

Contents

<u>Definition</u>	2
<u>Prevalence and incidence</u>	2
<u>Signs and symptoms</u>	3
<u>Causes/risk factors</u>	3
<u>Pathophysiology (mechanism of disease)</u>	4
<u>Prognosis and complications</u>	6
<u>Diagnosis/detection</u>	7
<u>Pharmacological treatment</u>	7
<u>Non-pharmacological treatment</u>	10
<u>Further resources</u>	10
<u>External websites</u>	10
<u>References</u>	10

Definition

Asthma is a long-term condition that affects your airways. The World Health Organization (WHO) defines it as ‘a disease characterized by recurrent attacks of breathlessness and wheezing, which vary in severity and frequency from person to person. In an individual, they may occur from hour to hour and day to day. This condition is due to inflammation of the air passages in the lungs and affects the sensitivity of the nerve endings in the airways so they become easily irritated. In an attack, the lining of the passages swell causing the airways to narrow and reducing the flow of air in and out of the lungs.’¹

Asthma is typically associated with chronic Type 2-mediated airway inflammation and hyper-responsiveness. Increased numbers of eosinophils in peripheral blood and in airway secretions are a characteristic feature of asthma.

There are several different types of asthma:

- occupational asthma
- difficult to control and severe asthma
- adult onset asthma
- childhood asthma
- seasonal asthma.

For more information on the different types of asthma, visit [Asthma UK – Types of asthma](#).

It is important to understand the differences between COPD and asthma. This is discussed in the following *Pharmaceutical Journal* article, **Knowing the differences between COPD and asthma is vital to good practice**.

[Return to contents](#)

Prevalence and incidence

Over eight million people in the UK (approximately 12 percent) have been diagnosed with asthma, making it the most prevalent airway condition. Asthma UK states that 5.4 million people are currently receiving asthma treatment. One in every 12 adults and one in every 11 children have asthma. Three people die every day in the UK, though research shows that two thirds of these are preventable.²

Rates of asthma diagnosis are falling, with approximately 160,000 people in the UK diagnosed each year. The incidence of asthma is far higher in children than in adults, which is in contrast to other lung conditions.³

In early childhood asthma is more common in boys, but by adulthood it’s more common in women. When looking at those who died from asthma in 2012, 358 were male and 888 were female.³

In 2012, incidence rates of asthma were 36 percent higher in the most deprived communities compared to the least deprived.⁴

[Return to contents](#)

Signs and symptoms

Symptoms of asthma include:

- shortness of breath
- wheezing
- chest tightness
- cough.^{5,6}

Symptoms commonly occur in episodes, are diurnal (worse at night or in the early morning), and/or triggered or exacerbated by exercise, viral infection, and exposure to cold air or allergens.⁷ More information about triggers can be found in the *Causes/risk factors* section of this page.

Visit healthtalk.org – *What asthma feels like* to access videos of people with asthma discussing their symptoms.

Signs of an exacerbation include:

- worsening symptoms such as cough, breathlessness, wheeze or chest tightness
- resistance to reliever inhalers, if the reliever inhaler isn't helping or not lasting for longer than four hours
- exhaustion
- breathlessness affecting ability to speak, eat, sleep or undertake daily activity
- tachypnoea (fast breathing) and the feeling that breath isn't getting into the lungs
- cyanosis (bluish lips or extremities)
- a reduced peak expiratory flow rate (PEFR – the maximum speed of expiration measured by a peak flow meter) assuming one can be provided
- the use of accessory muscles (muscles in neck and stomach) to aid breathing while the person is at rest
- complaint of stomach or chest ache in children.^{8,9,10}

[Return to contents](#)

Causes/risk factors

There are several risk factors that may increase the likelihood of development or persistence of asthma, these include:

- personal history of atopic disease (an allergy which leads to a hypersensitivity reaction), eg, eczema, allergic rhinitis, or allergic conjunctivitis
- family history of atopic disease (there are several genes that are associated with asthma which may pre-dispose people to hyper responsiveness to environmental factors)¹¹
- respiratory infections in infancy such as bronchiolitis
- exposure (including prenatally) to tobacco smoke
- premature birth (before 37 weeks) and associated low birth weight
- obesity
- social deprivation, potentially due to damp housing, fungal spores, pollution, and exposure to tobacco smoke
- exposure to inhaled particulates
- workplace exposures including flour dust and isocyanates from paint^{4,12}

- if you are an adult female, **hormones** can affect asthma symptoms, and some women first develop asthma before and after the menopause.¹³

Triggers of asthma include:

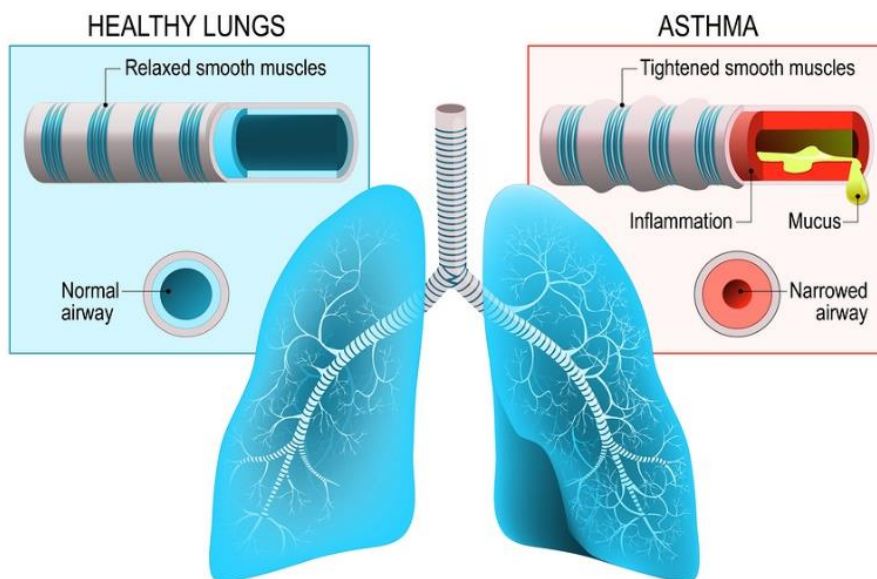
- respiratory infections
- allergens, eg, pollen, dust mites, animal fur or feathers, alcohol
- smoke, fumes and pollution
- non-steroidal anti-inflammatory drugs (NSAIDs) and beta blockers
- emotions, including stress, or laughter
- weather – such as sudden changes in temperature, cold air, wind, thunderstorms, heat and humidity
- mould or damp
- exercise.^{12,14}

[Return to contents](#)

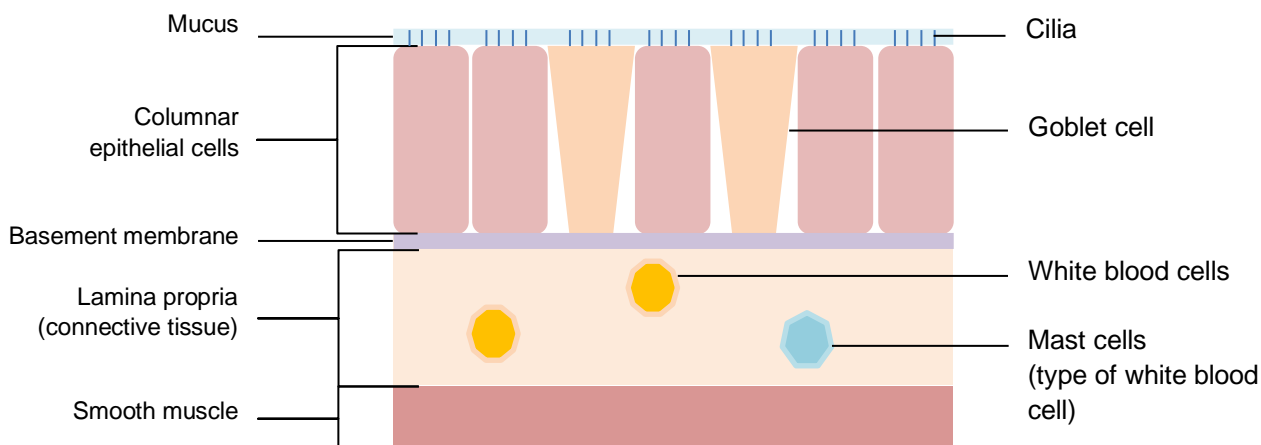
Pathophysiology (mechanism of disease)

The pathophysiology of asthma can be understood by looking at the airways of the lungs.

As per the image below, the airways in healthy lungs have relaxed smooth muscles, they are not inflamed and there is no excess mucus. In the lungs of a person with asthma, there is smooth muscle tightening, or constriction, inflammation inside the airway and increased mucus.



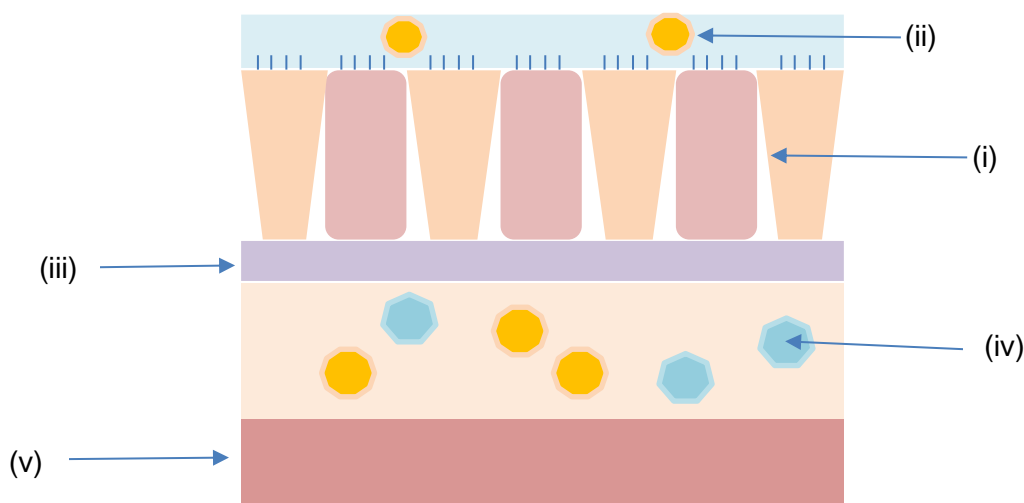
The below diagram shows a cross section of the layers of a healthy airway.



A layer of mucus sits on the top of the epithelium (outer surface of the airway). This layer of mucus is normal and helps to protect the airways. Mucus helps to humidify the inhaled air, prevent the airways from drying out and also catch particles such as dust and bacteria. The cilia (small hair-like structures on the epithelial cells) move and push the mucus up and out of the lungs.

The lamina propria is the layer beneath the epithelium and basement membrane that contains mast cells (which produce the inflammatory molecules histamine and leukotrienes) and other white blood cells. In healthy lungs, these cells will mediate a normal immune response to pathogens.¹⁵

There are several differences in the airways of a person with asthma, which are shown in the diagram below. These changes are a result of a process called airway remodelling. This remodelling happens over time and is thought to be linked to the chronic inflammation associated with asthma.¹⁶



The differences include:

- (i) more goblet cells which produce more mucus¹⁷
- (ii) white blood cells in the mucus (including lymphocytes, eosinophils, and neutrophils)¹⁸
- (iii) a thicker basement membrane
- (iv) more white blood cells, including mast cells, in the lamina propria
- (v) thickening of the smooth muscle, leading to narrowing of the airway.¹⁹

Following allergy antibody IgE complex activation of the mast cell, the mast cell degranulates and releases inflammatory molecules, such as histamine, leukotrienes and cytokines (e.g. interleukin-5).

Leukotrienes released by the mast cells are thought to be primarily responsible for bronchoconstriction during an asthma exacerbation.²⁰

Asthmatics have ongoing airway obstruction and airway hypersensitivity because of the remodelling being present continuously. Advances in our understanding of the eosinophil recruitment to the airway, and the consequence of eosinophilic inflammation, has led to the development of new therapies to target these molecular pathways.

For more information on the pathology and pathophysiology of asthma, including details on the complex immunological changes, access the following *Frontiers in microbiology* article, **Pathology of asthma**.

For more about the remodelling process access the following *Proceedings of the American Thoracic Society* article, **Remodeling in Asthma**.

[Return to contents](#)

Prognosis and complications

The risk of developing persistent asthma depends on the age of presentation. In general, the earlier the onset of asthma the better the prognosis. Most children who present under two years of age become asymptomatic by mid-childhood. Additionally, male children are more likely to grow out of asthma during adolescence than female children.¹⁴

Frequent or severe episodes of wheezing in childhood are associated with recurrent wheeze that persists into adolescence.²¹

The most severe complication associated with asthma is death. The British Lung Foundation states that 'around 1200 people a year are recorded as dying from asthma' in the UK.³

Why asthma still kills is the National Review of Asthma Deaths' (NRAD) first national investigation of asthma deaths in the UK. The aim of the NRAD was to '*understand the circumstances surrounding asthma deaths in the UK, in order to identify avoidable factors and make recommendations for changes to improve asthma care as well as patient self-management.*'²² Access the report for further information about asthma deaths and how they can be prevented.

There are other complications associated with asthma, and these include pneumonia, lung collapse (caused by mucus plugging of the airways), respiratory failure, pneumothorax (air filling the space between the lung and chest wall), status asthmaticus (continuous asthma attacks which do not respond to appropriate treatment) and impaired quality of life (fatigue and underperformance at work or school).²³

[Return to contents](#)

Diagnosis/detection

The British Thoracic Society (BTS) and Scottish Intercollegiate Guidelines Network (SIGN) **British guideline on the management of asthma** states that '*The diagnosis of asthma is a clinical one. The absence of consistent gold-standard diagnostic criteria means that it is not possible to make unequivocal evidence-based recommendations on how to make a diagnosis of asthma.*'

Read Sections 1.1 *Initial clinical assessment*, 1.3 *Objective tests for diagnosing asthma in adults, young people and children aged 5 and over* and 1.4 *Diagnostic summary* of the National Institute for Health and Care Excellence (NICE) guideline **Asthma: diagnosis, monitoring and chronic asthma management [NG80]**, which covers diagnosing, monitoring and managing, to learn more about the NICE recommendations for diagnosis of asthma.

Further information on diagnostic techniques for asthma can be found in the BTS/SIGN **British guideline on the management of asthma** under Section 3 *Diagnosis*.

A summary can be found in the NICE clinical knowledge summary (CKS) page on **Asthma, Diagnosis – When should I suspect asthma?**

Information aimed at people with suspected asthma can be found on the Asthma UK website – **Tests to diagnose asthma**.

[Return to contents](#)

Pharmacological treatment

Read Sections 1.5 *Principles of pharmacological treatment* and 1.6 *Pharmacological treatment pathway for adults (aged 17 and over)* of NICE guideline **Asthma: diagnosis, monitoring and chronic asthma management [NG80]**.

The BTS and SIGN recommend a slightly difference approach. This is outlined in the table below which is taken from the BTS/SIGN **British guideline on the management of asthma**.

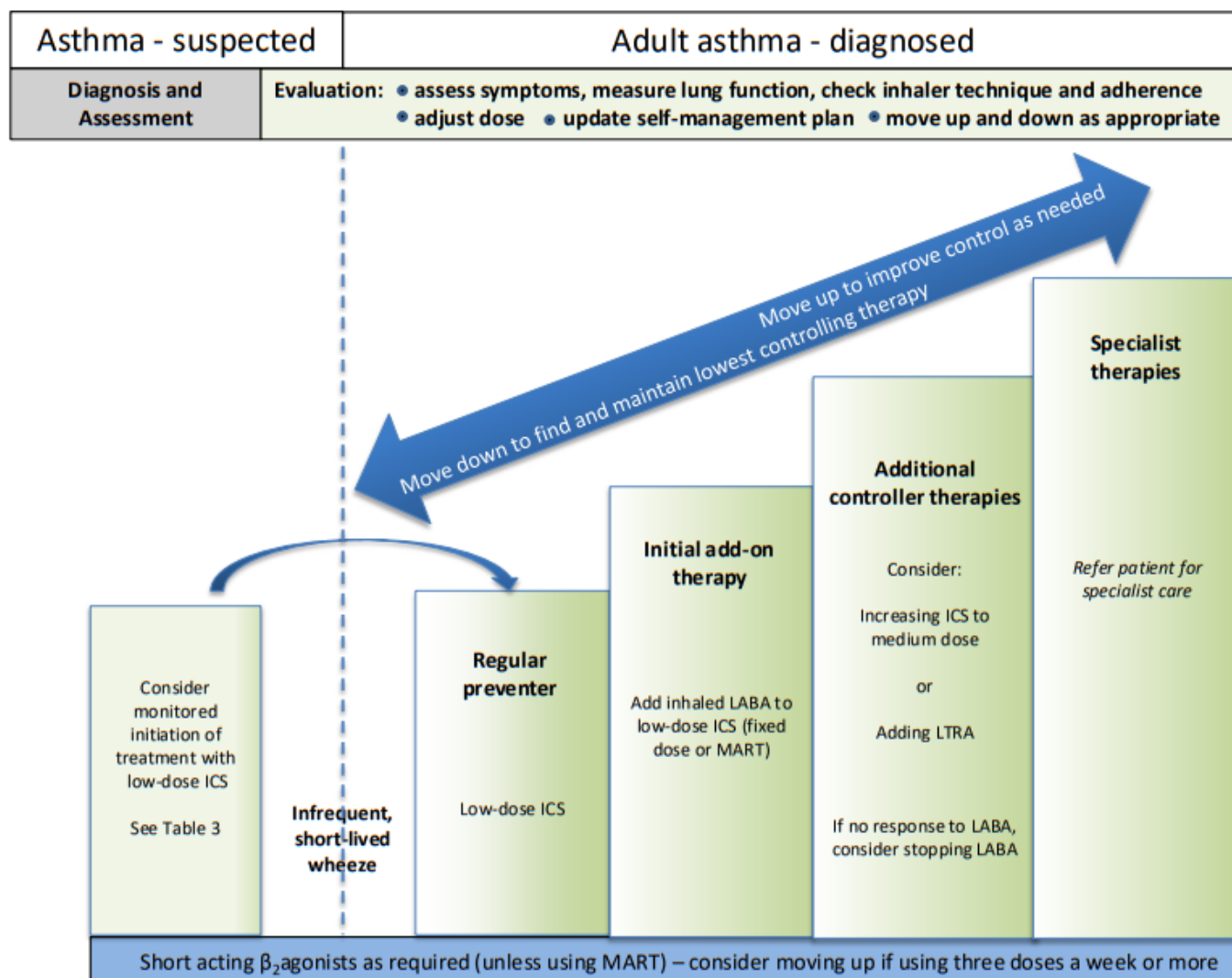
The abbreviations used are as follows:

ICS – inhaled corticosteroid

LABA – long-acting beta agonist

LAMA – long-acting muscarinic antagonist

LTRA – leukotriene receptor antagonists



Taken from the BTS/SIGN *British guideline on the management of asthma*. 2019.

Read Section 7 *Pharmacological management* of the BTS/SIGN *British guideline on the management of asthma* for further information on dosing, monitoring and side effects of the recommended therapies that the BTS/SIGN recommend.

The differences between NICE guidance and the BTS/SIGN guidance are discussed in the following *Thorax* article: **Guidelines for the diagnosis and management of asthma: a look at the key differences between BTS/SIGN and NICE.**

A useful resource which supports NICE guideline *Asthma: diagnosis, monitoring and chronic asthma management [NG80]* is NICE's *Inhaled corticosteroid doses for NICE's asthma guideline*. It includes tables to show how ICS dosages vary across different formulations. The tables indicate low, moderate and high dosages for adult and paediatric maintenance therapy, in line with the NICE guideline.

Overuse of SABA therapy is associated with poor asthma control, increased airway hyper-responsiveness, increased asthma-related mortality and increased healthcare utilisation due to asthma. Excessive use of SABA medication has been associated with epidemics of asthma deaths, and dispensing of more than 12 SABA inhalers to one individual over a 12-month period is associated with increased risk of asthma-related death. It is therefore critical that SABA use be exclusively restricted to use on an 'as needed' basis and monitored carefully. The new Global Initiative for Asthma (GINA) <https://ginasthma.org/> update recommends a significant change in the way asthma is managed compared to NICE and BTS/SIGN guidance. Due to the known dangers of overuse of SABA, and evidence that even mild asthma involves inflammation, it recommends that adult and adolescent patients with asthma are not prescribed a SABA inhaler but instead a low dose ICS-LABA to be used for symptom relief (and used regularly plus when required depending on severity).

RightBreathe is a tool designed specifically to help with the selection, prescribing, and ongoing use of inhalers.

The following *Respiratory Medicine* article may be useful when considering whether to increase an ICS dose or introduce a LABA, **The dose–response characteristics of inhaled corticosteroids when used to treat asthma: An overview of Cochrane systematic reviews.**

Personalised Asthma Action plan

A personalised asthma action plan is a key resource for people with asthma. Asthma UK's ***Your asthma action plan*** can be used to help avoid exacerbations and hospital admissions.²⁴

Vaccinations

People with asthma are eligible for and should be offered an annual influenza vaccination.²⁵

Inhaler technique

Good inhaler technique is important to ensure that people using inhaled therapies receive the prescribed dose. CPPE's ***Inhaler technique for health professionals: getting it right*** e-learning explores the reasons why we need to improve how pharmacy professionals help people with their inhaler devices, how the devices work and how to improve outcomes.

Additionally, the following *Guidelines* article suggests a management algorithm for selecting an inhaler device: ***Choosing an appropriate inhaler device for the treatment of adults with asthma or COPD.***

It should be noted that inhalers should always be prescribed by brand.

Additionally, a published article may be helpful; How to help patients optimise their inhaler technique: <https://www.pharmaceutical-journal.com/learning/learning-article/how-to-help-patients-optimise-their-inhaler-technique/20201442.article>

The UK Inhaler Group developed peer reviewed Inhaler Device Videos to support health professionals and patients how to use the devices: <https://www.asthma.org.uk/advice/inhaler-videos/>

[Return to contents](#)

Non-pharmacological treatment

An important aspect of non-pharmacological management is the provision of advice. Advice and support for those who suffer from asthma can be found on the **British Lung Foundation** and **Asthma UK** websites.²⁵

Avoiding trigger factors is also important. These may include specific allergens, high levels of air pollution, smoke (smoking cessation advice and treatment should be offered), beta blockers, or NSAIDs.^{14,25} Weight loss should be encouraged for people who are overweight and obese.¹⁴

A peak flow meter should be provided so that people can measure their peak flow regularly as part of their personalised asthma action plan.²⁵

SIMPLES is a structured primary care approach to the review of a person with uncontrolled asthma. It encompasses patient education monitoring, lifestyle and pharmacological management and addressing support needs which will achieve control in most patients:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6442837/pdf/pcrj201375.pdf>

[Return to contents](#)

Further resources

It is important to understand the differences between asthma and COPD. This is discussed in the following *Pharmaceutical Journal* article: **Knowing the differences between COPD and asthma is vital to good practice.**

Asthma e-learning from e-learning for Healthcare can be accessed via CPPE's website at: **e-Learning for Healthcare learning modules.**

[Return to contents](#)

External websites

CPPE is not responsible for the content of any non-CPPE websites mentioned on this page or for the accuracy of any information to be found there.

All web links were accessed on 30 March 2020.

[Return to contents](#)

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[Return to contents](#)

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