

Pediatric Asthma

Asthma is a chronic (long-lasting) inflammatory disease of the lower airways of the lungs in which various triggers cause narrowing which leads to difficulty breathing. These changes commonly occur in response to changes in the environment including weather, allergens (such as dog or cat dander, mold, or dust), foods, or respiratory infections (colds). It is important to remember that Asthma is a reversible process which can be treated and controlled with proper intervention

An Asthma exacerbation consists of swelling and inflammation of the airways, increased mucous production, and reversible tightening of the tiny muscles that surround the airways (bronchospasm). In severe cases of asthma, damage to the lungs can accumulate over time, resulting in permanent narrowing of the airways

This disease is commonly found in children, although it can also occur in adults. Among children, asthma is a leading cause of hospitalization, chronic disease, and school absenteeism. Children with asthma may be able to breathe normally most of the time. When they encounter a substance that can cause problems (a "trigger"), an asthma attack (exacerbation) can occur.

Below is a list of common asthma triggers.

- tobacco smoke
- dust
- pollen
- exercise
- viral infections, such as the common cold
- animals (hair or dander)
- chemicals in the air or in food
- mold
- changes in weather (frequently cold weather)
- strong emotions
- aspirin and other medications

In recent years, there has been a worldwide increase in the number of children with asthma. This trend has been linked to environmental factors, including air pollution. However, it is important to understand that indoor triggers can play just as much of a role as outdoor triggers in bringing on an asthma exacerbation.

Asthma, allergies, and eczema is a group of conditions in patients with atopy, an immune system that is hyper-responsive to foreign entities. An acute allergic reaction to nuts can be confused with an asthma attack as the signs and symptoms are similar (shortness of breath, tightening of the chest). It is important to remember this, as an acute allergic reaction can lead to immediate cardio-respiratory arrest if untreated. It is important to gather a comprehensive history (OPQRST/Sample history) on these patients and not to focus in only on what seems obvious. A thorough history can lead to differential diagnoses shedding light on more possible causes.

Children's airways are narrower than those of adults. This means that triggers that may cause only a slight response in an adult can be much more serious in children. In children, it can appear suddenly with severe symptoms. For this reason, it is important that asthma be diagnosed and treated correctly. For some children, this may mean taking daily medication even during times when the child is not having symptoms of asthma.

Symptoms

During an asthma attack, people may have difficulty breathing and may begin to breathe very rapidly. They may also feel short of breath, even at rest. The child with asthma may need to use the muscles around the chest (accessory muscles) to help with breathing. **Wheezing** and coughing are also important signs that can occur during an attack, or even when a child is feeling well. A persistent night-time cough is one common sign of asthma, even in children without other symptoms.

Signs and tests

Often a doctor can hear the effects of asthma in a patient's lungs. Sometimes, an instrument called a spirometer is used to test a child's breathing in order to help make the diagnosis of asthma.



Spirometer

When an asthmatic patient is having an attack, that person must work harder to move air in and out of the lungs. Patients with asthma can use a home monitor called a 'peak flow meter' to assess their ability to breathe. A loss of peak flow can signal an asthma attack.



Peak flow meter

Treatment

Families and their pediatrician or pulmonologist should work together as a team to develop and carry out a plan that includes eliminating asthma triggers and monitoring symptoms, and a plan for what to do when a child's asthma starts to act up.

Medications

There are two basic kinds of medication for the treatment of asthma: This module will include the trade names here as the EMT will run into these medications while extracting Hx's from the patient.

Long term medications-- used on a regular basis to **prevent** attacks, not for treatment during an attack.

- inhaled steroids (e.g., Azmacort, Vanceril, AeroBid, Flovent) prevent inflammation
- leukotriene inhibitors (e.g., Singulair, Accolate)
- long-acting bronchodilators (e.g., famoterol, Serevent) help open airways
- cromolyn sodium (Intal) or nedocromil sodium
- aminophylline or theophylline (not used as frequently as in the past)
- combination of anti-inflammatory and bronchodilator (Advair)
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- **Quick relief (rescue) medications**
- -- used to **relieve symptoms** during an attack.
 - short-acting bronchodilators (e.g., Proventil, Ventolin, Xopenex, and others)
 - oral or intravenous corticosteroids (e.g., prednisone, methylprednisolone) stabilize severe episodes

Children with mild asthma (infrequent attacks) may use relief medication as needed. Those with persistent asthma most likely take control medications on a regular basis to prevent symptoms from occurring. A severe asthma attack requires a medical evaluation and may require hospitalization, oxygen, and intravenous medications.

Although these are the same medications used to treat adults, there are different inhalers and dosages especially for children. In fact, children often use a nebulizer to take their medications rather than an inhaler, because it can be difficult for them to use an inhaler **properly**.

Families can play a very important role in the control of asthma by helping get rid of the indoor triggers that worsen asthma. For example, it is extremely important to eliminate tobacco smoke from the home. This is the single most important thing that a family can do to help a child with asthma. Just having people smoke "not in

the house" is not enough, as family members and visitors can "off gas" residual smoke in on their clothes and in their hair.

FYI

Keeping low levels of humidity and fixing leaks can reduce growth of organisms such as molds. Exposure to cockroaches can be reduced by cleaning and by keeping food in containers and out of bedrooms. Bedding can be covered with "allergy proof" polyurethane-coated casings to reduce exposure to dust mites. Detergents and cleaning agents in the home should be unscented.

All of these efforts can make a significant difference to the child with asthma, even though it may not be obvious right away. An allergist can assist with a plan for reducing the asthma triggers in the home.

A peak flow meter, a simple device to measure lung volume, can be used at home to help a patient "see an attack coming" and take the appropriate action, sometimes even before any symptoms appear. If a patient is not monitoring asthma on a regular basis, an attack can be a surprise.

Peak flow measurements can help show when medication is needed, or other action needs to be taken. Peak flow values of 50-80% of the child's personal best indicate a moderate asthma attack, while values below 50% indicate a severe attack. Measuring peak flow is performed in the hospital or doctor's office. It is not use in prehospital emergency care.

Many children under age 5 can't use a peak flow meter well enough to make the resulting data useful, so their asthma must be managed by an adult who needs to watch carefully for the asthma signs. An age 5 "cutoff" is somewhat arbitrary, however, and can be adjusted either way based on the abilities of the individual child. It's a good idea to start using peak flow meters before age 5 to get the child used to them, but not to actually rely on them too much for monitoring the child's condition.

Expectations (Prognosis)

With proper treatment and a team approach to managing asthma (including, most importantly, the family), most affected children can live a normal life. Asthma, however, can be a **life-threatening** disease. It is important for families to work together with health care professionals to develop a plan for the child with asthma

in order to ensure proper treatment and to minimize the impact of this chronic condition.

Complications

The complications of asthma can be severe. Some include:

- chronic cough
- lack of sleep from nighttime symptoms
- decreased tolerance for exercise and other activity
- missed school
- missed work for parents
- trouble breathing
- need for emergency room visits
- need for hospitalization
- assisted ventilation
- chronic lung disease (permanent changes in the function of the lungs)
- **death Yes, DEATH. People do die from asthma attacks.**

Prevention

There is no fool-proof method to prevent asthma attacks. Council frequent patients that the best way to minimize the number of attacks is to follow the asthma plan they develop with their doctor and to eliminate triggers (especially cigarette smoke) as discussed above. When families take control of their home environment, asthma symptoms and exacerbations can be significantly decreased.

When a child begins to get symptoms, a severe attack can be prevented by a quick response. An asthma action plan can tell a family exactly what to do when symptoms start to increase. Following an asthma action plan can prevent severe exacerbations that otherwise might result in hospitalization.

Asthma can't be cured, but it can be controlled.

FIRST RESPONDER CARE

By the time the family calls for 911, it is probably because they are having a difficult time controlling an asthma event. It may be due to poor management of the medication, not having enough of the medication, ineffective/expired medication or any one of the many reasons beyond their control. It really doesn't matter because in reality, there is a pediatric patient that is depending on the EMT's initial care to make him/her feel better. Early interventions can save their lives.

Presentation

Let's say you respond on a call with a 3 year old, short of breath you suspect is having an asthma attack. You enter the house and proceed into the bedroom of the child and as you enter the room you actually hear **auditory** wheezing. You can even hear them wheezing from across the room without even putting the scope to the patient! **That's a very bad sign.** Next, without saying a word, you notice that the patient is using his accessory muscles to help him breathe. **That's not good.** You also notice that the patient is "**tripoding**" (to help align the structures of his airway). Now you hear the patient "grunting" (this helps splint his lower airway open). This patient needs help.



Above: Tripod position aligns the airways and makes it easier for the patient to breath. Short of breath patients seek this position.

The EMT - B plays a crucial role in caring for these sick children by:

- Performing rapid assessment
- Administering high flow oxygen
- Calming the patient while preparing for transport.

It comes down to...

ABC'S. This may include suctioning, rescue breathing, CPR

Oxygen management. High flow O2 via non re-breather mask. Utilize blow-by delivery if needed.

Vitals including SPO2

Proper positioning.

Assistance with the patient's own rescue meds for EMT-B

Attention to body temperature. Hyperthermic v. Hypothermic

Attempt to obtain a good Hx from the parent or guardian while doing a physical exam of your patient. Do not upset the child of a respiratory illness. Too much tactile stimulation and stress can worsen the condition.

Deliver high flow Oxygen to you patient in whatever way applicable so as not to further upset your patient. (NRB, Blow-by, BVM if inadequate breathing) . We may have to rescue breathe for this patient. Pull it out of the bag and have it ready in the event it needs to be deployed rapidly.

Prepare the **child and parents** for transport.