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Asthma in Children

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Asthma in Children

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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 healthcare provider, 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.

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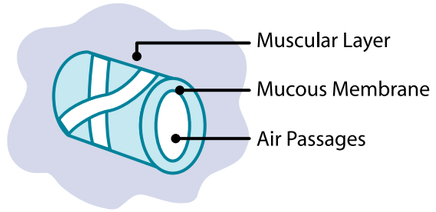
Introduction

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

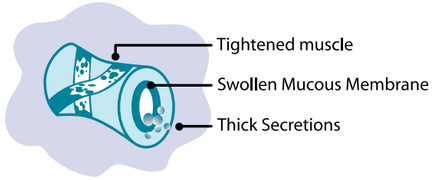
To understand asthma, you have to know a little about the structure of the lungs. This section will tell you about how the lungs are constructed and work, and how this changes during an asthma attack.

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 air is moved into the blood and stale air is removed from the blood so it can be exhaled back into the air. . 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 harmful 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.

What's inflammation?

Inflammation is the body's natural way of dealing with potentially harmful exposures or injuries. For example, your (swelling) 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.

If your child has asthma, the airways are very sensitive and become narrowed very easily, making it hard to breathe. Reasons that the airways narrow are:

- The inside of the airways become red, swollen or puffy (inflammation)
- Extra mucus (phlegm or sputum) can build up in your airways
- The tiny bands of muscle that surround your airways tighten up (constrict) - this is also known as bronchospasm or bronchoconstriction

All of these reasons can make it harder to move air into and out of your airways and cause the common asthma symptoms of cough, shortness of breath and chest tightness.

SYMPTOMS OF ASTHMA IN CHILDREN

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 allergic 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. Research studies have shown that many children who are diagnosed with "recurrent bronchitis" or "recurrent pneumonia"

actually have asthma. 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.

Asthma and Cough

A few people with asthma never wheeze or have trouble breathing, and their only symptom is excessive coughing. 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 infants and babies have asthma?

Many healthcare providers 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 healthcare provider will evaluate your child for these other conditions.

Many 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. Rattle breathing is generally not a sign of asthma.

Diagnosing Asthma

If you and/or your healthcare provider believes your child has asthma, there are a number of ways to decide. Early diagnosis is important, to help get asthma symptoms under control, prevent asthma attacks, and maximize lung function.

- Asthma symptoms have to occur on multiple separate occasions to make a diagnosis of asthma, so your child has had asthma symptoms at least twice
- Asthma symptoms got better when using a reliever *(discussed later on page 22) or using a controller *(discussed later on page 24)
- Your doctor hasn’t found another possible diagnosis to explain your childs symptoms. Note that in cooperative children 6 years of age or older, Canadian guidelines recommend obtaining a lung function test to help confirm the diagnosis of asthma. If this test shows airway narrowing that improves significantly with a reliever medication, that is consistent with a diagnosis of asthma.
- In children with asthma triggered by things other than colds, conventional allergy tests can help pinpoint what your child is allergic to, so you can minimize contact with these things. 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.

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 children. Dust mites bugs that are so small, we can't see them without a microscope. They live in dust and feed off dead skin flakes. As the insulation in modern homes gets better and better (and air ventilation gets worse), house dust and dust mite accumulation has become an increasing problem. In children with dust mite allergy, exposure to a lot of dust can cause asthma attacks, and over a long time, exposure can increase airway inflammation, increasing the severity of the reaction to other asthma triggers.

Dust mites grow especially well in mattresses, pillows and bedding and in areas of high humidity (as do moulds):

- Wash sheets and blanket weekly in hot water
- Avoid clutter (excess toys, books, etc.) in the child's
- Keep your house reasonably dry (humidity under 50%)

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 clean to prevent mould growth. For people with dust mite allergy, reducing dust in the bedroom is especially important. People spend more time in their bedroom than in any other single location Some ways of reducing dust mites in your child's bedroom include:

- Use a hardwood floor
- 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.

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 healthcare provider 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, get the heating ducts cleaned and the carpets and upholstery steam-cleaned.
This process should be repeated about four months later. If your child is pet-allergic and removing the pet is not an option, the child should minimize contact with the animal:

- Keep it out of your child's bedroom.
- Keep it off the furniture
- Use a H.E.P.A. (High Efficiency Particulate Air) filter air cleaner
- Have someone else brush your pet regularly.
- If possible, replace carpeting with hard flooring
- Vacuum regularly-use a vacuum cleaner that has a H.E.P.A filter, or central vacuum system

Asthma triggers

Plants & Pollens

Pollens from outdoor plants often cause seasonal allergies and asthma at particular times of the year. In Ontario, trees (such as elm, poplar and spruce) produce pollen between April and June. Grasses (such as timothy grass and bluegrass) produce pollen between mid-May and mid-July. Ragweed pollen levels are highest between August and October. You can check the level of pollens in your area on The Weather Network Pollen Report website weather.ca

You can reduce pollen levels in your home 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.

Moulds

Outdoor and indoor moulds are another important group of allergens. Outdoor moulds tend to release their spores in damp weather and travel better on windy days. This is probably the reason why many people's asthma gets worse in 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 and damp basements, where there are sources of moisture. 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 affected by mould should be cleaned thoroughly. Keep the indoor humidity level less than 50%. Humidity can be measured by a hygrometer (an instrument that measures humidity) available at hardware stores. Dehumidifiers help to reduce humidity levels. Make sure it's maintained according to the manufacturer's instructions, including emptying the bucket, replacing the filters, and cleaning the machine regularly. Use an air conditioner to filter out pollens and moulds and to reduce dampness indoors. If it's a window unit, wash the filter regularly.

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 child with asthma 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 peanut allergy, you should speak to your healthcare provider about getting a MedicAlert® bracelet and having an adrenaline syringe (EpiPen®) with your child at all times. In addition to watching ingredient lists (as instructed by your healthcare provider), 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. Children should not be exposed to cigarette smoke. The smoke from even one cigarette anywhere indoors will eventually reach all areas and can linger for a very long time.

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) called PM2.5. With climate change, PM2.5 is becoming an increasing problem – for example, due to smoke produced by forest fires. Sulfur dioxide is released by pulp and paper plants and can cause exercise induced asthma in people with asthma exercising outdoors in hot, polluted weather. Monitor the Air Quality Health Index (AQHI) at airhealth.ca and adjust your child's outdoor activity accordingly. When PM2.5 levels are high, using an air conditioner or air purifier with a HEPA filter can reduce levels of PM2.5 indoors.

Smoke from cigarettes, cannabis or vaping are an important contributing factor for rising asthma rates in children. Try not to let your child be exposed to second-hand cigarette smoke.

If someone in your home cannot quit they should smoke outside (not in the basement, bathroom, etc. as smoke lingers.) They also shouldn't smoke in the car.

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:

- Have your child or youth and other family members wash their hands before and after touching their nose or mouth.
- Avoid having friends visit when they've got colds.
- Keep your child with asthma from sharing towels with brothers and sisters with colds.
- Speak to your healthcare provider about having your child get the flu shot in the fall to help prevent "the flu".
- Have your family members wash their hands before and after touching their nose or mouth.
- Avoid cigarette smoke exposure.

Exercise

During quiet breathing, 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 children with asthma, 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 someone with asthma exercises in cold, dry air.

Exercise is important for good health, and children should be able to exercise like everyone else if their asthma is under control. A warm-up period sometimes helps reduce exercise-induced asthma.

Good asthma control, through effective asthma treatment, can reduce or prevent exercise-induced asthma in many people with asthma. For children with asthma who are well controlled:

- Be sure they are not having asthma symptoms before starting exercise
- Warm up before vigorous exercise and cool down after
- If needed, they can use their reliever (bronchodilator) medication 10 to 15 minutes prior to exercise*
- If they starting having asthma symptoms while exercising, they should stop and use a reliever inhaler and not start again until their symptoms are gone. While regular exercise will not prevent exercise-induced asthma attacks, it will certainly improve fitness. **If your child needs to use the reliever regularly prior to exercise, asthma may not be well controlled. If this is happening, see your child's healthcare provider to discuss steps to better control the asthma*

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 homes 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 room), 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.

Can you prevent asthma?

Cigarette Smoke

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

If you smoke, consider quitting. Your healthcare provider can advise you of techniques available to help you quit smoking — including counseling, community support groups, and medications. Some resources to help people quit smoking that are available include:

- ***Journey to Quit – A Workbook to Help You Quit Smoking*** – lunghealth.ca

Dirt

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!

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. Some children with asthma outgrow it — sometime before or around puberty. In a small number of these patients, asthma comes back later in adult life.

Risk factors and outcomes

There may be two different forms of asthma in young children:

Viral Triggered Asthma

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

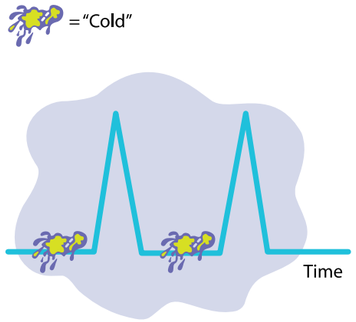
In this type of childhood asthma, children tend to have allergic diseases such as asthma, hay fever and eczema. These children have asthma symptoms when exposed to substances they are allergic to, such as pollens and animals, as well as having asthma symptoms during viral respiratory infections.

These children have 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. Most children with allergic asthma also have asthma symptoms with exercise. Children with allergic asthma are considerably less likely to outgrow it, though it may become milder as the child grows.

Patterns of asthma in children

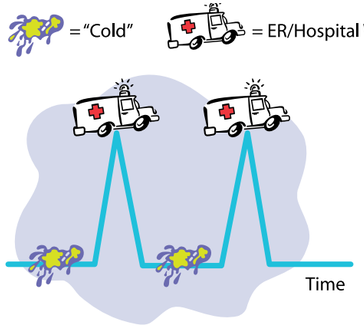
Mild intermittent asthma

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. Healthcare providers often treat this type of asthma with reliever medications used on an 'as needed' basis. Some healthcare providers recommend taking a 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

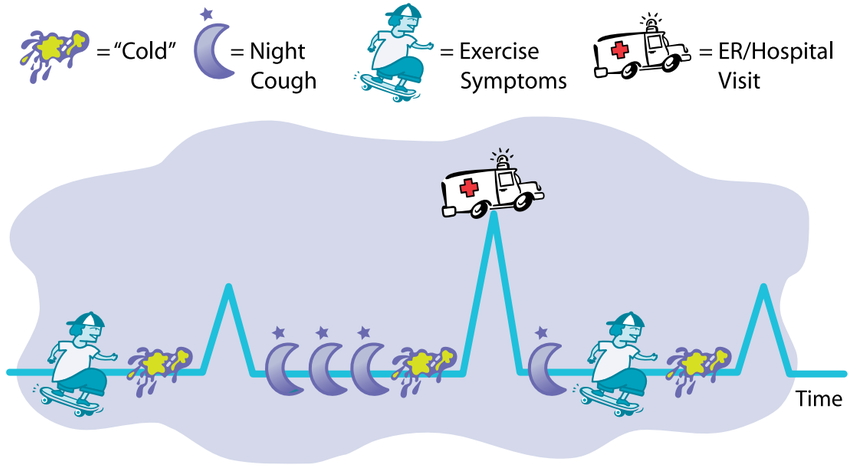
Patients with severe intermittent asthma generally have infrequent attacks, but when attacks happen, they are often severe and may need a visit to the emergency department or even admission to the hospital. As in mild intermittent asthma, colds are the most common trigger in children. Healthcare providers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



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 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 healthcare provider 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 healthcare provider may order pulmonary function tests (breathing tests), 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.**

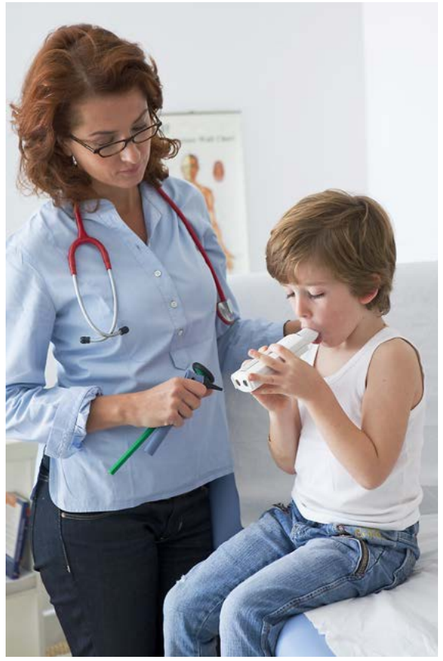
If your child has signs of a severe asthma attack, and/or needs treatments with their reliever medication every four hours or less (or more often than your doctor recommends), you should have your child assessed by a doctor. If the attack is very severe, you should bring your child to an emergency department,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

Monitoring Using a Peak Flow Meter

A peak flow meter helps you keep track of your child's asthma. 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. For children who do not notice that their asthma symptoms are getting worse, peak flow meters may be most useful. Peak flow monitoring can also be useful for children who may be excessively concerned about relatively minor symptoms. After using the peak flow meter when your child's asthma is fully under control a few weeks you will be able to find out your child's personal best peak flow reading. Your healthcare provider 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 his or her peak flows before and after vigorous exercise. It is recommended that whenever peak flows are used, 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 on a computer spreadsheet that should let you make graphs to track trends!

Meters may need to be replaced from time to time. After a couple years of regular use, you may need to buy a new one.

When a healthcare provider recommends using a peak flow meter, he/she 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.



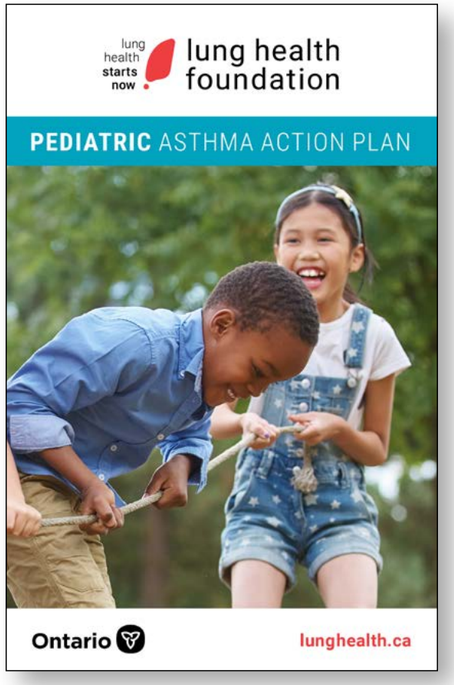
Monitoring your child's asthma symptoms

DEVELOPING A WRITTEN ASTHMA ACTION PLAN FOR YOUR CHILD

It's very important to have your healthcare provider work with you on an asthma action plan for your child. An action plan should include:

- Instructions on what medications you normally take when your child is feeling well
- How to know when your child's asthma is starting to get out of control and when it is an emergency
- What changes you should make to your child's medications when your child has asthma symptoms

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 actions plans include:

GO MAINTAIN THERAPY:

You/your child has ANY of the following:

- Use of reliever puffer no more than - 2 times a week*
- Daytime symptoms (cough, wheeze or - breathing problems) no more than 2 times a week*
- Ability to do physical activity (playing, running) or sports without difficulty
- No nighttime asthma symptoms
- Not missing regular activities or school
- No symptoms of a cold **1 time a week if 1 to 5 years old*

Follow medication instructions for green zone.

YELLOW ZONE:

You/your child has ANY of the following:

- Use your reliever puffer 4 or more times per week*
- Daytime symptoms (cough, wheeze or breathing problems) 4 or more times per week*
- Difficulty with physical activity (playing or sports)
- Asthma symptoms for 1 or more nights per week
- Missing regular activities or school
- Symptoms of a cold

** These criteria for an asthma flare may differ from what your provider uses to decide if your asthma is well controlled overall.*

RED ZONE:

You/your child has any of the following:

- Reliever puffer lasts less than 3 hours
- "Pulling in" of skin in the neck/between or below ribs
- Feeling very short of breath
- Difficulty talking
- Continuous wheeze or cough

Follow medication and other instructions for red zone.

Asthma medications

Controlling asthma involves a couple of important steps. The first step is reducing to reduce exposure to 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 35-47).

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.

The Types of Medications Used in Asthma

There are two main types of medications used in asthma relievers and controllers:

RELIEVER medications

Reliever medications temporarily relax the muscle bands that surround the bronchial tubes when they tighten up 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. Everyone with asthma should have a reliever medication available.

The main reliever medication for asthma is the beta-2-agonist. Occasionally your healthcare providers may prescribe an anti-cholinergic medication (see page 24).

Short-acting beta-2-agonists

Beta-2-agonists are used as reliever medication in asthma to relieve shortness of breath. 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.

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

- Inhaled short-acting beta-2-agonists, or relievers, are usually given every four-to-six hours, as needed, for asthma symptoms such as coughing, wheezing, chest tightness, or trouble breathing.
- If your child needs his/her short-acting beta-2-agonist three or more times per week, it is a sign of inadequate asthma control. Discuss your child's asthma control with your health care professional.
- If your child needs his/her short-acting beta-2 agonist more than every 4 hours, it is a sign of a severe asthma attack. Follow your child's action plan. If you don't have one, take your child to the emergency room.
- While your child has a cold, they may need to use the reliever inhaler more often to help prevent the muscles around the bronchial tubes from tightening up (known as bronchospasm). Once the child is better, the reliever should only be used as needed.
- Beta-2-agonists can be used about 10-15 minutes before exercise to prevent exercise-induced asthma. However, if your child regularly need to use the reliever inhaler prior to exercise, it could be a sign that their asthma is not well controlled.

Side effects

- 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 his/her inhaled beta-2- agonist more than every four hours, follow your child's action plan. If you don't have one, take your child to the emergency room.
- Regular prolonged use of short-acting beta-2- agonists can lead to worsening of asthma. If your child needs the short-acting beta-2- agonists four or more times per week, they do not have good asthma control and

should be prescribed a controller medication to improve their control. If your child needs his/her short-acting beta-2-agonist four or more times per week, talk to your child's healthcare provider.

Anti-cholinergic medications

Anti-cholinergic medications relax the muscles that surround the bronchial tubes in a different way than the ones used by beta-2-agonists. Atrovent® (ipratropium bromide) is available as a puffer (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. In some cases, healthcare providers 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.

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 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

Controller medications are important for long term control of asthma. As the name suggests, controller medications control asthma symptoms and reduce the chance of asthma attacks. In general, these medications must be used regularly to be effective. Most controller medications are considered "anti-inflammatory" medications. Anti-inflammatory medications reduce swelling in the airways. This makes the lungs less sensitive to the various factors that trigger a child's asthma, even when the child is exposed to these factors. Inhaled corticosteroids are the most effective controller medication. Anti-leukotriene medications are another important type of anti-inflammatory medication. Other anti-inflammatory medications include anti-IgE therapy, and IL-5 therapy. Long-acting beta-2-agonists (LABAs) 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.

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. Some people with severe asthma may 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 healthcare provider. Inhaled steroids available in Canada include:

In asthma, anti-cholinergic medications are not usually used alone to relieve tightened bronchial muscles. They don't work as fast as beta-2 agonists. However, an anti-cholinergic medication can be useful as a reliever medication in children who can't tolerate or use a beta-2-agonist. This includes

- 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 healthcare providerss 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 healthcare provider 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 (31-33).

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/valved-holding chamber (like the AeroChamber® spacer), so the heavier medicine particles released by the inhaler land in the spacer, rather than in the mouth.
- 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 healthcare providers 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.
- Inhaled steroids may cause changes in the balance of natural steroid hormones that are produced by the body's adrenal glands. With low-to-moderate doses of inhaled steroids, 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 500 micrograms per day of fluticasonee, 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 healthcare provider if they experience these types of symptoms.

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 one-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 healthcare

providers. 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

- Extremely rarely, even short courses of oral steroids can cause degeneration and collapse of the hip bone inside the hip joint
- 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 healthcare provider.

Anti-leukotriene medications

Singulair® (montelukast) is a type of anti-leukotriene medication. It is an oral medication, 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 in about three weeks. This means that if your child is started on Singulair® 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 healthcare provider.

- 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.

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 healthcare provider to reduce the amount of inhaled steroid needed by the child. If your child is taking an inhaled steroid and your healthcare provider adds an anti-leukotriene medication, the inhaled steroid should not be stopped abruptly and the dose should not be reduced without your healthcare providers'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.

Common uses of anti-leukotriene medications:

- 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.

Long-acting beta-2-agonists

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

- Serevent® (salmeterol)
- Oxeze® (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.

Asthma Medications

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™
- Indacaterol (a once-daily long-acting beta-2 agonist) is available combined with the inhaled steroid momestasone, and is called Atectura®
- Breo® is licensed in Canada for individuals 18 years and older and comes in an Ellipta® dry powder inhaler.
- 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 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® 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
- 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 healthcare providers 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

- 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 healthcare providers about adding an inhaled steroid or changing to a combination inhaler (see page 30).

Asthma Medications

Biologics (Monoclonal Antibody Therapies)

Inflammation of the airways in people with asthma (page 3) involves many different kinds of cells, and chemicals produced in the body. 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. Inflammation associated with allergies involves chemicals that stimulate a type of white blood cell, called the eosinophil, to migrate to parts of the body where substances that cause allergies have come into contact with body issues (like the lining of the bronchial tubes and nose, and/or skin). The chemicals also cause eosinophils to stay in the area longer, and release other chemicals. Many of symptoms of allergic reactions (including allergic asthma) are caused by eosinophils. Some of the chemicals that stimulate eosinophil activity include interleukin 5 (IL-5), interleukin 4 and 13 (IL-4 and IL-13), and Thymic stromal lymphopoietin (TSLP).

- Omalizumab (or Xolair®) is a medication designed to block IgE antibodies. It is currently licensed in Canada for individuals 6 years of age and older.
- Mepolizumab (Nucala®) blocks IL-5. It is currently licensed in Canada for individuals 6 years of age and older.
- Dupilumab (Dupixent®) IL-4 and IL-13. It may be prescribed for children and youth 12 years of age and older.
- Tezepelumab (Tezspire™) blocks thymic stromal erythropoietin. It may be prescribed for children and youth 12 years of age and older.

Several medications are available for use in children with very severe asthma to block these chemicals. These medications are all given by injection, generally every 2-4 weeks (a bit like allergy shots). These medications can all help prevent most types of allergic reactions from leading to worsening asthma. These medications are used in children with inadequate asthma control despite high doses of inhaled corticosteroids and other controller medications, or who are on long-term steroids by mouth. These medications all significantly reduce asthma severity, including the number of asthma attacks, and may allow children to reduce the doses of inhaled and/or steroids by mouth that they need. After starting these medications, it is extremely important that patients or families do not reduce the dose of controller medications the child is on, on their own. This needs to be done under very careful medical supervision.

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 healthcare providerss 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 healthcare providers 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 healthcare providers 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.

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 healthcare professional experienced in teaching the use of asthma inhalers (such as a healthcare providers, nurse, pharmacist, or respiratory therapist) should also teach you and your child how to use the inhalers, and double check 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 healthcare providers 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 han MDI properly. For these children a spacer device (see pages 37-40) should be used with the MDI. To view videos on inhalers, go to lunghealth.ca/inhalers

Instructions

1. Remove the cap from the inhaler.
2. Shake the inhaler well 5-6 times before each puff.
3. Breathe out all the way.
4. Hold the inhaler upright.
5. Place the mouthpiece between your teeth and form a good seal with your lips .
6. As you start to inhale slowly, press the inhaler canister down to release a puff of medication. Continue to breathe in slowly all the way. Hold your breath for 5-l0 seconds.
7. If you need another puff, wait 30-60

Note: *Check manufacturer's instructions as they may vary slightly for each device*

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 / VALVED HOLDING CHAMBERS

Spacer devices/ valved holding chambers allow medication released from a metered-dose inhaler to form a mist 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 it in. The best spacer devices contain a one-way valve, to allow the mist in the holding chamber to be inhaled when the child breathes in more effectively. There are many types of spacers devices available in Canada, and some others that may not be as effective. Your healthcare provider can help you choose the appropriate device for your child.

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 differ-ent sizes, for children of varying ages. For example:

- The orange AeroChamber® with Mask is used for infants less than 18 months of age.
- The yellow AeroChamber® with Mask is used in children approximately one-to-five years of age
- The purple AeroChamber® with Mask is used in children approximately older than five years of age who are unable to use an AeroChamber® with mouth-piece.

Instructions

Note: *If you are using the inhaler for the first time, or if it has not been used for a few days, check the instructions given with your device to see if you need to prime (prepare) it before use.*

1. Remove the cap from the inhaler.
2. Shake the inhaler well 5-6 times before each puff.
3. Keep the inhaler upright and insert the mouth-piece into the back of the spacer.
4. Hold the spacer with one hand and put the mask firmly over the nose and mouth, making sure there is a good seal.
5. As you start to inhale slowly, press the inhaler canister down with your other hand to release a puff of medication into the spacer. Continue to breathe in slowly all the way.
6. Keep the mask on the face for 6 breaths.
7. If you need another puff, wait 30-60 seconds, then repeat steps 2-6.

Note: *Check manufacturer's instructions as they may vary slightly for each device*

Asthma inhalers & other devices

Hints

- If your child is struggling with 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 five-to-six 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.
- Clean device weekly with mild soap and let dry thoroughly.
- Rinse the device in warm tap water every few days and clean weekly with a mild detergent. Let dry thoroughly before using.
- With the AeroChamber®, you can watch watch the valve at the top of the device move 6 times, to count the breaths.

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 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

Note: *If you are using the inhaler for the first time, or if it has not been used for a few days, check the instructions given with your device to see if you need to prime (prepare) it before use.*

1. Remove the cap from the inhaler and the spacer.
2. Shake the inhaler well 5-6 times before each puff.
3. Keep the inhaler upright and insert the mouthpiece into the back of the spacer.
4. Breathe out all the way.
5. Holding the spacer with one hand, place the spacer mouthpiece between the teeth and seal with the lips.
6. As you start to inhale slowly, press the inhaler canister down with your other hand to release a puff of medication into the spacer. Continue to breathe in slowly all the way.
7. Take spacer out of your mouth and hold your breath for 5-10 seconds.

Note: *Check manufacturer's instructions as they may vary slightly for each device. If you need another puff, wait 30-60 seconds, then repeat steps 2-7.*

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.
- Clean device weekly with mild soap and let dry thoroughly.
- To avoid dust accumulation, keep cap on mouthpiece when not in use.
- If your child has difficulty taking one long, deep breath, they can take 5-6 regular breaths. With the AeroChamber®, you can watch watch the valve at the top of the device move 6 times, to count the breaths.

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 HFA propellant in many metered dose inhalers act as greenhouse gases that can contribute to global warming. In children where the appropriate medication is available in a dry powder inhaler and who can use this device, many environmental protection agencies have recommended that people with asthma receive their medication(s) by dry powder inhaler.

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

Unlike a Metered Dose Inhaler (puffer) that sprays out a puff of medication, the medication in a Turbuhaler® is a dry powder. Note: If you are using the inhaler for the first time, check the instructions given with your device to see if you need to prime (prepare) it before use.

1. Holding it upright with the grip at the bottom, unscrew and remove the cover.
2. Turn the grip all the way in one direction then back all the way in the other direction. You will hear a click during this step, which means the medication is loaded.Ask your child to breathe out, emptying their lungs.
3. To make sure you don't lose the medication after the device is loaded: Do not shake the Turbuhaler®.
4. Do not tilt the mouthpiece down.
5. Do not drop it.
6. Do not breathe into the Turbuhaler®.
7. Breathe out away from the Turbuhaler®
8. Place the mouthpiece between your teeth and seal your lips around it.
9. Breathe in quickly and deeply.
10. Hold your breath for 5-10 seconds.
11. If a second dose is required, repeat steps 2-6.
12. When finished, replace the Turbuhaler® cover and twist until it is tightly closed.
13. After taking an inhaled steroid medication, it is important to rinse with water, gargle and spit out.

Hints

- Your child may not feel or taste anything after they inhale the medication.
- 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.
- The Turbuhaler® is empty and should be thrown out when the zero or a red line is in the centre of the dose-counting window. 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.

Asthma inhalers & other devices

Diskus® closed **Diskus® open**

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)
- 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

The Diskus® is a round plastic device containing powdered medication. The medication is inside foil strips that protect the powder from moisture. The device has a dose counter which counts down after each dose.

1. To open the Diskus®, hold it in one hand.
2. Put the thumb of the other hand into the thumb grip and slide it back until a click is heard. You will now be able to see the mouth-piece and medication lever.
3. With the mouthpiece facing you, slide the medication lever back all the way until a click is heard. To make sure you don't lose the medication after the device is loaded: Do not shake the Diskus® Do not tilt the mouthpiece down Do not drop it Do not breathe into the Diskus®
4. Breathe out.
5. Seal your lips around the mouthpiece and breathe in quickly and deeply through your mouth.
6. Hold your breath for 5-10 seconds.
7. Close the Diskus® by sliding the thumb grip back towards you as far as it goes, to its original position. The mouthpiece and medication lever will now be hidden.
8. If you need another dose, repeat steps 1-7.

Hints

- If your child is taking an inhaled steroid, 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 Ellipta®

Instructions

1. On first use, you will have to open a foil tray and remove the inhaler. Discard the packaging and tray. On the inhaler, write the date the package was opened as well as the discard date for 6 weeks from opening.
2. Slide open the cover. You should hear a click.
3. Breathe out fully, away from the mouthpiece.
4. Seal your lips around the mouthpiece and take in a long, steady, deep breath, ensuring you do not block the vent with your fingers.
5. Remove the inhaler from your mouth and hold your breath for 5-10 seconds.
6. Breathe out.
7. Close the cover.
8. Rinse your mouth.

The Breezhaler®

Instructions

1. Remove the cap. Hold the base of the inhaler and tilt the mouthpiece to open it up.
2. Place the capsule into the chamber.
3. To open the capsules, peel back foil on flat side of blister strip, exposing one capsule at a time. The capsules are sensitive to heat and light.
4. Close the mouthpiece until you hear it click.
5. Hold inhaler upright, press both blue buttons together once and release.
6. Blow out all the air from your lungs.
7. Tilt chin up slightly.
8. Seal lips around the mouthpiece.
9. Breathe in rapidly.
10. Take device out of mouth.
11. Hold breath for 5-10 seconds.
12. Breathe out.
13. Repeat steps 6-12.
14. Throw empty capsule into the garbage
15. Close cap.
16. Wash hands immediately.

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 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, nebules, 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 nebule, open the top of it and dump all of the liquid (or give the amount recommended by your healthcare providers) 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 soap). Rinse well and allow to air dry completely.

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 man-ufacturer for three-to-five years.

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 healthcare providers 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. But try to calm your child before giving the treatment. Hopefully your child will become used to the treatments. Try to involve the child in the treatment as much as possible. Let them hold the mask for the treatment.

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

A: No. There is no sedation in the medication. They may fall asleep because they are breathing easier.

THE PEAK FLOW METER

This devise 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. Ask your child to take in as deep a breath as possible.
2. Place the mouthpiece of the peak flow meter into your child's mouth with their lips tightly around it.
3. Ask your child to blow out rapidly into the peak flow meter as hard and as fast as he/she can.
4. Read the peak expiratory flow value on the scale then repeat steps one-to-four, two more times.
5. 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 or spreadsheet each morning and night.

- 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 % of personal best is where your child should be every day. A peak flow between 70 to 80 % of personal best indicates asthma is not under control and a peak flow under 70 % 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.

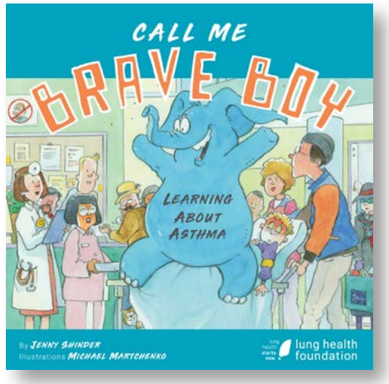
The Hospital for Sick Children has an asthma hub that also includes a list of resources you can access by visiting aboutkidshealth.ca/asthmahub.

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.

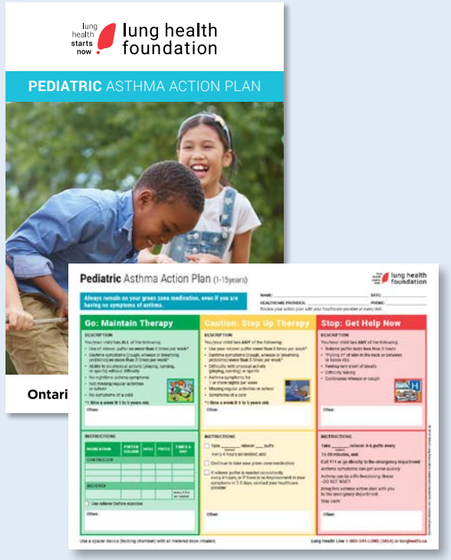
Visit the Lung Health Foundation's resource library for free downloadable resources at lunghealth.ca/resource-library.



Sources of information on asthma

Pediatric Asthma Action Plan

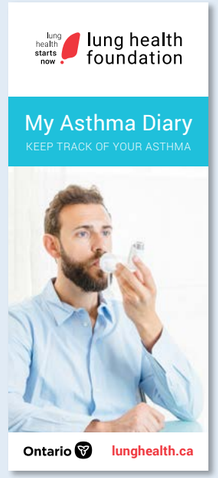
Download and print out a Pediatric Asthma Action Plan from our resource library at lunghealth.ca/resource-library to bring to your healthcare provider to fill out

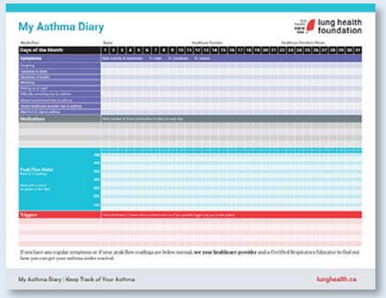


Asthma Diary Card

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





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