



Medicine for Managers

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Asthma Revisited

I last wrote about asthma in September 2011. It continues to be the most common long-term condition in the UK. It is a chronic respiratory disorder characterised by breathlessness, cough and wheezing. Treatment these days is very effective and yet it is still the case that, every day, three families suffer the tragedy of the death of a loved one from the condition.

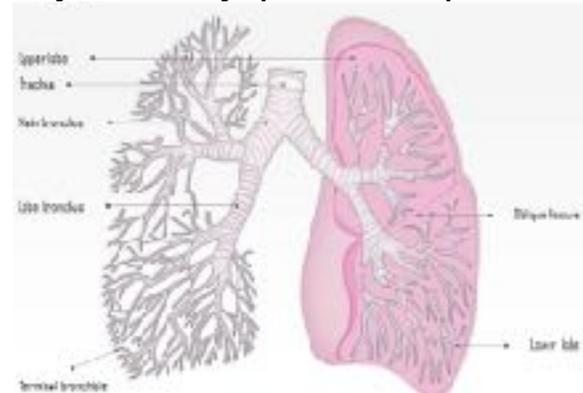
The condition is triggered by exposure to allergens such as pollens, house dust mite, moulds, spores, general pollution and especially traffic fumes or horse dander.

Other factors include stress and viral infections. In some patients the mechanism by which asthma develops is not fully understood but in some there is undoubtedly a hereditary element.

The result of asthma is the development of symptoms

- Breathlessness
- Wheezing
- Chest tightness
- A cough productive of thick copious mucus.

Why do these symptoms develop?



The respiratory tract is divided into an upper and a lower airway. The lower airway consists of the **trachea** (windpipe), the **bronchi** (left and right which result from the division of the trachea) and the **bronchioles** (which result from divisions of the bronchi). Air passes in and out through the bronchiolar system and into the **alveoli** (which are the terminal elements of the lung and which consist of what look like bunches of hollow, delicate grape-like structures). Alveolar air is exchanged with blood vessels to deliver oxygen and remove carbon dioxide.

The trachea is a rigid structure composed of rings of **cartilage**. The bronchi and bronchioles which lead from it have walls made of smooth muscle and are elastic. Asthma occurs as a result of inflammation of the conducting zone of the lungs, principally the bronchi and the bronchioles. In simple terms this results in spasm of the muscle surrounding them, resulting in reduction in the tube lumen, which is aggravated by swelling of the lining through inflammation and the accumulation of mucus on the inside of the tubes.

Patients may experience sudden acute attacks of wheezing and coughing. Sometimes attacks may be very severe and disabling and patients may become increasingly breathless and short of oxygen which may even lead to unconsciousness. In the worst attacks, where there is no remission and the symptoms are persistent and severe, **status asthmaticus**, the attack may be life-threatening and lead to respiratory failure and death.

What are the statistics?

When I wrote in 2011, the statistics (from 2009) showed that there were 5.4 million people with asthma in the UK (1.1 million children and 4.3 million adults) resulting in about 1,200 deaths annually. Recent data shows that those figures are unchanged and in 2014, 1,216 people died from asthma (data from asthma UK). The disorder costs the NHS about 1 billion pounds a year and affects 1 in 10 people in Northern Ireland and Wales, 1 in 11 people in England and 1 in 14 in Scotland. Someone is hospitalised with an asthma attack every eight minutes.

What actually happens to cause asthma attacks?

Asthma has many causes and there is undoubtedly a complex genetic association together with environmental factors such

as poor air quality, the association with smoking, stress and even antibiotic usage; all have been implicated.

Asthma sufferers experience **reversible airway restriction** which may either resolve spontaneously or with the use of drug therapy. The actual process is the development of inflammation in the respiratory tubes. As a result of the inflammatory change the tubes become extremely sensitive to allergens and pollutants resulting in smooth muscle spasm and swelling of the lining which results in tubular narrowing.

The attack not only causes the respiratory symptoms described above, but also a rapid heartbeat, confusion and exhaustion, the development of a blue colouration of the lips and tips of the fingers (called **cyanosis**) and the patient may faint.

Work Related Asthma

Although most asthma is associated with the allergens and pollutants listed above, some people develop asthma as a result of contact with specific occupational pollutants. These include

- Isocyanates. These are the classic cause of work asthma and are found in poly-urethane paint sprays, glues, foams, coatings and some flooring materials.
- Materials associated with soldering and welding
- Work with animals
- The Latex Industry
- Grain dust in flour milling

It therefore involves car body repairers, floor layers, millers, chemical workers and those who work with timber products, fertilisers and animals amongst others.

There is much encouragement to tackle the problem of work-related asthma by the HSE, involving ways to ensure that employees avoid allergen chemicals or are protected from them. In addition, risks are being reduced by using products which do not contain isocyanates or using products

which are in a different form and can be applied by brush or roller rather than by spray.

The Diagnosis of Asthma

The condition is usually diagnosed by the doctor or nurse who sees the patient when they are experiencing an episode. The combination of breathlessness, wheezing, coughing and sputum production without a temperature (and often with a history) tends to leave no doubt about the diagnosis.

Sometimes, when only one or two symptoms are present, the diagnosis may be less easy. Furthermore, doctors will want to test the patient with symptoms to obtain a measure of the degree of severity and disability of the disorder both in its quiescent phase and when exacerbations occur.

The **Peak Flow Test** is a simple and effective way of assessing asthma and is a measure of how fast air can be blown out of the lungs. The test employs a device called a **Peak Flow Meter**



which has a scale and a pointer which moves up the scale according to how well the air is expelled. Clearly the greater the level of bronchial obstruction, the less able the patient is to blow the air out. The test involves taking a very deep breath and then blowing the air out as fast as possible. The test, which involves recording the best of three attempts, can be done in a couple of minutes and is recorded when required up to several times over twenty-four hours

periods to assess the degree of disability and the diurnal variations.

Spirometry is a more detailed test and involves breathing into a device, through a tube, to record the amount of air that can be expelled from the lungs in a second and the total capacity of the lungs. These readings can be



compared with readings for a population of patients of the same age and of the same height to obtain a measure of the normality of the airways.

Both tests can be used and repeated a few minutes after taking a dose of a bronchodilator drug to demonstrate **reversibility** (which confirms the diagnosis) and assess the value of such a drug for a particular individual.

There are other tests to assess the individual components of asthma such as the degree of inflammation in the bronchial tree and the nature of the allergen(s) that might provoke asthmatic episodes.

The Management of Asthma

In many respects the treatment of asthma has changed relatively little in the last half century. The drug **isoprenaline** was introduced as a treatment for asthma in the early 1960s although its more recognised use was in the treatment of bradycardia. Between 1963 and 1968 there were reports of increased deaths of asthma patients using isoprenaline inhalers and the drug rapidly fell out of favour. The pharmaceutical company, **Allen and**

Hanbury, first opened in 1715 and was acquired by Glaxo in 1958. The company continued to use the Allen and Hanbury brand until it was phased out in 2013. In 1968 the company introduced **Ventolin Inhalers (salbutamol)** which is a **short acting β_2 adrenergic receptor agonist**. For anyone without a degree in pharmacology that means that the drug blocks receptors that make smooth muscle contract so that the muscle relaxes. The bronchi and bronchioles are wrapped in smooth muscle and, when the muscle relaxes, the airway opens allowing more air to pass through.

Salbutamol (Ventolin) inhalers which are normally blue, normally act quickly to relieve symptoms and have done for nearly half a



century. The drug is used to treat acute symptoms and should normally be available for use should any symptoms suddenly develop. It is called a **Reliever Inhaler**. The drug is a **bronchodilator**. For most people they are without side effects although in some people they cause feelings of mild shakiness and headache. There have been many



variations in the way in which the salbutamol is released during that time and it is available as spray, capsules with powder and in other formulations. Other β_2

agonists are available, such as **terbutaline (Bricanyl)** and **fenoterol (Berotec)**.

Preventer Inhalers, which are traditionally brown in colour, are designed to prevent the changes leading to narrowing of the bronchi and bronchioles from happening. They work by reducing inflammation in the respiratory tract and by making the airways less sensitive to allergenic challenge. The classic type of inhaler, **Becotide Inhaler, (beclomethasone)** was introduced in 1970 and also caused a seismic change in asthma management. Before 1970, asthma could be controlled by the use of oral steroids but their use was accompanied by multiple side effects, most notably obesity and metabolic problems such as reduced resistance



to infection. The introduction of becotide made steroid use safe because the dose was only a fraction of the amount of tablets and it went straight to the point where it was needed. It is normally used twice daily regularly to prevent asthma from occurring. Again variations on the administration have been developed and there are other steroid inhalers, notably **budesonide (Pulmicort)**. In 2007, Becotide was withdrawn although beclomethasone (now spelt **beclometasone**) generic inhalers are still available.

Longer Acting Reliever Inhalers

In the last few years a range of other bronchodilator drugs have been introduced, many lasting longer than salbutamol. They act in the same way but their effects may be felt for up to twelve hours. These longer acting drugs to open the bronchi are often used alongside a

longer acting preventer inhaler. Such longer acting combination inhalers are often maroon red or purple. Examples include *Seretide*, *Serevent* and *Fostair*.

Apart from the pressurised inhalers, there are now a variety of ways of giving the drugs, using



Spacers, devices that rely on powdered drug and automatic dispensers to make administration easier and more tailored to all patients

More established treatments

There is no doubt that the introduction of inhalers revolutionised the treatment of asthma but for some patients the more traditional drugs, provided as tablets:

1. **Theophyllines:** First discovered in 1888, *theophylline (Phyllocontin)* and its intravenous formulation, *aminophylline* are still used by many patients.
2. **Montelukast and Zafirlukast** are drugs known as leukotriene receptor antagonists and reduce airway inflammation.
3. **Steroids.** For some patients oral steroids are necessary to control the asthma symptoms. Of course they tend to cause the side effects of weight gain, fat redistribution, impairment of the immune response and the inflammatory response and other effects. These days they are used (often intravenously) for the short-term control of acute attacks and in those patients where other drugs simply do not work adequately.
4. **Omalizumab (Xolair)** is a newer preparation available in specialist

care for the treatment resistant patient. It is aimed at controlling frequent acute attacks.

There are also other actions to assist in the management of and treatment of asthma

1. Stop smoking
2. Eat healthily
3. Exercise regularly
4. Breathing exercises
5. Have vaccinations against 'flu each winter
6. Avoid environments that seem to aggravate the symptoms

First recognised by the **ancient Egyptians**, asthma remains incurable but its treatment has improved enormously in the last forty to fifty years. It was first recognised by Hippocrates as a respiratory ailment in 450 BC and the name is derived from the Greek word for panting. Like so many other conditions experimental treatments were first used in the latter part of the nineteenth century and included chloroform liniment to rub into the chest (1880) and adrenaline first used around 1900. Yet the 1,216 deaths in the UK in 2014 show that it remains resistant to treatment for a significant number of patients and there is much further to go to consign it to history.