productive. The cough is frequently worse at night and rarely responds to common over-the-counter medicines.

The narrowing of the small airways also causes obstruction to airflow in and out of the lungs. The musical wheeze commonly heard in asthma is the result of this narrowing and can be thought of like the noise produced by air going through an organ pipe. If this narrowing gets severe enough, the patient will experience difficulty getting air in and out of the lungs. This causes the child to breathe faster, and they even develop other signs of respiratory distress like using their neck muscles and chest muscles to help them breathe (“retractions.”)

NOTE: Cough often occurs as the only symptom, without wheeze or respiratory distress. It is usually the first symptom to appear during an asthma flare and the last one to go away. And cough with exercise or at night may be the first sign that you child’s asthma is not as well controlled as it should be.

***What causes asthma to flare up?***

All of us can get cough and wheeze if our lungs are irritated enough. The asthmatic, however, has more sensitive airways that respond more readily. Common things that provoke asthma flares are:

1. Viral upper respiratory infections (“colds”)

2. Allergies (if sensitive) – pollen, weeds, grass, animals, house dust mites, cockroach waste, and foods

3. Exercise

4. Smoke – exposure to cigarette smoke in any way (even just on clothing) is very irritating to the airway

5. Air pollution

6. Cleaning solvents, pest control fumes, perfumes

7. Weather change

***How do you know my child has asthma?***

The definition of asthma is “recurrent episodes of cough or wheeze and no evidence any other lung disease.” Terms like “croup” and “Bronchitis” imply isolated illnesses. It is important to recognize that recurrent episodes are consistent with asthma. It is important to make the diagnosis because asthma can be treated easily with the appropriate medications.

There are some more rare diseases that may be confused with asthma, such as habit cough, pneumonia, foreign body aspiration, immotile cilia, airway abnormality, aspiration, whooping cough, cystic fibrosis, and congestive heart failure. If there is any suspicion of any of these diseases, we may need to do further tests.

There is no single laboratory test that will make or confirm the diagnosis of asthma. Pulmonary function tests and exhaled nitric oxide (breathing tests) can be helpful, but they can only be done once the child reaches 6 or 7 years old, ad they are often both normal in asthmatic children. We make the diagnosis based on a history of recurrent cough and wheeze, positive response to asthma medicine, family history (usually), allergy history (in older children) and not symptoms or indication of anything else.

***How will having asthma affect my child’s life?***

Almost all children with asthma should be able to live a completely normal life. They should be able to exercise normally and even participate in high-level sports. Many Olympic athletes have asthma. If it is not treated appropriately, however, asthma can progressively and irreversibly damage the airways and lead to chronic lung disease is adulthood. It is felt that much COPD is the aftermath of untreated asthma, even in the absence of smoking. Children’s lungs continue to grow and develop up to near 21 years. If they are inflamed, their growth is impaired and can never be regained. It is therefore very important to treat children with asthma early and aggressively in order to control the inflammation in the airways, allow normal lung growth, and prevent permanent scarring of the airways.

It is possible (but not likely) that your child will completely outgrow her asthma. About 1/3 or children with asthma will improve during adolescence (boys more often that girls), but many of those have a recurrence as an adult. The remaining 2/3 continue to have symptoms of asthma throughout their life. Infants with asthma, who do not have risk factors such as asthma in a parent, eczema, or allergies, may grow out of it as they grow up. We cannot predict what path your child will take. Well-treated children with asthma generally do not continue to get worse. Children who begin with mild symptoms generally continue to have more mild asthma, while those who begin with more severe symptoms usually continue to have more significant problems. This makes sense because is it all dependent upon how sensitive their airways are from the beginning. Because asthma is a chronic disease, it requires long-term treatment. Mild asthmatics may be able to have intermittent treatment with minimal medications, while those who begin with severe symptoms usually continue to have more significant problems. There is no permanent “cure” for asthma, but almost all asthmatics can be very well-controlled with adequate treatment.

***How is asthma treated?***

It is important for you to understand how the medicines we use to treat asthma work so that you feel comfortable giving them to your child, know how to use them effectively, and are aware of any potential side effects. There are different approaches to treating different children with asthma. We work to develop an approach that is most appropriate for you and your child. The goal is a treatment plan that will be as convenient and inexpensive as possible, while still keeping your child healthy. In order to do this, it is important that you and your child follow the treatment plant as closely as possible so we adjust accordingly based on their response. We also want you to express any and all concerns about the medications we recommend and your ability to give them as prescribed.

It is also very confusing since there are “Brand” names and “Generic” names.

The first important thing to understand is that there are two different classes of medications we use. The “Preventative” or “Controller” medicines are given daily to keep the lungs as healthy as possible. The “Rescue” medications are used only when needed, when your child is coughing or wheezing. The idea is consistent Controller medications and early and aggressive Rescue medications.

***The “Rescue” medications include:***

*Albuterol and levalbuterol (Xopenex):*These medications are related to adrenaline (epinephrine). They work immediately to open the airways. They are given by inhalation (inhaler or nebulizer). The nebulizer (aerosol machine) is the most effective way to give the medication, but they are time-consuming (10-15 minutes long), and young children sometimes cry or fuss. We recommend that aerosol treatments be given with a mask (much better delivery in young children and hands free in older children as opposed to a mouthpiece) and never just “blow-by.” The inhaler (“puffer”) should always be used with a spacer (even in older children and adults). We use a spacer with a mask up to about age 7 and then transition to a spacer with a mouthpiece (which requires a more advanced breathing technique). Albuterol can cause increased heart rate, jitteriness, insomnia, and nausea. These are annoying but not harmful. Levalbuterol (Xopenex) was developed to have less of these side effects, but the evidence is not solid.

Albuterol and levalbuterol (Xopenex) are the most important medications for the treatment of acute asthma symptoms. They are also sometimes used before exercise to prevent exercise-induced symptoms. If your child needs albuterol/levalbuterol on any kind of regular basis a change in preventative medicine should be considered. If your child is doing well, you should not give the albuterol/levalbuterol routinely. It has no role in the prevention of inflammation and will not work as well when it is needed.

*Prednisone and prednisolone****:*** They medicines are very potent and work to quickly decrease the inflammation during asthma flare. Prednisone is a pill and prednisolone is a liquid – the dose is the same. (It is also sometimes given in the emergency room by injection [Decadron or dexamethasone] and in the hospital IV.) Prednisone is used when an asthma flare does not readily respond to aggressive nebulized albuterol. The “7 day burst” is commonly given by pediatricians, because most patients will respond in that time, and it can be abruptly discontinued with no consequence. But many times patients are not “100%” after 7 days of treatment and required longer to fully treat the inflammation. It’s a bit like a campfire – if you douse it but don’t drown it, it may smolder for a long time or even reignite. But continuing prednisone longer than 7 days requires careful management with meticulous tapering. So we need to see your child or talk to you weekly whenever your child is on prednisone. Also, the albuterol and prednisone work together, so as a general rule, whenever your child is on prednisone, he/she should be on their albuterol at least 4 times a day.

***The “Controller” medications include:***

*Inhaled Steroids (Asmanex, Alvesco, Arnuity Ellipta, budesonide, Flovent, Pulmicort, and QVar):*These are preventative medications. They are available though a metered dose inhaler (MDI, puffer), dry powder inhaler (DPI), or in a solution given by the nebulizer machine. These medications are related to prednisone and work to prevent the inflammation in the airways associated with asthma. They are topical steroid, similar to nasal steroids or steroid creams, so the necessary dose is very low, very little is absorbed into the bloodstream, and the side-effects are minimal. In order to be effective they must be given daily as directed. Patients may rarely develop thrush (a yeast infection in the mouth) or hoarse voice. Your child should brush their teeth or rinse their mouth after use. The puffers should always be used with a spacer.

*Leukotriene Antagonists (Singulair = montelukast):*This is also a preventative medication. It is available as a granule packet sprinkled onto soft food (for infants and toddlers), a chewable tablet, and a pill. It also also a preventative medication that must be given dialy. It also works to prevent airway inflammation, but it is not a steroid. It is generally given in addition to an inhaled steroid if necessary.

*Inhaled Steroid/Long-Acting Albuterol Combination Medications (Advair, Breo Ellipta, Dulera, and Symbicort):*These are also preventative medications. They are available though a metered dose inhaler (MDI, puffer with a spacer) or dry powder inhaler (DPI). They combine the anti-inflammatory effect of inhaled steroids with a long-acting albuterol. They should only be used in patients who cannot be well-controlled on inhaled steroids alone, and should be transitioned back to an inhaled steroid alone at the earliest appropriate time. They should never be used as a rescue medicine. Extra doses should never be given. Side effects are the same as for Inhaled Steroids and Albuterol. They must be taken exactly as directed to have maximum effect – any skipped doses lower the effectiveness considerably.

***What do I do when my child gets sick?***

Asthma flares in children are most commonly triggered by a viral cold. Other common triggers are allergies and exercise. Often the first warning is runny nose, followed by a cough. Cough is the sensitive indication of irritation in the lungs, no matter what kin (dry, wet, tight, productive, loose, etc). Wheezing and shortness of breath will usually follow the cough as the airway inflammation progresses to obstruction. A drop in the Peak Flow may also occur, but not always, especially in the early stages. A drop in the Pulse Ox is an indicator of significant trouble, again, usually later into the flare, and is not an early warning sign. Neither should be the only guide to treatment.

Early, aggressive intervention in flares is crucial to minimize the need for prednisone and to avoid Emergency Room visits and hospitalization. Often in pediatrics we use a “wait and watch” approach because many illnesses will get better on their own. Asthma flares are very different. Without treatment they will progress.

The first medication to start is albuterol/levalbuterol. It will often work quickly to relieve the cough and wheezing. The earlier you start it the better – there is no harm if a cold does not further progress and you have given it a few days. It is most effective given by the aerosol machine, but an inhaler with a spacer can be substituted if you are away from your machine. It should be given at least 4x/day during flares, and can be given very safely up to every 2 hours. The dose is on your child’s Action Plan. You should always have it ready to use at home. All of your child’s usual preventative medicines should be continue during and asthma flares.

If your child is not responding adequately to the albuterol, or is getting worse despite frequent aerosols, you should call us even if it is an evening or a weekend. Usually we will recommend that you start prednisone to more aggressively treat the inflammation. You should always have some prednisone on hand at home, but you should never start it without talking to us first. Generally we will ask that your child take it for a week and that then you call us or see us to check his progress and decide if we can stop it, or if it needs to be given for longer. It is very important that we keep in weekly contact whenever you child is on prednisone, since if it is given more than a week we will need to direct a very specific tapering schedule.

Your child will have her own customize Asthma Action Plan outlining the above instructions. We are happy to talk to you any time and help. We would much rather hear from you than have you uncomfortable and unsure. And we always strive to minimize your need to go the Emergency Room.

***Office visits***

Regular follow up visits with us are critical to your child’s asthma care. At these visits we will ask you about your child’s progress since the last visit including flares, exercise tolerance, need for rescue medication, and medication issues (like adherence, side effects, refills, and other concerns). Spirometry (lung function testing) will be done on all children over 6 years. It tells us whether the airways are clear and open or obstructed. Exhaled Nitric Oxide is done on all patients over 7 years. It is a marker of airway inflammation. We will adjust your child’s medications – increased or decreased – based on all this information put together.

We will start or adjust their Peak Flow Meter settings, make sure they have adequate equipment (age-appropriate spacer, nebulizer, and facemask), and be sure they have everything they need at school. Once a year we will update their Action Plan and School form. And in the fall we will encourage the flu shot.

The frequency of visits will vary with how severe your child’s asthma is and how they have done since the last visit. We do not have Physician Extenders (Nurse Practitioners or Physician Assistants) – you will be seen at every visit only by Dr. Neddenriep.

As you can see, a lot goes on in these visits. Our philosophy is that “an ounce of prevention is worth a pound of cure,” and that regular follow-up ensures we can keep your child’s asthma on track.

We ask that you respect the time of other patients and be punctual for your appointment. Fitting in a late patient pushes back the schedule for everyone else who arrives on time. If you are over 15 minutes you will be rescheduled.

If you must reschedule, please be considerate and relinquish your appointment 24 hours in advance. There is a no-show fee of $25.

***Asthma Class***

We strongly encourage all of our patients to attend our 1 ½ hour long Asthma Class. See the Asthma Class handout for more details.

***Telephone Support***

Our practice is very unique in that Dr. Neddenriep provides prompt person telephone support by 24/7. We do not utilize a nurse for this – you will speak directly with Dr. Neddenriep. We ask that you are up to date on your follow-up visits and that you have attended Asthma Class, so Dr. Neddenriep can feel confident communicating with you by phone. We also ask that you be respectful of her time, and reserve weekend and evening calls for urgent health problems that require a doctor’s expertise. Medication refills will be done only during office hours. To reach Dr. Neddenriep for urgent health matters outside of office hours, please call the office number. It will prompt you to press 1 and will connect you directly to her on-call cell phone. Please do not call or text her personal cell phone directly. The on-call cell phone number alerts her that is a patient call, and if she is out of town, routes you to the correct number taking her calls.

***Peak Flow Meters***

This is a device that measures your child’s exhaled air flow. Children are typically able to accurately use this device when they are about 6 year old. It is not something you need to do every day. You and your child just need to be comfortable with how to use it, that your child is giving it her/her best effort, and have it handy. Your child’s current “Best” and “Zones” will be on the meter and will give you some information about their breathing when they are in a flare. Dr. Neddenriep will want to know this number when you call.

***Pulse Oximetry***

These devices measure the oxygen in your child’s blood. There are 2 pitfalls with using them. The first is that they are very finicky and often give inaccurate results. The other is that the oxygen decreases very late in an asthma flare. So if you wait to treat your child based on a decreased Pulse Ox, you will be way behind. For your reference, normal is ≥95%. 90%-95% is not normal but not dangerous and most likely could be treated at home. <90% requires admission to the hospital. But again, you are way better off using your observations skills to evaluate your child’s cough and work of breathing than focusing on the Pulse Ox.

***Prescription Refills***

The most efficient way to refill your medications is through your pharmacy. If the refills have expired, they will notify Dr. Neddenriep directly through the EHR and she will quickly renew. If you are changing pharmacies or refilling a prescription that did not originally come from Dr. Neddenriep, call the office and we are happy to send into the pharmacy electronically. Please note that prescriptions will only be renewed for patients who are up to date on their follow-up appointments. Otherwise the renewal will be denied with a note to the pharmacy that your child must be seen first.

***Exercise***

We encourage exercise of all kinds and almost always can keep your child healthy enough to participate even if elite athletics. Encourage you child to play whatever sport they would like, and we will work with you to help achieve whatever level they aspire to. Many pro and Olympic athletes have asthma. Asthma should not be a barrier.

***Flu shot***

We strongly encourage the flu vaccine every fall, preferably before Thanksgiving to have its maximum potential effect. See our Flu Shot handout or the blog on our website.

***School***

Full attendance at school is a major goal. It is very important to communicate with the school nurse or health aid and provide them with your child’s Action Plan and School Form, albuterol inhaler, and spacer.

***Allergies, Allergy Testing, Allergy Referral, and Allergy Shots***

Allergies can be an important trigger of asthma. If we suspect this we may recommend a blood test to get a better handle on your child’s allergic component. We refer and work together frequently with Allergists, and if appropriate they may recommend allergy shots (immunotherapy) or Xolair.

***Hospitalization***

Dr. Neddenriep prefers her patients to be seen at TMC For Children. Also remember that if your child has had hospitalizations, especially to the PICU, you should mention this any time you see a doctor about her asthma.

***Terminology and Definitions***

Many of the terms we use can be confusing, and can have multiple different names. Here are some terms and definitions that might be helpful:

 Nebulizer = machine

 Puffer = inhaler = MDI = Metered Dose Inhaler

 Proair, Ventolin, Proventil = albuterol puffers

 Singulair = montelukast

 Pulmicort = budesonide

 Flare = attack = exacerbation

***Summary***

Asthma is a chronic disease of the lungs that can almost always be very well controlled with safe medications. It is important that these medications be given as prescribed and that you be honest with us about hos the medication is being given, how well it is working, and side effects so that we can develop a treatment plan together that is practical and effective. With time you will learn how to use these medications and how to help you child through an asthma flare. We encourage you to call us with any questions or problems; remember that asthma flares are much easier to treat if they are recognized and dealt with early.