PROFESSOR OF PEDIATRICS,
CHILDREN'S HOSPITAL OF EASTERN ONTARIO, UNIVERSITY OF OTTAWA



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Fourth Edition, 2012

Disclaimer

This booklet is provided for the information of parents of children with asthma. The authors do not assume responsibility for inaccuracies or omissions contained in this booklet. New information about asthma and new treatments are constantly becoming available and this booklet can not include all the latest information.

This booklet can not be used to make or confirm a diagnosis of asthma, or to treat people with asthma. This booklet can not be used as a substitute for obtaining medical advice or for seeking treatment from a qualified physician. You should not rely on the information contained in it for advice in particular cases.

This booklet may help you identify when your child is having an asthma attack. If your child is having an asthma attack please contact your doctor, bring your child to an emergency room, or, in the case of an extremely severe attack, call 911 if this service is available in your area.



Tom Kovesi, MD, FRCPC, is a pediatric respirologist at the Children's Hospital of Eastern Ontario in Ottawa, Canada, and professor in the Department of Pediatrics at the University of Ottawa. He graduated from the University of Ottawa School of Medicine, completed a residency in Pediatrics at the children's hospitals in Ottawa and Halifax, and then subspecialty training in pediatric respirology at the Hospital for Sick Children in Toronto. He has been on staff at the Children's Hospital of Eastern Ontario since 1992. Dr. Kovesi has been a member of the Canadian Pediatric Asthma Consensus Guidelines Committee since 1996 and is past chair of the Pediatric Assembly of the Canadian Thoracic Society. He is a member of the Executive of the Ontario Thoracic Society. Dr. Kovesi also has a website on asthma in children cheo.on.ca/en/resources-and-support/asthma.aspx.

Dr. Kovesi's research interests include asthma, air quality and lung health in Inuit children in Nunavut. When not working, he enjoys cycling, downhill skiing, and shuttling his kids to lessons.

A letter from the author

Dear Parent/Caregiver,

This is the fourth edition of *Asthma in Children*. There are over 150,000 copies of the first, second and third editions in print, in English, French and Farsi. This booklet is designed to fill a particular need. There are many pamphlets, booklets, and websites that provide basic information about asthma in children, but most are too vague to be really practical and helpful. This booklet is intended to be detailed enough to be really helpful. The first time I tried writing this booklet, it read rather like an encyclopedia. I went back and redid it by writing down what I'd actually tell the parent of a child just diagnosed with asthma about asthma in my own clinic at the Children's Hospital of Eastern Ontario. It's hard for a health care professional to tell you all about asthma in a busy clinic, emergency department or hospital ward, and this booklet is intended to supplement the information you get from your health care provider. This book cannot replace medical advice from a qualified health care provider. However, you can, and should, use this booklet to determine whether your child's asthma is adequately controlled. If it isn't, you should discuss with your health care provider methods of improving your child's level of asthma control.

Asthma is the most common chronic disease in children. Children with asthma may cough, wheeze and have difficulty breathing, which can prevent them from participating in sports, lead to missed school and lead to frightening, sometimes severe, asthma attacks. To control asthma effectively, families need the right information. They need to know what asthma is, the symptoms to watch for, common triggers to avoid, and how to treat asthma. Every child should have well-controlled asthma, and with avoidance of appropriate triggers and use of modern medications, this can nearly always be achieved. I hope this book helps you and your child achieve this goal.

Tom Kovesi, M.D., F.R.C.P.C.,
Pediatric Respirologist, Professor of Pediatrics,
Children's Hospital of Eastern Ontario, University of Ottawa



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Introduction

Introduction

Asthma is the most common chronic disease in children. Not only does one Canadian child in 10 have asthma, but asthma in children is becoming more common – especially in very young children. Many children – especially young children who have asthma symptoms only with ‘colds’ – eventually outgrow asthma. In other children – particularly those who also have allergies – asthma may persist for long periods of time. Asthma can impair a child’s ability to participate in activities, lead to absences from school and lead to frightening and potentially dangerous asthma attacks. To control asthma, you will need to know what asthma is, what symptoms to watch for, and what are the common triggers to

watch for and how to avoid them. You also need to know how to use asthma medications effectively and safely. You need to be able to recognize when your child’s asthma control is not as good as it should be. Like everything in medicine, an “ounce of prevention is worth a pound of cure.” Recognizing poor control early, before things get out of hand, will let you take steps at home to improve the level of asthma control, or will let you notify your child’s physician so you can discuss ways of improving your child’s asthma control. The purpose of modern asthma management is to control your child’s asthma so the asthma doesn’t control their life. The information in this booklet is designed to help you achieve this.

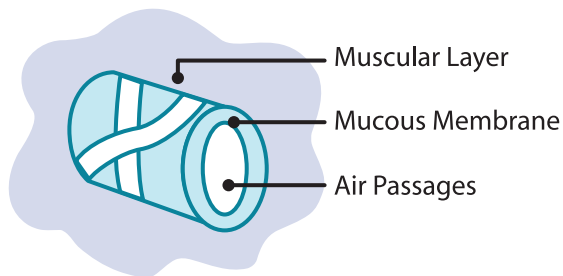


Tell me about asthma

Tell me about asthma

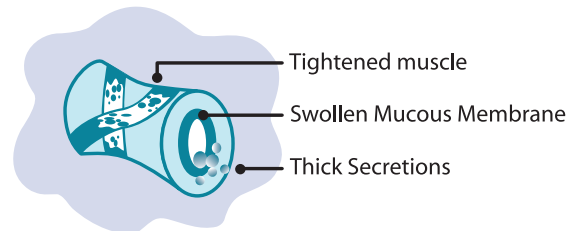
To understand asthma, you have to know a little about the structure of the lungs. This section will tell you about how the lungs are constructed and work, and how this changes during an asthma attack.

The lungs are made up of airways (also known as bronchial tubes or bronchi) and air sacs (also known as alveoli). The purpose of the airways is to allow fresh air to travel into the air sacs and to allow spent air to travel out of the lungs. In the alveoli, fresh oxygen is moved into the blood and waste gas (or carbon dioxide) is taken out of the blood so it can be exhaled into the atmosphere. The bronchial tubes have tiny bands of muscle encircling them.



Why do bands of muscle surround bronchial tubes?

Imagine a situation where you had to breathe noxious air – for example, if you were in a burning house. The muscles around your bronchial tubes would tighten up, trying to keep smoke out of your lungs and the inner linings of your bronchial tubes would start to produce mucous to try and trap any soot and ash you inhaled. Then, you'd start to cough – your body's way of removing the soot, ash and smoke out of your lungs. These are the normal reactions we would all have.



The lungs of a child with asthma produce these reactions when they're not supposed to – in response to things that shouldn't cause problems, for example, exposure to pollens or animal dander, or during viral respiratory infections such as colds.

Symptoms of asthma in children

What's inflammation?

Inflammation is the body's natural way of dealing with potentially harmful exposures or injuries. For example, your skin becomes red, irritated, hot and inflamed after it's burned, during a skin infection, or after you've had a sliver for a while. The body relies on special cells, called inflammatory cells, which release chemicals after exposure to irritants. The chemicals released by these cells cause inflammation.

The inner lining of the bronchial tubes contains inflammatory cells too. In the airways, release of chemicals causing inflammation leads to narrowing of the small muscles encircling the bronchial tubes, promotes mucus secretion by the airways, and causes swelling of the inner lining of the bronchial tubes. All of this leads to narrowing of the bronchial tubes, making it hard to breathe and causing coughing and wheezing. Some of these chemicals also tell the body to send more inflammatory cells to the area. In people with asthma, the linings of the bronchial tubes contain more inflammatory cells than normal. These inflammatory cells release their chemicals more easily than normal and in response to more exposures than normal, such as things the person is allergic to (for example, dogs, cats or ragweed).

SYMPTOMS OF ASTHMA IN CHILDREN

Classic asthma

People with 'classic' or adult-type asthma develop cough, wheezing and/or shortness of breath or chest tightness following exposure to things to which the individual is allergic. The usual culprits that can cause allergies and asthma are dust, pollen, animals, and mould. The majority of people with typical asthma that is not under control also have symptoms during or after exercise – especially in cold or dry air and during colds.

Asthma with colds

Younger children most often get asthma symptoms only when they have a "cold" or "flu" (upper respiratory tract infections caused by viruses). During colds, they cough more than other children and usually have wheezing and/or difficulty breathing. Between colds, they're fine. Asthma symptoms typically start about two or three days after they begin having a runny nose. Symptoms often continue for weeks after the cold has gone away. Like most things in pediatrics, symptoms (especially the cough) tend to be worse at night!



Since people with classic asthma can also have attacks triggered by colds, in all, about 90 percent of asthma attacks in children (and many attacks in adults) are caused by colds.

The excess mucus production caused by asthma leads to chest congestion. Asthma should be considered as a possible diagnosis in any child whose colds ‘always seem to settle in the chest,’ or who wheezes with colds. When a doctor listens to the chest, mucus rattling around in the bronchial tubes can produce the same noises as pneumonia, and mucus clogging up a bronchial tube can also mimic the way pneumonia looks on a chest x-ray. Research studies have shown that many children who are diagnosed with “recurrent bronchitis” or “recurrent pneumonia” actually have asthma.

Cough-variant asthma

A few people with asthma never wheeze or have trouble breathing, and their only symptom is excessive coughing. This is called ‘cough-variant asthma.’ Children with this type of asthma may have a persistent cough at night, cough with exercise and/or prolonged or excessive coughing during and after colds. The cough improves with asthma therapy.

Can babies have asthma?

Many doctors feel uncomfortable diagnosing asthma before the age of six-to-12 months. In very young infants other conditions, sometimes more serious, can cause asthma-like symptoms. If you have a small infant with asthma like symptoms, your doctor will evaluate your child for these other conditions.

Many normal babies have noisy breathing due to secretions rattling around in the back of the throat that the baby hasn’t yet learned to swallow. The noisy breathing is also worse during colds as there are more secretions. This “noisy breathing” sounds a bit like a motorcycle, and parents often feel a “rattle” when they feel the baby’s chest. These sounds are different from wheezing, which is a whistling sound coming from the chest. Rattly breathing is generally not a sign of asthma.



Asthma triggers

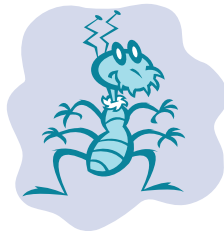
Asthma triggers

The more you can avoid things that can trigger your child's asthma, the less your child will need asthma medication(s). This section will help you recognize what your child's asthma triggers are and ways in which you can learn to help your child avoid them. Things that people can get allergic to are often called allergens.

ALLERGIC ASTHMA TRIGGERS

Dust mites

Dust mite allergy is probably the most common allergy leading to asthma in Canadian children. Dust mites are extremely tiny little animals that live in dust, feeding off bits of shed human skin and other appetizing little morsels. As the insulation in modern homes gets better and better (and air circulation gets potentially worse and worse), house dust and



dust mite accumulation becomes an increasing problem. In children with dust mite allergy, exposure to dust can not only lead to asthma attacks, but long-term exposure can increase airway inflammation, increasing the severity of the reaction to other asthma allergens and irritants. Dust mites grow best in high humidity (as do molds), so, contrary to popular belief, keeping your house reasonably dry (humidity under 50%) is preferable for children with asthma. Humidifiers in the bedroom are sometimes helpful during colds but should be used for as short a time as possible to avoid promoting dust mite growth. Humidifiers should also be kept extremely clean as mold can easily grow in the humidifier and then get blown around the room.

People spend more time in their bedroom than in any other single location, so for people with dust mite allergy, reducing dust in the bedroom is especially important. Dust mites grow especially well in mattresses, pillows and bedding. Some ways of reducing dust mites in your child's bedroom include:

- Use a hardwood floor and remove upholstered furniture
- Plastic-covered mattresses (the type used for cribs and toddler's beds) are ideal for reducing dust mites in your child's crib or bed – the most important source of dust mites for small children. When your child moves to a regular mattress, enclose the mattress, box



spring, and pillows with dust-proof covers. These covers are available in medical-supply stores. Vinyl covers are less expensive but also less comfortable.

- Wash sheets and blankets every 2 - 4 weeks
- Wash blinds regularly; mop the floor with a damp mop each week.
- Avoid clutter (excess toys, books, etc.) in the child's bedroom.
- Keep the household humidity level at 50% or less.

Animals

Furry animals (and less commonly birds) can cause quite serious asthma in people who are allergic to them. For people who are animal-allergic, not only can exposure lead to asthma attacks but long-term exposure to a pet can increase airway inflammation, increasing the severity of asthma attacks in reaction to other triggers. If you have a pet and aren't sure whether your child is allergic to it, you may wish to ask your doctor about allergy tests. If you don't have a pet but your child has animal allergies, you should avoid visiting homes with that type of animal and not purchase that type of animal as a pet. Children with a lot of allergies tend to develop more allergies over time, so if your child has several allergies, it's wise not to get a pet even

if your child's not allergic to that type of animal right now. It's much, much easier to avoid getting a pet than to try removing a pet after your child's become allergic to it!

Cats tend to cause more severe allergies than dogs, but dogs, horses and other animals can also cause problems. People who react to animals are actually allergic to the animal's dandruff or dander - if the animal has hair, it's going to have dandruff. For this reason, a 'hypo-allergenic' dog can cause allergies.

To remove all traces of pet after a pet is removed from the house, it is important to get the heating ducts cleaned and the carpets and upholstery steam-cleaned. This whole process should be repeated about four months later. If your child is pet-allergic and removing the pet is not an option, excluding it from the child's bedroom and bathing the pet weekly might be helpful. The child should minimize contact with the animal.



Asthma triggers

Plants & Pollens

Outdoor plants and pollens often cause seasonal allergies and asthma at particular times of the year. In Ontario, trees (such as elm, poplar and spruce) generally cause problems between April and June. Grasses (such as timothy grass and bluegrass) generally cause problems between mid-May and mid-July. Ragweed causes problems between August and October. You can check the level of pollens in your area on The Weather Network Pollen Report website theweathernetwork.com/outdoors/pollen/list.

Pollens can effectively be kept out of your house by keeping your doors and windows closed during pollen season. An air conditioner is helpful to keep your house comfortable while you do this. If your child is grass-allergic, they shouldn't mow the lawn. You might wish to remember that your child probably isn't allergic to washing the dishes!



Moulds

Outdoor and indoor moulds are another important group of allergens. Outdoor moulds are a problem in Ontario between March and November as they tend to release their spores in damp weather which travel better on windy days. This is probably the reason why many people's asthma gets worse in miserable, damp weather. During the fall, children with outdoor mould allergies (particularly allergy to a mould called *Alternaria*) should avoid playing in forests and other areas where there are a lot of damp, decaying leaves.

Indoor moulds grow especially well in damp places like poorly ventilated bathrooms. They also like damp basements – especially if there are open pools of water. Indoor moulds can be a problem year-round. Humidifiers should be used sparingly and cleaned often, as they can be contaminated by moulds. Reducing dampness in bathrooms and the basement can reduce indoor moulds. Areas in the home contaminated by mould should be cleaned thoroughly. A dehumidifier is sometimes helpful. For more information on addressing moisture and mould in your home visit canada.ca/en/health-canada/services/publications/healthy-living/addressing-moisture-mould-your-home.html.



Other important asthma triggers

OTHER IMPORTANT ASTHMA TRIGGERS

Foods

Foods are actually a pretty unusual cause of asthma. Unless your child wheezes or has other asthma symptoms shortly after ingesting a food, it most likely isn't a problem.

One food you should be especially aware of is peanut, if your asthmatic child has a peanut allergy. Studies have shown that children who have asthma and severe, life-threatening reactions to peanut are more likely to die after eating peanut than children who have severe, life-threatening reactions to peanut alone. If your child has severe, life-threatening reactions to peanut, you should speak to your doctor about getting a Medic-Alert bracelet and having an adrenaline syringe (Epipen®) with you at all times. In addition to watching ingredient lists (as instructed by your doctor), you need to be on the lookout for unexpected things – like the friend who makes a plate of peanut butter sandwiches and a plate of cheese sandwiches and then uses the same knife to cut all the sandwiches.

Cigarettes

Cigarette smoke makes asthma worse and can cause asthma attacks in children. Children should not be exposed to cigarette smoke. Because Canadian houses are so air-tight, cigarette smoke readily re-circulates in houses, and people who smoke should smoke completely outside. Marijuana smoke can also cause increased cough and increased production of mucus by the bronchial tubes.

Air Pollution

Polluted air may contain several substances that can worsen asthma, including nitrogen dioxide, low-level ozone in the atmosphere, and small airborne particles (or particulates). Sulfur dioxide is sometimes released by pulp and paper plants and can cause exercise-induced asthma in people with asthma exercising outdoors in hot, polluted weather. It is advisable for people with asthma to avoid excess time outdoors (especially exercising outdoors) when pollution warnings are in effect. Air pollution levels can be checked on several Internet websites, including Air Quality Ontario airqualityontario.com/aqhi as well as The Weather Network website theweathernetwork.com.

Other important asthma triggers

Strong Odours

Some children with asthma react to strong odours, like paints and hairspray, and should avoid exposure to these odours.

Colds

About 90 percent of asthma attacks in children are triggered by viral upper respiratory tract infections, known commonly as ‘colds’ and ‘the flu.’ Asthma symptoms usually start about three days after the child starts the runny nose and mild cough typical of a ‘cold.’ Some of the viruses that are common triggers of asthma attacks are: rhinovirus (the cause of the common “cold”), Influenza virus, and Respiratory Syncytial Virus (or RSV). RSV also causes bronchiolitis in babies, a respiratory tract infection involving the tiniest bronchial tubes. About half of babies who have bronchiolitis will develop asthma later in life. The commonest time of the year for asthma attacks is September. This is because kids returning to school in September start sharing colds, which leads to asthma attacks in kids with asthma, and in family members who have asthma. Bacterial infections (bacteria are more complicated bugs that are treated with antibiotics) are uncommon causes of asthma attacks.

There are a few things you can do to prevent colds. You can avoid having friends visit when they’ve got colds. You can try to keep your child with asthma from sharing towels with brothers and sisters with colds. You may wish to speak to your doctor about having your child get the flu shot in the fall to help prevent “the flu”. You can try training older family members to remember to wash their hands before and after touching their nose or mouth.

Exercise

During quiet breathing, most air is breathed in through the nose, to be warmed and humidified before reaching the lungs. During exercise, most air is breathed in through the mouth. In many asthmatics, this relatively cold and dry air can cause inflammatory cells in the bronchial tubes to release the chemicals that cause an asthma attack. As one might expect, this effect is more likely to occur when an asthmatic exercises in cold, dry air.

Exercise is important for good health, and asthmatics should be encouraged to exercise, just like everyone else. A warm-up period sometimes helps reduce exercise-induced asthma.

Good asthma control, through effective asthma treatment, can reduce or prevent exercise-induced



Can you prevent asthma?



asthma in many people with asthma. For children with asthma who are pretty well controlled except during exercise, inhaling their reliever (bronchodilator) medication just before exercise can help prevent exercise-induced asthma symptoms. While regular exercise will not prevent exercise-induced asthma attacks, it will certainly improve fitness.

Can you prevent asthma?

The rate of asthma in children is increasing in Canada and many other parts of the world. It makes sense that if the rate of asthma is increasing, modifying the environment children live in should be able to make the rate of asthma go down. This is an area of very active scientific research.

Dust Mites

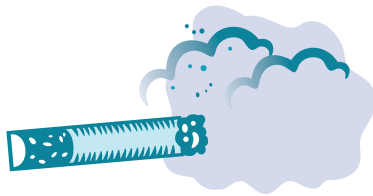
Dust mite allergy appears to be one of the key reasons for the increasing rate of asthma in children. As houses become increasingly airtight, the amount of dust mites trapped inside houses rises. The more dust mites that are present in the home (especially the child's bedroom), the higher the risk that children will develop dust mite allergy and asthma. Please see the section entitled Dust Mites on page 6 to find things you can do to reduce the amount of dust mites in your home and particularly in your child's bedroom.

Cigarette Smoke

Cigarette smoke is probably the second most important contributing factor for rising asthma rates in children. You should not allow your child

Can you prevent asthma?

to be exposed to cigarette smoke. If you smoke you should quit, if at all possible, for the sake of your children's health, your spouse's health, and last but not least, your own health.



Your doctor can advise you of techniques available to help you quit smoking – including counseling, community support groups, and medications. If someone in your house cannot quit they should smoke completely outside (not in the basement, bathroom, etc. as smoke re-circulates in air-tight Canadian houses) and they shouldn't smoke in the car if the child is in the car with them. It is now the law in Ontario.

Some resources to help people quit smoking that are available in Canada include:

- **Journey 2 Quit – A Workbook to Help You Quit Smoking** – available by calling the Lung Health Foundation's Lung Health Line at [1-888-344-LUNG \(5864\)](tel:1-888-344-LUNG)
- **Smokers' Helpline** – a toll free support service offered by The Canadian Cancer Society [1-877-513-5333](tel:1-877-513-5333)

Dirt

Recent research from several countries suggests that if the immune system of infants under six months of age is very busy fighting off infections, it may be too preoccupied to develop the kinds of inflammatory cells needed to develop allergic reactions. There is some evidence that children who are exposed to more germs – such as children with several older siblings, children in day care before six months of age, and children who live on farms or who are exposed to animals in early infancy, are less likely to develop allergies and allergic-type diseases such as asthma. Letting kids get dirty in the playground may be a good thing!

Anti-fever medications

Traditionally, people with asthma have been warned to avoid non-steroidal anti-inflammatory drugs (NSAIDs) such as acetylsalicylic acid and ibuprofen because some adults with asthma and nasal polyps are allergic to them, and use acetaminophen instead for fever or pain relief. Recent research suggests acetaminophen use early in life might increase the risk of asthma, and children with asthma who take acetaminophen for fever, rather than ibuprofen, may be more likely to have an asthma flare-up. While still controversial, some experts recommend avoiding acetaminophen in children with asthma or who are at risk for asthma, unless they have to avoid NSAIDs.



Risk factors and outcomes

RISK FACTORS AND OUTCOMES

Are there any risk factors for asthma?

The most important risk factor for asthma is probably whether allergic diseases run in the child's family. Children can inherit an increased likelihood of having an allergic disease from parents who have allergic diseases or whose families have allergic diseases. Those allergic diseases that can run in families include: asthma, hay fever (or allergic rhinitis), eczema, hives (or urticaria) and certain food allergies. There is usually no particular pattern of inheritance. In other words, a parent may have hay fever and have one child with asthma, another with eczema and a third with no allergic diseases at all. Individuals in families with allergic diseases are more prone to have cells that release chemicals causing local inflammation and allergic reactions in response to allergic and irritant triggers.

Smoking in the home increases the risk of asthma. This is important to note because prohibiting smoking in the house is a simple way to reduce the risk of a child developing asthma.

Recent studies have suggested that asthma is more common in children exposed to very large amounts of house dust.

Asthma is more frequent in children who were born prematurely (before 36 weeks gestational age). This is true even if the premature baby didn't have breathing difficulties due to under-developed lungs at birth. Asthma is also more common in children who had bronchiolitis as a baby – probably because the types of inflammatory cells present in the lungs of some children make them prone to both conditions.

Can a child with asthma outgrow it?

Even though asthma is a potentially dangerous disease, with good treatment, most Canadian children with asthma do well. The best studies on long-term outcome in asthma come from Australia. These studies show that about two-thirds of children with asthma outgrow it – sometime before or around puberty. In a small number of these patients, asthma comes back later in adult life. In most of the remaining one-third of patients their asthma improves as they grow older. Only about 10 percent of children with asthma will continue to experience asthma as a major problem as adults.

Risk factors and outcomes

Recent asthma research suggests that there may be two different forms of asthma in young children:

Viral Triggered Asthma

In one type, children are born with relatively small airways. When these airways are further narrowed by swelling of the linings of the airways due to viral respiratory infections, wheezing can result. This is a more common problem in boys and children whose mothers smoked during pregnancy. As the child grows, the airways become bigger and viral infections are less likely to cause enough airway narrowing to lead to asthma symptoms.

Thus, children with this form of asthma tend to have symptoms during viral infections such as colds and are otherwise well. They usually don't have other signs of allergies and usually outgrow their asthma later in childhood.

Allergic Asthma

In the other type of childhood asthma, children tend to have allergic diseases such as asthma, hay fever and eczema. These children have asthma symptoms when exposed to substances they are allergic to, such as pollens and animals, as well as having asthma symptoms during viral respiratory infections.

These children have probably inherited their tendency to have allergic diseases from their parents. They are more likely to continue having allergic diseases such as asthma and hay fever as they grow older, and they are less likely to outgrow their asthma.

Patterns of asthma in children

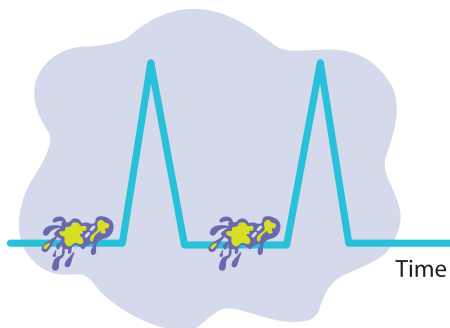
In children, asthma symptoms tend to happen in three different patterns. Knowing the pattern your child's asthma follows may help you and your child's doctor develop a plan to keep the asthma under control. Sometimes the pattern of a child's asthma changes as they get older. To recognize your child's asthma pattern, you need to keep track of how often your child has asthma symptoms or an asthma attack, what the triggers seem to be, and whether there are certain seasons when your child is more prone to asthma symptoms and/or asthma attacks. An asthma attack can be thought of as the presence of moderate or severe asthma symptoms which last for a day or longer.



Patterns of asthma in children

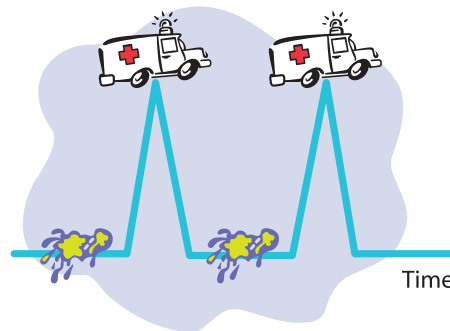
Mild intermittent asthma

This pattern is called mild intermittent asthma. Children with mild intermittent asthma have fairly mild attacks (more often than not, starting a couple days after colds) and have few or no asthma symptoms between these attacks. Doctors often treat this type of asthma with reliever medications used on an 'as needed' basis. Some doctors recommend taking the reliever medication regularly, for a few days, beginning at the start of colds to help prevent the muscles around the bronchial tubes from tightening up. The reliever medication can then be stopped when the cold is over.



Severe intermittent asthma

This pattern is called severe intermittent asthma. Patients with severe intermittent asthma generally have infrequent attacks, but when attacks happen, they are often severe and may need a visit to the emergency department or even admission to the hospital. As in mild intermittent asthma, colds are the most common trigger in children. Doctors may recommend using a controller medication — year-round or just during the seasons when asthma attacks are most likely to happen.

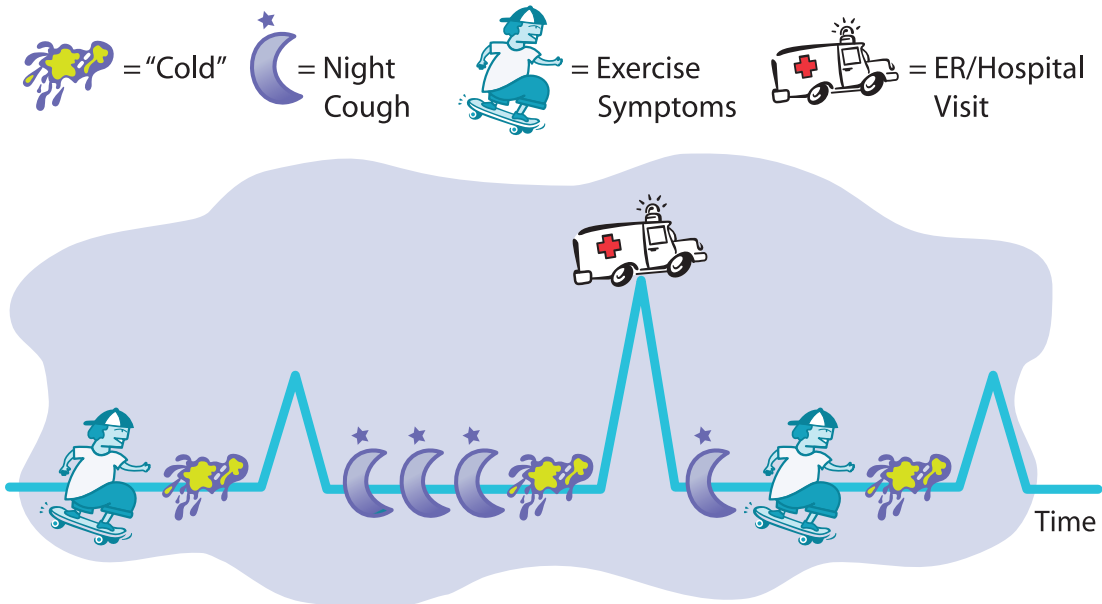


Patterns of asthma in children

Chronic asthma

This pattern is called chronic asthma. Before getting proper medications, children with chronic asthma have symptoms many or most days. They have asthma attacks (which may be mild or severe), and often have asthma symptoms, such as symptoms with exercise or nighttime cough, even when they're not having a major attack.

Guidelines recommend that children with chronic asthma receive regular daily treatment with a controller medication and also have a reliever medication available to use, on an as needed basis.





Monitoring your child's asthma symptoms

Monitoring your child's asthma symptoms

Monitoring means 'keeping track of the situation.' It's important to monitor your child both for sudden increases in asthma symptoms, which may represent an asthma attack, and gradual increases or decreases in symptoms, which will tell you and your doctor about your child's overall level of asthma control.

Monitoring your child's asthma symptoms

For most children, you can assess their asthma by keeping an eye on their symptoms of cough, wheeze and/or trouble breathing. Older children and adolescents can gradually learn to do this themselves, and then report to you if they're having problems. For a few children who are six years or older, when it's hard to tell whether their symptoms are due to asthma, or if they have few symptoms during asthma attacks, a peak flow meter (page 48) can help you and your child monitor their asthma. Keeping an asthma diary (either of symptoms, peak flows, or both) can help you track severity over time, and help you see whether symptoms are related to exposures.

Assessing Asthma Control

Your doctor will work with you and your child to monitor your child's asthma. He or she will do this by asking about how your child's been doing and by examining your child. If your child is old enough your doctor may order Pulmonary Function Tests (or PFTs), which measure how well air is getting in and out of your child's lungs. These are usually available for children 6 years and older. Your doctor will also give you advice on how to monitor your child's asthma between doctor's appointments.

What is good asthma control?

When your child's asthma is well controlled, he or she will have few (if any) asthma attacks. In addition, your child:

- Should rarely (if ever) have a nighttime cough or wake up at night because of coughing or shortness of breath.
- Should be able to exercise about as long as other children, with little (if any) cough, wheezing, chest tightness, or trouble breathing.
- Should handle 'colds' as well as other children.
- Should have mild and infrequent attacks, or none at all.

Monitoring your child's asthma symptoms

WHAT ARE THE SIGNS OF WORSENING ASTHMA CONTROL?

- Cough at night, or waking up at night because of coughing or chest tightness.
- Increased cough, wheezing and/or trouble breathing with exercise or reduced ability to exercise because of asthma.
- Cough or wheeze at rest (such as while doing homework or watching TV)
- More frequent or severe attacks, such as visits to the Emergency Department.

WHAT ARE THE SIGNS OF A SEVERE ASTHMA ATTACK?

- **Severe shortness of breath, rapid or shallow breathing, laboured breathing and/or sucking in of the skin between the ribs or at the base of the neck.**
- **Blueness anywhere.**
- **Severe cough or wheezing that returns within four hours after a treatment with the child's reliever medication.**
- **Inability to speak in full sentences.**
- **Sleepiness due to asthma.**
- **Fainting because of an asthma attack.**

If your child has signs of a severe asthma attack, and/or needs treatments with their reliever medication every four hours or less (or more often than your doctor recommends), you should have your child assessed by a doctor. If the attack is very severe, you should bring your child to an emergency department, or, if the attack is extremely severe, call 911 (if this service is available in your area). You should also see or talk to a doctor if you are worried about your child's asthma.

Monitoring Using a Peak Flow Meter

A peak flow meter lets you keep track of your child's asthma with an easy-to-use device. It measures the highest flow rate of air your child can blow out their lungs. Most children six years or older can learn to use a peak flow meter. Recent studies suggest that many children can notice their asthma symptoms before peak flow meter readings begin to drop much. This suggests that peak flow meters may be most useful for those children who have difficulty telling when their asthma has worsened. This includes children who have difficulty noticing when they're having quite severe difficulties breathing or those who are perhaps overly aware of their chest and may worry about minimal changes in their lung's function. If you use a peak flow meter, you should record the results in a diary card or on a calendar. After a few weeks you will be able to find



out your child's personal best peak flow reading. Your doctor can use this number when creating an asthma action plan for your child. Ideally your child should check peak flows in the morning, at night, and if you are wondering whether your child might be having an asthma attack. Your child might want to check their peak flows before and after vigorous exercise. It is recommended that whenever peak flows are checked, the child should repeat the measurement three times, and you should use the best measurement for your assessment and for record keeping. You may even want to record the peak flow readings in a computer spreadsheet that should let you make graphs to track trends!

Peak flow meters, like all-season radials, don't last forever. In most peak flow meters the little needle (that slides up to give you a reading) eventually loosens making the meter's readings a bit too generous. After a couple years of regular use, you should check your peak flow meter against a hospital's or buy a new one.

When a doctor prescribes a peak flow meter, they usually will provide you with a written asthma action plan to go with it. The action plan is usually based on the stoplight scheme. This will allow you to guide therapy and judge the importance of changes in your child's peak flow meter readings. In addition to checking where readings lie within your action plan, you should look for trends — are

the peak flows gradually going up after you start a new treatment, or are they gradually going down (for example, in the spring as the trees start to blossom)? For advice on how to use a peak flow meter, see page 48.

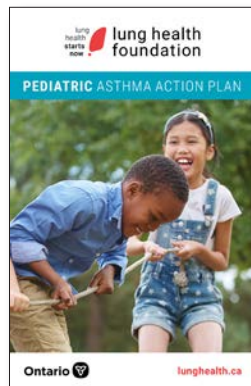


Monitoring your child's asthma symptoms

DEVELOPING A WRITTEN ASTHMA ACTION PLAN FOR YOUR CHILD

It's a very good idea to ask your doctor to write out an asthma action plan for your child. This will tell you when to give your child's asthma medications, how to tell when your child's asthma control has worsened, what to do when this happens, and what to do in case of an asthma emergency. Action plans are particularly useful in the middle of the night, when it's hard to remember everything your doctor told you. The asthma action plan usually uses the "stoplight" system based on your child's symptoms, peak flow measurements, or both.

You can download and print out a Pediatric Asthma Action Plan from our resource library at lunghealth.ca/resource-library to bring to your healthcare provider to fill out.



Many asthma action plans include:



GREEN ZONE: Your child has no asthma symptoms, and/or the peak flow reading is between 80-100% of your child's personal best. This is the "All Clear" zone — your child should continue their usual treatments.



YELLOW ZONE: Asthma symptoms are starting or your child has been exposed to a trigger such as a cold, and/or the peak flow reading is between 70-79% of your child's personal best. This is the "Caution" zone — your child's asthma may be getting worse. You should change your child's treatment as recommended by your doctor.



RED ZONE: Your child has severe asthma symptoms and/or the peak flow reading is less than 70% of your child's personal best. **This is an asthma emergency.** You should take a reliever medication as recommended by your doctor. Your doctor may recommend that you then call him/her right away. You should call 911 or go to the hospital right away if your child is struggling to breathe, has blue lips or fingers, is becoming tired from working so hard at breathing, and/or has a peak flow still in the Red Zone 15 minutes later despite treatment with his/her reliever medication.



HOW DO DOCTORS DETERMINE THE LEVEL OF ASTHMA CONTROL?

The Canadian Asthma Consensus Guidelines give precise definitions of asthma control for Canadian doctors to use. This table gives the definitions of good and adequate asthma control as described in the Canadian Asthma Consensus Guidelines used

by Canadian physicians. If your child's asthma doesn't seem adequately controlled, you should inform your child's doctor and you should discuss together what you can do to better control your child's asthma.

	GOOD CONTROL	ADEQUATE CONTROL
Daytime symptoms	None	Less than 4 days per week
Night-time symptoms	None	Less than 1 night per week
Physical activity	Normal	Normal
Need for reliever medication	None	Less than 4 doses per week
Absences from school or work	None	None
Asthma attacks	None	Mild and infrequent
Peak flow readings	Normal	90% of personal best
Peak flow variability $\frac{\text{highest number in two weeks} - \text{lowest number}}{\text{highest number in two weeks}} \times 100$	Less than 10%	Less than 15%
Pulmonary function test (at the doctor's office)	Normal	90% of personal best

Adapted from the Canadian Respiratory Journal Volume 17 Number 1 January/February 2010.

Asthma Medications

Asthma medications

Note: All medications have both a commercial name and a chemical name. Generic products often use the chemical name. In the following, the chemical names are given in brackets. There are too many asthma medications to list them all. In this section, we will discuss the preparations most commonly used in Ontario.

Controlling asthma involves a couple of important steps. The first step is reducing contact with the child's asthma triggers and the second step is drug therapy. As most medications for asthma are inhaled, an understanding of how to use the child's inhaler(s) is absolutely essential (pages 36-47).

Inhaled medications are popular, as relatively large amounts of medication can be delivered directly to the lungs, and quite little medication reaches other parts of the body where it can potentially cause side effects. The disadvantage of inhaled medications is that the inhaler must be used properly and the inhaler must be in good working order for the medication to reach the lungs. Some asthma medications are taken as pills or syrups.

The Types of Medications Used in Asthma

There are two main types of medications used in asthma:

RELIEVER medications

Reliever medications temporarily relax the muscle bands that surround the bronchial tubes when they tighten up (or bronchoconstrict) during an asthma attack. These medications are essential for making certain that enough air gets in and out of the lungs during an asthma attack. Virtually everyone with asthma should have a reliever medication available.

CONTROLLER medications

Controller medications are important for long term control of asthma. As the name suggests, controller medications control asthma symptoms to reduce the chance of asthma attacks and reduce the severity of the child's asthma. In general, these medications must be used regularly to be effective.

Most controller medications are considered "anti-inflammatory" medications. Anti-inflammatory medications make inflammatory cells in the lungs



less likely to release the chemicals that cause asthmatic reactions in the lungs. This makes the lungs less sensitive to the various factors that trigger a given child's asthma, even when the child is exposed to these factors. Some controller medications even decrease the number of inflammatory cells in the lungs. Inhaled corticosteroids are the most effective controller medication. Anti-leukotriene medications are another important type of anti-inflammatory medication. Other anti-inflammatory medications include ketotifen, anti-IgE therapy, and the theophyllines. Theophyllines actually have reliever and controller properties. Long-acting beta-2-agonists are bronchodilators that reduce bronchoconstriction for long periods of time. They reduce asthma symptoms and also appear to reduce the risk of asthma attacks. They are considered a type of controller medication that doesn't have significant anti-inflammatory properties.

RELIEVER MEDICATIONS

The main reliever medication for asthma is the beta-2-agonist. Occasionally your doctor may prescribe an anti-cholinergic medication (see page 25).

Short-acting beta-2-agonists

Beta-2-agonists are related to adrenaline, but are chemically altered so they have much less effect on the heart and the blood pressure. They are the most powerful and most rapidly-acting type of reliever medication. There are two main types of beta-2-agonists: short-acting and long-acting. All short-acting beta-2-agonists are fast-acting. Short-acting beta-2-agonists, when given by inhaler, start working in about five minutes, reach peak effect in about 30 minutes, and finish working in about four-to-six hours. Common inhaled forms of short-acting beta-2-agonists include:

- Ventolin® (salbutamol)
- Airomir™ (salbutamol)
- Bricanyl® (terbutaline)

These medications come in metered-dose inhalers ("puffers"), dry powder inhalers, and for use in wet nebulizers; Ventolin® is also available as a syrup. Beta-2-agonists are more effective and have fewer side effects when given by inhaler. If your child is having an asthma attack and you have a beta-2-agonist syrup and a beta-2-agonist inhaler available at home, using the beta-2-agonist inhaler is preferable.

Asthma Medications

There are several common ways short-acting beta-2-agonists are used:

- Inhaled short-acting beta-2-agonists are usually given every four-to-six hours, as needed, for asthma symptoms such as coughing, wheezing, chest tightness, or trouble breathing. Beta-2-agonist syrups can be given up to every six hours.
- If your child needs their beta-2-agonist inhaler more than every four hours, it is a sign of a severe asthma attack. You should discuss with your doctor ahead of time what to do if this happens. Many doctors will recommend that you should talk to a doctor, bring your child to a doctor, or take your child to an emergency room.
- Treatment with a short-acting beta-2-agonist, three-to-four times a day, can be started at the first sign of a cold to help prevent the muscles around the bronchial tubes from tightening up (known as bronchospasm). The beta-2-agonist should be stopped once the cold starts to go away, if no signs of asthma have developed.
- Beta-2-agonists can be used about ten minutes before exercise to prevent exercise-induced asthma.

Side effects

- Because beta-2-agonists are related to adrenaline, even when they are used properly, they can cause a muscle tremor and a mild increase in the heart rate, and temporarily make children excessively active.
- Very high doses can cause serious heart problems, which is why giving very frequent





doses of beta-2-agonists should be done in a hospital setting carefully supervised by medical staff. If your child needs their inhaled beta-2-agonist more than every four hours, you should carry out your doctor's plan of action. If you don't have a plan of action prepared in advance, or if you have any worries about your child, you should speak to or see a doctor, or take your child to an emergency room.

- Regular prolonged use of short-acting beta-2-agonists can lead to worsening of asthma. The same is true for long-acting beta-2-agonists, if they are used regularly without regular use of an inhaled steroid controller medication. For this reason, current Canadian guidelines for the treatment of asthma suggest that people who need short-acting beta-2-agonists four or more times per week do not have adequate asthma control and should receive a controller medication to improve their control. If your child needs their short-acting beta-2-agonist four or more times per week, you should let your doctor know as you should discuss potential treatment options with your doctor.

Anti-cholinergic medications

Anti-cholinergic medications relax the muscles that surround the bronchial tubes by using chemical messages which are different from the ones used by beta-2-agonists. One anti-cholinergic medication is presently available – Atrovent® (Ipratropium Bromide). Atrovent® is available as puffer (or metered-dose inhaler) and for use in a nebulizer. Anti-cholinergic medications cause gradual, fairly mild relaxation of the muscles that surround the bronchial tubes. However, because it works using messages which are different from the ones used by beta-2-agonists, doctors may use an anti-cholinergic medication along with a beta-2-agonist to achieve more relaxation of tightened bronchial muscles than you could achieve with a beta-2-agonist by itself.

Ipratropium is also available combined with a short acting beta-2 agonist salbutamol in a nebulizer solution called Combivent®.

Common uses of anti-cholinergics

- An anti-cholinergic medication can be used to help relieve asthma attacks that usually don't get relieved enough by a beta-2-agonist by itself.
- An anti-cholinergic medication can be useful as a reliever medication in children who can't

Asthma Medications

tolerate or use a beta-2-agonist, including children with heart conditions who have difficulty tolerating the increase in heart rate beta-2-agonists can cause, or are on medications called beta-blockers, that interfere with the action of beta-2-agonists.

- An Anti-cholinergic medication can be used before exercise to prevent exercise-induced asthma.

Side effects

Anti-cholinergic medications rarely cause side effects but can occasionally cause a dry throat. The medication should not be aimed towards the eyes.

CONTROLLER MEDICATIONS

There are three main types of controller medications for asthma. They are: steroid-type medications, anti-leukotriene medications, and long-acting beta-2-agonists. Occasionally your doctor may also prescribe a theophylline (see page 33).

Steroid-type controller medications

Steroids act directly on the inflammatory cells that cause asthmatic reactions in the lungs,

making them less likely to release chemicals causing asthmatic reactions, and reducing the number of inflammatory cells present. This helps prevent asthma symptoms and attacks and reduces the severity of the disease. Steroid medications are the most consistently effective controller medications used to treat asthma.

The steroid medications used in asthma treatment are different from the anabolic steroids that have been misused by athletes, for example, in the Olympics. When steroid medications are used for the long-term prevention of asthma attacks, they are almost always given by inhaler. Inhaled steroids are more effective when given on a consistent basis, during the season or seasons when a child with asthma is most likely to be having asthma symptoms and attacks. During asthma attacks, oral steroids given by pill or liquid may be used to prevent the worsening of a severe attack. A few very severe asthmatics need to take oral (pill or syrup) steroid medications on a regular basis.

Inhaled steroid controller medications

Inhaled steroids are designed to go directly to where they are needed (the lungs), with extremely little of the drug reaching the rest of the body. This lets inhaled steroids act as extremely effective controller medications, while markedly reducing



the risk of steroid-type side effects. Inhaled steroids are used to prevent asthma attacks, and improve overall asthma control. Because inhaled steroids usually take one-to-six weeks to start working, they generally work best when taken on a regular basis, long-term, using them for a season at a time (or longer). Because inhaled steroids begin working relatively slowly, if your child is started on an inhaled steroid and isn't better after a couple of weeks, you shouldn't get discouraged. Obviously, if during this time your child gets worse, you should notify your doctor. Inhaled steroids available in Canada include:

- Pulmicort® (budesonide)
- Flovent® (fluticasone)
- QVAR™ (beclomethasone)
- Alvesco® (ciclesonide)
- Asmanex™ (mometasone)

Inhaled steroids are available, depending on the medication, as puffers (metered-dose inhalers), dry powder inhalers, and for use in nebulizers. Some doctors recommend that when asthma symptoms or peak flows show signs of steady worsening, the inhaled steroid dose should be increased. While some studies suggest that doubling the dose during attacks is not very effective for many patients, quadrupling the dose may be effective, although that's fairly expensive. It's generally better to work

with your doctor to find a dose of inhaled steroids that consistently prevents attacks from occurring in the first place. During a severe asthma attack, oral steroids are the most effective medications for preventing the attack from worsening.

Several inhalers containing a combination of inhaled steroid and long-acting beta-2-agonist are also available. These are discussed under Long-acting beta-2-agonists (page 31).

Side effects

Most children using inhaled steroids experience no side effects at all.

- A few children have dry mouth or throat irritation. This is usually minor.
- Inhaled steroids can cause thrush in the mouth (little white patches caused by a yeast infection). If this happens it is usually treated with a special anti-yeast antibiotic. Thrush can be prevented by:
 - Rinsing the mouth with some water (and ideally spitting the water out) after using the inhaled steroid inhaler;
 - Using a spacer device (like the AeroChamber® spacer), so the heavier medicine particles released by the inhaler land in the spacer, rather than in the mouth.

Asthma Medications

- Very rarely, inhaled steroids can cause a hoarse voice. If your child develops a hoarse voice for no apparent reason (such as a cold) you should let your doctor know because the hoarseness can be an important indicator of a problem with the vocal cords.
- Some children, especially on higher doses of inhaled steroids, may grow about 1 cm less during the first year of treatment. With continued, long-term therapy, the growth rate generally returns to normal. Final adult height is generally normal, particularly since children with asthma often begin puberty a little later than normal and will therefore keep growing for longer. The great majority of children on inhaled steroids grow normally. Since severe, uncontrolled asthma affects growth, some children actually grow better on inhaled steroids. Others may be more sensitive to growth effects, and should have the inhaled steroid dose reduced, if possible. All children on inhaled steroids should have their growth carefully monitored. Alvesco® (ciclesonide) inhalers contain an inactive inhaled steroid, which is activated only in the lungs, so effects on the rest of the body are minimal; studies to date have not found that this drug affects growth or hormone levels (see below).
- Inhaled steroids may cause minor changes in the balance of natural steroid hormones that

are produced by the body's adrenal glands. This does not seem to be of any clinical significance. Children with severe asthma may frequently need oral steroids. By reducing the severity of asthma, inhaled steroids generally reduce the need for oral steroids. Studies have shown that being on an inhaled steroid all year long has less effect on natural steroid hormone balance than four courses of oral (or intravenous) steroids in a year. Because of this, it is safer for a child to take inhaled steroids all year round than use oral steroids frequently. Children on extremely high doses of inhaled steroids (generally over 1000 micrograms per day of fluticasone, for example) may be at risk of suppression of the adrenal glands' function, which can lead to growth failure, severe fatigue, nausea, low blood sugar, and/or low blood pressure. Children on such very high doses of inhaled steroids should be followed by an asthma specialist, possibly have their morning blood cortisol levels checked, and see a doctor if they experience these types of symptoms. Note that if your child's doctor recommends a course of oral steroid to control a serious asthma attack, your child should still take the oral steroid because it can keep the asthma attack from becoming severe.



Oral steroids

Oral steroids can be given by mouth or, in a hospital setting, injected (either through an intravenous or into the muscle). When given in such ways they powerfully reduce inflammation and are effective in helping control severe asthma attacks. Oral steroids are usually given for three-to-seven day periods; when used for a week or more the dose is usually slowly tapered down over a varying period of time. Oral steroids rarely have serious side effects when given for three-to-seven day periods.

In a few very severe cases, oral steroids are used for months at a time, or even longer. This should be done under the careful supervision of a doctor. When oral steroids are used for months at a time (or longer), there is a potential for a number of serious side effects.

In Canada, commonly used oral steroids include Prednisone, PediaPred® (Prednisolone), and Decadron® (Dexamethasone).

Side effects

- When used for short (three-to-seven day) periods, oral steroids can cause mood changes, increased appetite, acne and weight gain. Serious side effects, such as damage to the hip joint, are uncommon.

- When used for long periods (many months or more), oral steroids can cause reduced growth, thinning of the bones, cataracts, high blood pressure, difficulties dealing with stresses (like surgery), reduced ability to handle infections (especially chickenpox) and weight gain. Because of the potential for these kinds of side effects, patients on long-term treatment with oral steroids are monitored closely by a doctor.

Anti-leukotriene medications

Singulair® (montelukast) and Accolate® (zafirlukast) interfere with chemicals that cause inflammatory reactions in the airways called leukotrienes. These are oral medications, so inhaler devices are not needed, making it convenient for many people. Anti-leukotriene medications are given on a long-term, regular basis to prevent asthma attacks and improve asthma control. They work in many, but not all children with asthma. Children with asthma triggered by colds produce more leukotrienes than normal, and Singulair® (or montelukast) is sometimes used only during colds, especially around September when colds are most frequent. These medications take about one-to-seven days to start working and reach maximum effectiveness

Asthma Medications

in about three weeks. This means that if your child is started on Singulair® or Accolate® and doesn't improve right away, you shouldn't get discouraged. If during this time your child gets worse or isn't better within about three weeks of using this type of medication, you should notify your doctor.

- In Canada, Singulair® is licensed for use in children two years of age and older. It's available as a chewable tablet and a sprinkle, which can be mixed with applesauce or pudding. It is given as a single dose at bedtime.
- In Canada, Accolate® is licensed for use in children twelve years of age and older. It's a tablet that's taken twice a day and each dose should be taken one hour before or two hours after meals.

Given alone, these medications reduce asthma symptoms, including symptoms of exercise-induced asthma, and the frequency of asthma attacks. Children with more severe chronic or intermittent asthma (including people with attacks severe enough to need visits to an emergency room or admission to hospital, and/or people with frequent and severe symptoms) will generally have better asthma control using an inhaled steroid.

Patients with more severe asthma may benefit from regular therapy with both an anti-leukotriene

medication and an inhaled steroid medication. This may reduce symptoms more than using the inhaled steroid alone, and it may allow the doctor to reduce the amount of inhaled steroid needed by the child. If your child is taking an inhaled steroid and your doctor adds an anti-leukotriene medication, the inhaled steroid should not be stopped abruptly and the dose should not be reduced without your doctor's advice. In a child who needs an inhaled steroid to prevent severe asthma attacks, decreasing the inhaled steroid dose too much (or stopping the inhaled steroid) could put the child at risk for a severe attack.

Accolate® may interact with several medications, including erythromycin (a common antibiotic), Aspirin® (acetylsalicylic acid), theophylline (another asthma medication which is taken by mouth), Coumadin® (or warfarin, a blood-thinner), Dilantin® (phenytoin, an antiseizure or Epilepsy medication) and Tegretol® (or carbamazepine, an anti-seizure or Epilepsy medication). Speak to your doctor or pharmacist if your child is taking Accolate® and other medications that are not inhalers.

Common uses of anti-leukotriene medications:

- Anti-leukotriene medications are used as controller medications, on a long-term, regular basis.



- Anti-leukotriene medications are sometimes used to reduce asthma symptoms during colds.
- Anti-leukotriene medications may be used on their own or together with an inhaled steroid.

Side effects

In general, side effects with anti-leukotriene medications are rare.

- These medications occasionally cause headaches and stomach aches.
- A few children may experience insomnia, nightmares, mood changes including depression, and/or behaviour problems.
- Rarely, patients on Accolate® have developed liver problems, and patients on this medication should have blood tests to check the liver regularly. Liver problems are extremely uncommon with Singulair®.

Long-acting beta-2-agonists

The long-acting beta-2-agonists available in Canada are:

- Serevent® (salmeterol)
- Oxeze® (formoterol)
- Foradil® (formoterol)

These are only available as metered-dose and dry powder inhalers. A long-acting beta-2-agonist can be useful for reducing asthma symptoms in people who still have symptoms despite use of an inhaled steroid controller medication. In Canada, salmeterol is licensed for use in children four years of age and older, and formoterol is licensed for use in children six years of age and older.

Both long-acting beta-2-agonists are also available in inhalers combined with an inhaled steroid medication:

- Serevent® (salmeterol) is available combined with the inhaled steroid Flovent® (fluticasone), and called Advair®
- Oxeze® (formoterol) is available combined with the inhaled steroid Pulmicort® (budesonide), and called Symbicort®
- Formoterol is available combined with the inhaled steroid mometasone, and called Zenhale™

In general, using a combination inhaler is the safest way to receive long-acting beta-2-agonists. One advantage of these combination inhalers is convenience for people requiring both inhaled steroid and long-acting beta-2-agonist medications. In addition, for adolescents, the combination product will prevent them from using only the long-acting

Asthma Medications

beta-2-agonist inhaler (which provides fairly rapid symptom relief) and ensures they also receive their anti-inflammatory controller medication. Advair® is licensed in Canada for individuals four years of age and older as a Diskus® dry powder inhaler, and for individuals 12 years of age and older as a puffer (metered-dose inhaler). Symbicort® is licensed in Canada for individuals 12 years of age and older and comes in a Turbuhaler® dry powder inhaler. Zenhale™ is licensed in Canada for individuals 12 years and older and comes in a metered-dose inhaler.

There are several common ways long-acting beta-2-agonists are used:

- Long-acting beta-2-agonists can be useful for prolonged protection against exercise-induced asthma in older children who are endurance athletes (e.g. cross-country skiers). Serevent® should be taken a half-hour before exercise and Oxeze® or Foradil® should be taken 15 minutes before exercise. Both can provide up to 12 hours of protection. People taking long-acting beta-2-agonists should also receive regular treatment with an inhaled steroid controller medication.
- In people who have asthma symptoms despite optimal treatment with controller medications, taking a long-acting beta-2-agonist regularly

(on a long-term basis) reduces symptoms, improves lung function, and possibly even reduces the risk of asthma attacks.

- If you have taken a long-acting beta-2-agonist and are still having asthma symptoms, you can take a short-acting beta-2-agonist. You should contact a doctor if the asthma symptoms are severe.
- Because the combination inhaler Symbicort® contains a long-acting beta-2-agonist that starts working as fast as short-acting beta-2-agonists, it can both be taken regularly, and have additional doses taken as needed for asthma symptoms (to a maximum total dose of 8 inhalations per day). The additional “as needed” doses will provide extra inhaled steroid controller therapy, which appears to reduce the risk of asthma attacks. This strategy is sometimes called the “SMART” protocol, which means Symbicort® Maintenance And Reliever Therapy.

Side effects

- Because beta-2-agonists are related to adrenaline, even when they are used properly, they can cause a muscle tremor and a mild increase in the heart rate, and temporarily make children excessively active.



- Regular use of long-acting beta-2-agonists may lead to a slight reduction in their ability to prevent exercise-induced asthma.
- Many recent studies suggest that regular prolonged use of long-acting beta-2-agonists without the regular use of an inhaled steroid controller medication can lead to worsening asthma. If a long-acting beta-2-agonist is used without an inhaled steroid more than twice a week, it **MUST** be taken with regular inhaled steroid therapy. If this is the case with your child, you should speak to your doctor about adding an inhaled steroid or changing to a combination inhaler (see page 31).

Ketotifen

Zaditen® (ketotifen) interferes with a chemical that causes airway inflammation called Platelet Activating Factor. It is usually given on a long-term, regular basis to prevent asthma attacks and improve asthma control. Ketotifen also has some anti-histamine effects. Ketotifen is given as a pill or syrup and takes one-to-two months to start working. It works in some patients with mild asthma. This means that if your child is started on ketotifen and isn't better after a couple weeks, you shouldn't get discouraged. If during this time your child gets worse, you should notify your doctor.

Common uses of ketotifen

- Ketotifen is used as a controller medication, on a long-term, regular basis.

Side effects

Side effects are relatively common with ketotifen.

- Ketotifen may cause weight gain.
- A few children get sleepy on ketotifen. As can happen when they take anti-histamines, a few children get overly active instead of sleepy. Both of these reactions are usually temporary.

Theophyllines

Theophyllines are available as pills and syrups. They produce fairly mild relaxation of the muscles around the bronchial tubes and commonly cause side effects. For these reasons they aren't currently used that often to treat asthma in children in Canada. Theophylline appears to also have some anti-inflammatory controller effects which may help inhaled steroids work better. Theophylline drugs available in Canada include Theolair™ and Uniphyll®. Theophyllines have to build up a certain level in the blood to be effective. If the blood level is too low, the medication may not work. If the blood level is too high, serious side effects can happen.

Other forms of treatment

People on theophyllines should have their blood levels checked periodically by their doctors. Theophyllines have drug interactions with many other medications.

Common Uses of Theophyllines

- In Canada theophyllines are used most often in severe asthmatics who need additional medication despite treatment with other drugs.

Anti-IgE therapy

Antibodies are proteins people make to fight infections. IgE is a very special type of antibody made by people with allergies. When people with allergies are exposed to their allergic triggers, the substances they're allergic to combine with IgE to trigger an allergic reaction. Part of the allergic reaction involves creating airway inflammation, which can lead to asthma symptoms or attacks.

Xolair® (or omalizumab) is a medication designed to block IgE antibodies. It is currently licensed in Canada for individuals 6 years of age and older. It is given by injection, every 2 to 4 weeks (rather like allergy shots). Since it blocks all human IgE antibodies, it can help prevent most types of allergic reactions from leading to worsening

asthma. Studies have shown that treatment with Xolair® leads to moderate improvements in asthma severity.

OTHER FORMS OF TREATMENT

Allergy shots

Allergy shots (or immunotherapy) are a series of injections which contain very tiny amounts of a substance a person is allergic to. Giving these injections, in slightly increasing amounts over a long period of time may gradually make the person less likely to have an allergic reaction when exposed to a larger amount of this substance. Allergy shots can be helpful in people with hay fever (or allergic rhinitis) who are allergic to a particular pollen which is present a certain time of the year, such as ragweed. Unfortunately, most people with asthma triggered by allergies are allergic to many different things, and making these people less sensitive to one or two particular allergens usually has little impact on their overall asthma control. In addition, people with asthma are more likely to have severe reactions to allergy shots than people who have allergies alone. Because of these reasons, most doctors do not recommend allergy shots for children



with asthma. If allergy shots are used, they should be given very carefully and are usually only used in particular situations, such as the child who really seems to be only allergic to one or two things, and who has no other triggers.

Complementary (alternative) therapies and asthma

Conventional asthma therapy can improve asthma control and prevent potentially dangerous asthma attacks in virtually all children with asthma. While some families may wish to consider alternative treatments, it must be emphasized that **these treatments, when used, should be used in addition to conventional therapy rather than instead of conventional therapy to avoid the possibility of a severe asthma attack.** You must remember to keep your doctor informed of any alternate treatments and remedies.

Massage therapy

Twenty-minute massage therapy sessions (stroking and kneading motions of the face, head, neck and shoulders, arms, hands, legs, feet and back) taught by a trained massage therapist have been shown in a carefully-performed medical research study to reduce anxiety in children four-to-14 years of age and modestly improve pulmonary function.

Chiropractic therapy

A carefully performed study of chiropractic manipulation showed no benefit when added to conventional medical therapy in children with asthma.

Herbal remedies

Some herbal remedies for asthma contain compounds closely related to medications commonly used in the conventional treatment of asthma. Tea contains caffeine, which is closely related to theophylline, a mild bronchodilator. Ma Huang (Ephedra) is related to beta-2-agonist relievers (bronchodilators). However as dosages may not be standardized or may vary, there is no discernible advantage to their use over conventional drug preparations.

Note: Mixing herbal remedies with conventional medications could be a dangerous combination. Remember to keep your doctor and pharmacist informed of every treatment you or your child take.

Other methods

Many other alternative therapies for asthma are being promoted. In general, these treatments have not been carefully evaluated for their efficacy and their potential side effects are often unknown. Some of these therapies rely on non-conventional allergy testing.

Asthma inhalers & other devices

Conventional allergy tests usually apply extracts of substances which are common causes of allergies to skin which has been pricked with a needle or, less often, injected with a needle into the skin. The results of these tests have been shown to be closely related to allergy-causing antibodies against these substances.

Non-conventional allergy tests, using electrical, magnetic or other methods, have not been shown to be related to antibodies and their clinical significance has not been demonstrated. If your child is having allergy tests performed by someone who is not a trained allergist, you should ask whether your child is getting a conventional or non-conventional allergy test.

Asthma inhalers & other devices

Inhaled asthma medication will not work unless it reaches your child's lungs. This section will help remind you how to use the various types of asthma inhalers. However, a health care professional experienced in teaching the use of asthma inhalers (such as a doctor, nurse, pharmacist, or respiratory therapist) should also teach you and your child how to use

the inhalers, and doublecheck your child's inhaler technique from time to time. If you have questions or concerns regarding the use of your child's inhaler device(s), speak to your doctor as soon as possible.

Of course, as with all asthma medications, inhaled medications also won't work unless your child takes them. Particularly with teenagers, check from time to time that they are taking their medications as prescribed. Many inhalers have dose counters, which you can use to check whether the medication is being taken too frequently, or not often enough. Some parents trust quite young children to take their controller medications alone. This may not be a good idea, and it may be better to have your child take their medication(s) at meal times, when you can verify that they're being used properly.

THE METERED-DOSE INHALER (MDI)

This is a metal canister placed in a plastic holder. Most children under the age of nine cannot use an MDI properly. For these children a spacer device (see pages 37-40) should be used with the MDI. Regardless of the child's age, spacers are recommended when a steroid inhaler is used to reduce the risk of developing a yeast infection in the mouth or throat.



Instructions

1. Make sure that the metal canister is placed firmly in the plastic holder.
2. Remove the cap and shake the MDI well.
3. Ask your child to breathe out, emptying their lungs.
4. Have your child tilt their head back slightly and place their mouth around the mouthpiece
5. Have your child start breathing in slowly and deeply through the mouth. About one-third of the way into the breath, have your child depress the metal canister to release one puff of the medication, while continuing to breathe in steadily and deeply all the way. Once your child has breathed in fully, have them hold their breath in for five-to-ten seconds or as long as possible before breathing out.
6. If your child requires more than one puff of the medication, wait 30 seconds, shake the MDI again, and then repeat steps three-to-five.

Hints

- If you see a mist escaping from the mouth during the inhalation, you will need to improve your child's technique.
- Rinse the plastic holder of MDI regularly with warm tap water. Remove canister from plastic

holder before rinsing. Let dry thoroughly before replacing the canister.

- To check the level of medication remaining in your MDI, remove the metal canister from the plastic holder. Placing a finger on the top of the canister, gently shake, feeling for liquid moving within the canister. When little liquid movement can be felt, the MDI is almost empty.



SPACER DEVICES

Spacer devices allow medication released from a metered-dose inhaler to form a cloud inside the holding chamber, allowing people with asthma to inhale the medication without having to precisely coordinate releasing the medication from the inhaler and breathing in the medication. The best holding chambers, or spacer devices,

Asthma inhalers & other devices



contain one or more one-way valves, to keep the medication in the holding chamber as long as possible. There are several very good quality spacer devices available in Canada, and some others that may not be as effective. Your health care professional can help you choose the appropriate device for your child. In the past, some professionals have suggested using coffee cups or two litre plastic soft drink bottles as spacer devices. However, these do not contain valves, and are not nearly as effective as devices designed especially for delivering asthma medications to the lungs. This booklet will discuss the AeroChamber®, one of the high-quality spacer devices which is commonly used in Ontario.

The spacer with mask

A spacer with mask is a holding device which helps to deliver medication in young children (usually

under five years of age) who cannot coordinate their breathing well enough to use a metered-dose inhaler (MDI) alone and who are too immature to be able to keep their lips tight around the mouthpiece of a spacer with mouthpiece. The spacer with mask is used together with an MDI. They come in different sizes, for children of varying ages. For example:

- The orange AeroChamber® with Mask is used for infants less than one year of age.
- The yellow AeroChamber® with Mask is used in children approximately one-to-five years of age.

Instructions

1. Prepare the MDI by removing the cap, shaking the canister well and placing it upright in the rubber opening of the spacer.
2. Place the device's mask over your child's face firmly, making a good seal over the nose and mouth.
3. Press down on the canister, releasing one puff of medication into the spacer.
4. Hold the mask in place until your child has taken at least six breaths. You can watch the gray valve move inside the AeroChamber® to help you count the breaths.



5. If your child requires more than one puff of medication, wait at least 30 seconds, and then repeat steps one-to-four. Remember to shake the canister well before giving another puff. Do not spray more than one puff at a time into the device.

Hints

- If your child struggles when using this device, try to persist, as most children will eventually get used to it. Your child will get medication into the lungs even if he/she cries.
 - At about four-to-five years of age your child should be switched to a spacer with mouthpiece, as this will prevent loss of medication in the nose.
 - If your child is using inhaled steroids, have your child drink or rinse their mouth with water if able after each use. This will reduce the risk of developing a yeast infection in the mouth or throat.
 - The AeroChamber® should be replaced when the small gray flap valve is cracked, hard, or gets permanently curled, if the rubber opening of the device becomes cracked or torn, or if the mask is damaged or has a hole in it.
 - To avoid dust accumulation, keep your device in its plastic container when not in use.
- Rinse the device in warm tap water every few days and clean weekly with a mild detergent. Let dry thoroughly before using.

The spacer with mouthpiece

The spacer with mouthpiece is a holding device that helps to deliver medication in children (usually five years of age or older) who cannot coordinate their breathing well enough to use a metered-dose inhaler (MDI) alone.

The spacer is used together with an MDI. The spacer with mouthpiece is appropriate for children old enough to keep their lips tight around the spacer mouthpiece. Because the nose traps particles, children who use the spacer with mask will lose some of the medication in the nose and it is



Asthma inhalers & other devices

therefore preferable to use a spacer with mouthpiece when the child is able to keep their lips tight around the adult spacer mouthpiece. This is usually around five or six years of age. Regardless of the child's age, spacers are recommended when a steroid inhaler is used in order to reduce the risk of developing a yeast infection in the mouth or throat.

Instructions

1. Prepare the metered-dose inhaler by removing the cap, shaking the canister well and placing it upright in the rubber opening of the spacer.
2. Ask your child to breathe out, emptying their lungs.
3. Place the mouthpiece of the spacer into your child's mouth and have your child close their lips tightly around the mouthpiece.
4. Press down on the canister, releasing one puff of medication into the spacer.
5. Ask your child to take one breath in through the mouth as deeply as possible, and hold the breath in for five-to-ten seconds. If he/she is unable to do so, ask your child to breathe in and out deeply and slowly for three-to-four breaths instead, while keeping the lips closed around the mouthpiece.
6. If your child requires more than one puff of medication, wait at least 30 seconds, and then repeat steps one-to-five. Remember to shake the canister well before giving another puff. Do not spray more than one puff at a time into the spacer.

Hints

- If your child is breathing through the (blue) Adult AeroChamber® too quickly, you will hear a musical sound. If this happens ask your child to breathe in and out more slowly when using the AeroChamber®.
- If your child is using inhaled steroids, have your child rinse their mouth with water after each use. This will reduce the risk of developing a yeast infection in the mouth or throat.
- The AeroChamber® should be replaced when the small gray flap valve is cracked, hard, or gets permanently curled, or if the rubber opening of the AeroChamber® becomes cracked or torn.
- Rinse the device in warm tap water every few days and clean weekly with a mild detergent. Let dry thoroughly before using.
- To avoid dust accumulation, keep cap on mouthpiece when not in use.

DRY POWDER INHALER DEVICES

Many children enjoy using dry powder inhalers, as they avoid the need for a bulky spacer device. Most children can learn to use a dry powder inhaler between four and six years of age. A few children are bothered by the



powder contained in a dry powder inhaler and prefer a metered-dose inhaler with or without a spacer device.

The Turbuhaler®

Finely powdered medication is contained inside this device in pre-measured doses. Most children over five years old can use this device.

Medications that are available in a Turbuhaler® include:

- Pulmicort® (Budesonide) – brown base on Turbuhaler® (an inhaled steroid)
- Bricanyl® (Terbutaline) – blue base on Turbuhaler® (a short-acting reliever)
- Oxeze® (Formoterol) – greenish-blue base on Turbuhaler® (a long-acting beta-2-agonist)
- Symbicort® (Budesonide combined with Formoterol) – red base on Turbuhaler® (a combined inhaled steroid controller and a long-acting beta-2-agonist)

Instructions

1. Unscrew the cover and lift it off.
2. Holding the inhaler upright, turn the coloured base to the right as far as it will go and then back to the left until you hear a click. This releases a measured dose of medication.



3. Ask your child to breathe out, emptying their lungs.
4. Then, have your child close their lips tightly around the mouthpiece then ask him/her to breathe in slowly and deeply through the mouth. For young children a deep breath is necessary. In older children a medium sized breath is best. Once your child has breathed in, remove the mouthpiece from the child's mouth and have him/her hold the breath in for five-to-ten seconds or as long as possible. Do not allow your child to breathe out into the Turbuhaler®.
5. If your child is to take a second dose of medication, repeat steps two-to-four.
6. Replace the cover and screw it shut to protect contents from moisture.

Hints

- Your child may not feel or taste anything after they inhale the medication.

Asthma inhalers & other devices

- The sound you hear when you shake the Turbuhaler® is a drying agent, not the medication. You don't need to shake the Turbuhaler® before using it.
- There are about 20 doses left when the red mark appears at the top of the window underneath the mouthpiece. When the red mark reaches the bottom of the window, the Turbuhaler® is empty. The Symbicort® Turbuhaler® contains a dose counter instead. **DO NOT** rely on shaking the device to determine whether it's empty.
- The mouthpiece should never be washed but may be wiped using a dry cloth. If your child is using Pulmicort® or Symbicort®, have your child rinse their mouth with water after each use. This will reduce the risk of developing a yeast infection in the mouth or throat.

The Diskus®

The Diskus® consists of a coloured body and integrated mouthpiece, a mouthpiece cover, a lever to open the mouthpiece cover, and a dose counter. Medications available in a Diskus® inhaler include:

- Serevent® (a long-acting beta-2-agonist),
- Ventolin® (a short-acting reliever),
- Flovent® (an inhaled steroid controller medication)

Diskus® closed



Diskus® open



- Advair™ (a combination of a long-acting beta-2-agonist and an inhaled steroid controller, Serevent® and Flovent®, respectively)

Most children over four or five years of age can use the Diskus®.

Instructions

1. Hold the outer case in one hand and put the thumb of the other hand on the indented thumb grip (near the dose counter). Push the thumb grip as far as it will go, until you hear a click.
2. You will now see a lever. Slide the lever as far as it will go until you hear a click.
3. Ask your child to breathe out (keeping the Diskus® away from your child's mouth). Bring the Diskus® to your child's mouth. Keeping the Diskus® level, have your child close their lips tightly around the mouthpiece.



4. Ask your child to breathe in through their mouth as quickly and as deeply as he/she can. Once your child has breathed in fully, remove the mouthpiece from the child's mouth and have him/her hold the breath in for five-to-ten seconds or as long as possible. Have your child breathe out slowly.
5. Slide the thumb grip back all the way until you hear a click. You do not have to close the lever yourself; it will close automatically as you slide the thumb grip back.
6. The Diskus[®] is not reusable. Each Diskus[®] contains 60 doses of medication. You should replace the Diskus[®] when the dose counter has reached 'zero' and there are no doses of medication left.

Hints

- If your child is using a Flovent[®] or Advair[™] have your child rinse their mouth with water after each use. This will reduce the risk of developing a yeast infection in the mouth or throat.
- You can use the dose counter to tell if your child is taking the medication or if your child is taking too much.

NEBULIZER FOR AEROSOL TREATMENTS

Wet nebulizers turn liquid medication solutions into a mist (or aerosol) for children to inhale. Wet nebulizers are more expensive, less portable, and slower to use than the other devices. However, they can be helpful for children who don't respond to asthma medications when given by the other devices, perhaps due to very shallow breathing by the child, which prevents the other devices from working effectively. If you have a nebulizer at home and another asthma inhaler and your child



Asthma inhalers & other devices

responds better to their reliever medication when it is given by nebulizer, you should use the nebulizer during asthma attacks.

Note: There are many different nebulizers on the market. You should check your instruction manual or ask the company that supplied your nebulizer for exact instructions on how to use your nebulizer. An effective amount of nebulized medication will only reach your child's lungs if the nebulizer mask has a tight (but comfortable) fit against your child's face, or the mouthpiece is being held firmly between your child's lips. If your child struggles when using this device, try to persist, as most children will eventually get used to it. Your child will get some medication into the lungs even if they cry. However, keeping the nebulizer near (rather than against) your child's face or mouth will not deliver an effective amount of asthma medication to your child.

Components of the nebulizer treatment system

- a) Compressor – an electric air compressor
- b) Nebulizer Kit, which consists of:
 - Medication reservoir (cup): this holds the medication, and has special ducts to vaporize the medication. A cap attaches to the top of the cup and a tube attaches to the bottom of the cup.
 - Cap – this attaches to the top of the cup.



- Tubing – this connects the nebulizer (cup) to the air compressor.
- Mask – a soft face mask which attaches to the top of the cap. Masks are available in children and adult sizes. The mask is held against the child's face so that the child can breathe in the medication mist.

OR

- Mouthpiece – this attaches to the top of the cap. The child places their lips around the mouthpiece and breathes through it. The mouthpiece is preferable in children old enough to understand how to use it, as it avoids having medication trapped and lost in the nose.



- Medication — a syringe may be required for measuring the medication (make sure a healthcare professional teaches you how to read the medication dose on the syringe). Once the medication is opened it should be stored in the refrigerator and any unused medication discarded after one month. Some medications may be given in combination — check with your physician or pharmacist. Some medications come in pre-mixed little containers, called ampules, nebulers, or unit-dose vials. Other nebulized medications need to be diluted, by having sterile salt water solution (also called saline or normal saline) for nebulizers added to the nebulizer cup.

How to use a nebulizer

1. Wash your hands.
2. Measure the desired amount of medication, being careful to remove any air bubbles and put it into the nebulizer cup. Measure and add the normal saline if required.
3. If you're using a pre-mixed nebuler, open the top of it and dump all of the liquid (or give the amount recommended by your doctor) into the cup.
4. Attach the cap to the nebulizer cup. Attach the mask or mouthpiece to the cap.

5. Attach one end of the tubing to the bottom of the nebulizer cup.
6. Connect the other end of the tubing to the air outlet connector on the compressor.
7. Plug in and turn on the compressor.
8. Holding the nebulizer upright, put the mask onto the child's face. If using a mouthpiece, instruct the child to seal their lips around the mouthpiece and breathe normally by their mouth.
9. When the liquid is gone from the cup and there is no more aerosol produced (usually about 15 minutes depending on the amount of medication), remove the nebulizer and turn off the compressor.

Cleaning

After each treatment take apart the nebulizer kit. Rinse the nebulizer cup, cap and mouthpiece/mask and syringe. Allow to air dry completely before reassembling. The tubing does not need to be cleaned.

Once per day wash the nebulizer cup, cap, mouthpiece/mask and syringe in lukewarm soapy water (mild dish detergent). Rinse well and allow to air dry completely.

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Some nebulizer kits are dishwasher safe — but check first with the manufacturer’s instructions or your home care provider.

Remember that most children’s asthma is aggravated by upper respiratory infections or colds, so it is essential to keep the supplies clean.

The care of your home compressor

It is a good idea to unplug the compressor when not in use. Keep the compressor in a dust-free area. Most compressors have an air intake filter, which discolours as it gets clogged. The filter is easy to change -- check the operator’s manual for your compressor. If the compressor becomes hot during use and/or if the treatment takes longer to nebulize, then the compressor may require service. Most compressors are under warranty by the manufacturer for three-to-five years. Check with your home care company for service.

Nebulizer troubleshooting

No aerosol output

- Check that the tubing is firmly attached to the nebulizer and compressor.
- Try another nebulizer (they are sometimes defective). It is rare that it is a problem with the compressor.

The tubing keeps popping off

- Check that the tubing is not kinked.
- Check that the air duct into the nebulizer cup is clear.
- Change the tubing (sometimes it becomes worn at the connections).

Hints

- Decide on your equipment needs carefully. You may want to lease equipment.
- Check with your extended health insurance or drug plan about your coverage.
- If the medication is refrigerated, it should be warmed to room temperature before it is given because cold air can aggravate asthma symptoms. An exception to this is if the child has ‘croup’ (barking cough) — the cool mist can help reduce airway swelling.
- Some medications can be combined in the nebulizer cup eliminating the need for normal saline and multiple treatments. Check with your doctor or pharmacist.
- If your child is receiving an inhaled steroid offer a drink following the treatment so that their mouth is thoroughly rinsed. This reduces the risk of yeast infection, a possible side effect of inhaled steroids. If the child uses



a facemask, wipe the child's face. This reduces the risk of a rash on the face - particularly with inhaled steroids.

- Nebulizer masks come with an elastic strap. As your child gets used to the nebulizer mask, you can use the strap, tightening it to get a snug, but comfortable fit, so you won't have to hold the mask next to your child's face.

Travel Tips

- If you are traveling abroad, be sure to have a transformer and an adequate supply of medications (in the original packaging).
- If you are traveling by car and/or enjoy camping, there are compressors which will plug into a car lighter. In general, these compressors are not as powerful as electric main units. Check with your vendor - you may be able to lease one for your vacation needs.
- Many of the medications for use in home nebulizers are available in unit-dose ampules, eliminating the need for normal saline and syringes. Although they are more expensive, they are easy to use and do not require refrigeration. This makes them handy for caregivers, schools, camps, and/or travel.

They may, in fact be more economical for infrequent use, since less medication is thrown out.

Commonly asked questions about nebulizers

Q: *My baby always cries during the treatments. Does this hurt?*

A: No. The good news is a crying child is breathing deeply. Try to persist and the child will become used to the treatments. It may be helpful to allow the child to play with the mask in between treatments to familiarize him/herself with it.

Q: *My infant always falls asleep following the aerosol treatment. Is there any sedation in the medication?*

A: No. Infants often tire from the increased work of breathing and crying throughout the treatment. The rhythmic sounds of the nebulizer, combined with eased breathing, provide conditions for a contented sleep.

Asthma inhalers & other devices

THE PEAK FLOW METER

This device measures the maximum flow with which air can be forced out of the lungs. Since the maximum airflow may be decreased early in an asthma attack, a peak flow meter may help detect an asthma attack at an early stage. Most children over six years of age can use a peak flow meter reliably.

Instructions for use

1. Set the marker to the lower end of the scale (at zero). Make sure your fingers do not cover the number scale.
2. Ask your child to take in as deep a breath as possible.
3. Place the mouthpiece of the peak flow meter into your child's mouth with their lips tightly around it.
4. Ask your child to blow out rapidly into the peak flow meter as hard and as fast as he/she can.
5. Read the peak expiratory flow value on the scale then repeat steps one-to-four, two more times.
6. Record your child's highest expiratory flow rate on your diary card.

Hints

- The best way to check your child's 'normal' value is to check the peak flow rate several times when he/she has no asthma symptoms. The highest value achieved is considered your child's personal best.
- Peak flow rates should be recorded on a diary card each morning and night or according to your physician's instructions.





Sources of information on asthma

- If the value drops below a predetermined range (established by your physician) this should be considered a warning sign. Your physician should be contacted or you should start your asthma action plan for asthma flare-ups.

In general, a peak flow between 80 to 100 percent of personal best is where your child should be every day. A peak flow between 70 to 80 percent of personal best indicates asthma is not under control and a peak flow under 70 percent of personal best indicates your child is having a severe asthma attack. If despite your best efforts your child's asthma is not well controlled or worsens, please seek medical attention immediately.

Sources of information on asthma

If you have questions about your child's asthma you should ask your child's physician. Listed here are some other resources to help you understand asthma in children.

Call the Lung Health Foundation's Lung Health Line at **1-888-344-LUNG (5864)** and speak to a Certified

Asthma Educator. The helpline is available from 8:30am - 4:30pm EST, Monday to Friday. Our asthma educators will answer specific questions about your asthma, assess your level of asthma control, provide you with educational materials specific to your need and connect you with resources in your own community.

The Children's Hospital of Eastern Ontario (CHEO) offer comprehensive information about asthma at cheo.on.ca/en/resources-and-support/asthma.aspx.

The Weather Network lists pollen counts and air pollution information in each part of Canada. Visit theweathernetwork.com and access the daily reports from the main drop-down menu, then click on "Forecasts & Reports". They are listed under the section "Environment"

For more information, you may also call Telehealth Ontario at **1-866-797-0000**.

The Hospital for Sick Children has an asthma hub that also includes a list of resources you can access by visiting aboutkidshealth.ca/astmahub.

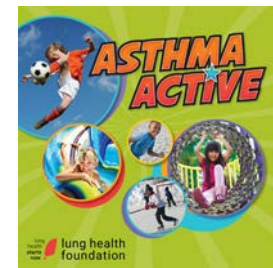
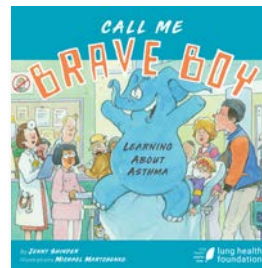
Sources of information on asthma

The following booklets are specifically for children.

Call Me Brave Boy by Jenny Shinder, illustrated by Michael Martchenko is a colourful picture book on childhood asthma designed for a parent or caregiver to read to a young child who has asthma.

Asthma Active is a book of puzzles, games and information to teach children how to control their asthma and stay active. It's a great way to learn that having asthma doesn't mean having to sit on the sidelines.

Visit the Lung Health Foundation's resource library for these free resources, along with several other asthma resources, at lunghealth.ca/resource-library.

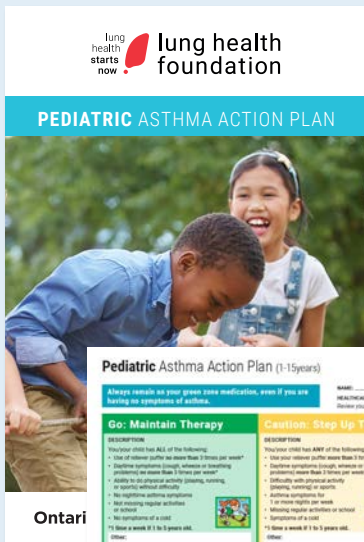




Sources of information on asthma

Pediatric Asthma Action Plan

Download and print out a Pediatric Asthma Action Plan from our resource library at lunghealth.ca/resource-library to bring to your healthcare provider to fill out



Pediatric Asthma Action Plan (1-15years)

Always remain on your green zone medication, even if you are having no symptoms of asthma.

Name: _____ Date: _____
 HEALTHCARE PROVIDER: _____ PHONE: _____
 Review your action plan with your healthcare provider at every visit.

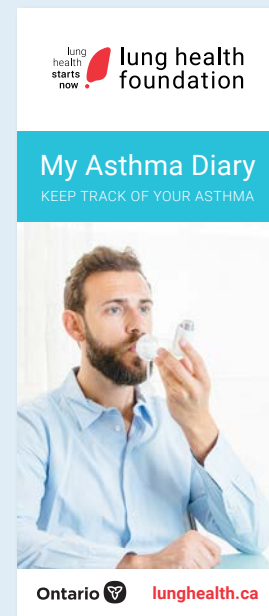
Go: Maintain Therapy	Caution: Step Up Therapy	Stop: Get Help Now
<p>DESCRIPTION Your child has ALL of the following:</p> <ul style="list-style-type: none"> Use of rescue inhaler or spacer less than 2 times per week* Rescue symptoms (cough, wheezing or breathing problems) no more than 2 times per week* Ability to do regular activity (playing, running, or sports) without difficulty No nighttime asthma symptoms No symptoms in school No symptoms at all! <p>*1 time a week or 1 to 3 times a wk. Other: _____</p>	<p>DESCRIPTION Your child has ANY of the following:</p> <ul style="list-style-type: none"> Use your rescue inhaler or spacer more than 2 times per week* Rescue symptoms (cough, wheezing or breathing problems) more than 2 times per week* Difficulty with regular activity Difficulty running or sports Asthma symptoms for 4 or more nights in a row Missing regular activities or school Symptoms in school <p>*1 time a week or 1 to 3 times a wk. Other: _____</p>	<p>DESCRIPTION Your child has ANY of the following:</p> <ul style="list-style-type: none"> Rescue inhaler or spacer less than 2 times a week Waking up at night or in the middle of the night Missing any part of school Difficulty talking Continuous wheezing or cough <p>Other: _____</p>
<p>INSTRUCTIONS</p> <p>Take _____ inhaler _____ puffs every _____ times a week and _____</p> <p><input type="checkbox"/> Continue to take your green zone medication</p> <p><input type="checkbox"/> If rescue inhaler or spacer is needed consistently every 4 hours, or if there is no improvement in your symptoms in 2-3 days, contact your healthcare provider</p> <p>Other: _____</p>	<p>INSTRUCTIONS</p> <p>Take _____ inhaler 4-6 puffs every 15-30 minutes, and _____</p> <p>Call 911 or go directly to the emergency department</p> <p>Asthma symptoms can get worse quickly</p> <p>Asthma can be life-threatening! Please "Call 911!"</p> <p>Bring this asthma action plan with you to the emergency department</p> <p>Other: _____</p>	<p>INSTRUCTIONS</p> <p>Take _____ inhaler 4-6 puffs every 15-30 minutes, and _____</p> <p>Call 911 or go directly to the emergency department</p> <p>Asthma symptoms can get worse quickly</p> <p>Asthma can be life-threatening! Please "Call 911!"</p> <p>Bring this asthma action plan with you to the emergency department</p> <p>Other: _____</p>

This is a secure Service (Printing) document with all marked areas sensitive. Lung Health Line 1-888-344-LUNG (5864) or lunghealth.ca

Asthma Diary Card

The resource library also has an asthma diary, which can help you keep track of your child's:

- asthma symptoms
- medication use
- peak flow meter readings
- asthma triggers



My Asthma Diary

Name: _____ Healthcare Provider: _____
 Healthcare Provider's Phone: _____

Days of the Month:

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Rescue Inhaler or Spacer																															
Rescue Symptoms (Cough, Wheezing, or Breathing Problems)																															
Ability to do regular activity (playing, running, or sports)																															
Nighttime symptoms																															
Symptoms in school																															
Symptoms at all!																															
Peak Flow Meter																															
Days with asthma symptoms																															
Triggers																															

If you have any regular symptoms or if your peak flow readings are below normal, see your healthcare provider and a Certified Respiratory Educator to find out how you can get your asthma under control.

My Asthma Diary | Keep Track of Your Asthma lunghealth.ca



The Lung Health Foundation

18 Wynford Drive, Unit 401 Toronto, ON M3C 0K8

(416) 864-9911

info@lunghealth.ca

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Ontario Lung Association is a registered charity operating as the Lung Health Foundation, and is no longer affiliated with the Canadian Lung Association.

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