Definition

Chronic obstructive pulmonary disease (COPD) is a treatable, yet incurable, and largely preventable lung disease. It is characterised by obstructed respiratory airflow which is not fully reversible and is usually progressive. The airway obstruction is due to a combination of emphysema (damage to the alveoli) and chronic obstructive bronchitis (long-term inflammation of the airways).\textsuperscript{1,2,3}

**EMPHYSEMA**

- **Healthy alveoli**
- **Emphysema**
- Normal alveoli
- Destroyed alveoli

**BRONCHITIS**

- Trachea
- Bronchi
- Bronchitis
- Inflammation
- Mucus
- Normal
- Lungs

The National Institute for Health and Care Excellence (NICE) defines COPD in the following way:

- ‘Airflow obstruction is defined as a reduced FEV1/FVC ratio (where FEV1 is forced expired volume in 1 second and FVC is forced vital capacity), such that FEV1/FVC is less than 0.7.’
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- If FEV1 is greater than or equal to 80 percent predicted normal a diagnosis of COPD should only be made in the presence of respiratory symptoms, for example breathlessness or cough.1,4

There may be occasions where COPD sufferers experience an acute exacerbation of COPD. This is defined by NICE as:

‘a sustained worsening of the patient's symptoms from their usual stable state which is beyond normal day-to-day variations, and is acute in onset.’4

It is important to understand the differences between COPD and asthma. Access the Pharmaceutical Journal article, Knowing the differences between COPD and asthma is vital to good practice, which discusses this.

Prevalence and incidence
COPD is the second most prevalent lung disease in the UK after asthma and affects an estimated two percent of the population5 which equates to around 1.2 million people. It is also estimated that there are an additional 2 million people with COPD who are undiagnosed.3

British Lung Foundation research suggests that the prevalence is growing, with the number of people living in the UK who have never been diagnosed with COPD rising from just fewer than 1 million in 2004; however, the numbers of new diagnoses per 100,000 people fell between 2004 and 2012, from 226 to 193.6

The prevalence of COPD increases with age and people are not usually diagnosed until they are 50 years of age or older3. It is more prevalent in men than women and men are more likely to die from it. Mortality rates are higher in Scotland and the North of England than the South, reflecting the fact that the prevalence and incidence is nearly twice as high in the most deprived 20 percent of the population compared to the least.5

For more general COPD statistics visit the British Lung Foundation website.

An inquiry into premature deaths of people with learning disabilities found that the most prevalent immediate cause of death in people with learning disabilities was respiratory disorders7. For more information, access Confidential Inquiry into premature deaths of people with learning disabilities (CIPOLD).

Signs and symptoms
The most common symptoms of COPD include cough, increased volume of sputum, persistent wheeze, frequent chest infections and increasing breathlessness.8,9

At a more advanced stage symptoms include weight loss, tiredness, swollen ankles (peripheral oedema), chest pain and coughing up blood (haemoptysis).9
Due to the progressive nature of COPD, these symptoms usually get worse over time and have an increasingly large impact on daily activities.

These symptoms usually develop gradually over time and significant airflow obstruction may be present before the person is aware of it.\textsuperscript{3,4}

During an acute exacerbation patients may report worsening breathlessness, cough, increased sputum production and change in sputum colour.\textsuperscript{4}

For more information about how people experience COPD, watch:

\textit{British Lung Foundation - Living with COPD: Jim's story}

\textbf{Causes/risk factors}

\textbf{Smoking}

Tobacco smoke causes the chronic airway inflammation and alveolar damage described above and is the major risk factor for COPD. It is estimated to account for 90 percent of cases and seems to enhance the effects of other risk factors.\textsuperscript{3,4}

Studies have also found a trend towards increased risk of COPD with passive smoking. Other types of smoking, such as pipe, cigar, water pipe, and marijuana increase the risk of COPD compared to non-smokers.

\textbf{Occupational exposure}

Exposure to dust, such as silica dust and grain and flour dust, chemicals, such as isocyanates, noxious gases, and particles has been linked to the development of COPD.\textsuperscript{3} It has been suggested that 20 percent of diagnosed cases of COPD can be attributed to occupational exposure, and in lifelong non-smokers this increases to 30 percent.\textsuperscript{2,3}

\textbf{Other factors}

There is some evidence to suggest air pollution can contribute to the development of COPD, although this is not conclusive.

There is also a potential genetic influence; less than one percent of those with COPD are deficient in alpha-1-antitrypsin, a protease enzyme inhibitor that protects lung tissue. Although this is the only documented
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genetic risk factor, there seems to be an increased familial risk in smokers who have siblings with severe COPD, meaning that there is likely to be a genetic influence in those who develop the disease.²,³

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Pathophysiology (mechanism of disease)

If you would like information on the pathology, pathogenesis, and pathophysiology of COPD then access the following British Medical Journal practice article, Pathology, pathogenesis, and pathophysiology.

The following Proceedings of the American Thoracic Society article focuses specifically on the pathophysiology of exacerbations: Pathophysiology of exacerbations of chronic obstructive pulmonary disease.

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Prognosis and complications

Although the mortality rate for COPD is difficult to quantify as many people die with the disease, we do know that about five percent of all deaths in the UK are due to COPD; this equates to around 30,000 people per year.

The inpatient mortality rate for people who are admitted to hospital for an exacerbation of COPD is around 3 to 4 percent, or 11 to 24 percent for those requiring intensive care unit treatment.

Complications include reduced quality of life due to breathlessness, depression and anxiety, cor pulmonale (right heart failure secondary to lung disease), type 2 respiratory failure due to increased airway resistance, and lung cancer.³

The majority of COPD exacerbations are due to infection. If a chest infection or pneumonia is diagnosed, NICE recommends initial empirical treatment should be an aminopenicillin (eg, amoxicillin), a macrolide (eg, clarithromycin/erythromycin), or a tetracycline (eg, doxycycline).¹⁰

For more information about the management of exacerbations of COPD visit the following NICE pathway, Managing exacerbations of COPD.

During an acute exacerbation, a serious complication that can arise is respiratory failure. Should you wish to learn more about respiratory failure in general, the following video offers an introduction to this, the differences between type 1 and 2 respiratory failure, and the associated arterial blood gas changes:

Respiratory Failure
It is important to recognise that in patients with COPD, as mentioned in the above video, their respiratory drive is driven by oxygen levels. Watch the following video to learn more about this mechanism:

**Hypoxia 22, Carbon dioxide retainers**

For more information about interpretation of blood gases, watch the following video:

**Arterial blood gas interpretation (in 3 easy steps)**

To learn more about how to manage respiratory failure in COPD, access the *International Journal of Chronic Obstruct Pulmonary Disease* article, *Treatment of respiratory failure in COPD*.

**Diagnosis/detection**

There is no single diagnostic test for COPD.³ To learn more about the diagnosis and assessment of COPD, access the following NICE clinical knowledge summary (CKS), *Chronic obstructive pulmonary disease. Diagnosis*.

**Pharmacological treatment**

Until recently, because the NICE guidance for the management of COPD was so out of date, the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidance was broadly adopted using the ABCD
assessments. NICE updated their guidelines in December 2019, and so these have now been broadly adopted.

There is an easy to follow flowchart that NICE have produced, *Chronic obstructive pulmonary disease in over 16s: non-pharmacological management and use of inhaled therapies.*

For a patient newly diagnosed with COPD (without asthma features, for instance steroid responsiveness, elevated eosinophil counts, previous diagnosis of asthma or atopy or variation in airflow), the first-line therapy is a long-acting beta-2 agonist and long-acting muscarinic antagonist (LABA/LAMA) combination. This differs from GOLD, as they suggest single bronchodilators until the severity of the COPD increases to include breathlessness and exacerbation frequency (GOLD group D).

Note that if a LAMA is introduced, a short-acting muscarinic antagonist (SAMA) should be discontinued, whereas a short-acting beta-2 agonist (SABA) may be continued with other combinations of inhalers. In practice, LABA/LAMA combination inhalers are now commonly being offered as a first therapy to maximise the symptom control for those with COPD for as long as possible and reduce exacerbation rates from the outset. This is also a cost-effective option when considering the cost of a LAMA inhaler such as tiotropium and the cost of a LAMA/LABA combination inhaler which is often cheaper. This approach also reduces the switching of devices and inhalers whilst stepping up and, although at this point a review is required, there is likely to be less alteration of therapy at this review.

If the patient continues to experience day-to-day symptoms after LABA/LAMA initiation, then the advice is to step up for three months to triple therapy (after checking technique and adherence), with a view to reducing back to a LABA/LAMA if no improvement.

If the patient has 1 severe (hospitalisation) or 2 moderate exacerbations on LABA/LAMA in the space of 12 months, then escalate to triple therapy and explore further treatment options if they still experience symptoms.

For patients with asthmatic features or evidence of steroid responsiveness, first-line treatment is with an inhaled corticosteroid (ICS)/LABA, with a step up to triple therapy if they still have symptoms that affect day-to-day activities or if they have 1 severe or 2 moderate exacerbations in 12 months.

Devices for each of these treatments vary and are operated in a variety of ways. Patient preference and ability to use each device should be considered paramount. Additional devices such as spacers may be useful and nebulisers may be initiated by specialists. However, nebulisers should be discouraged as they limit people’s activities, as well as introducing issues surrounding the logistics of maintaining nebuliser equipment. With the advent of the newer bronchodilators, there should be limited need for nebulisers to be recommended.

Other pharmacological treatment options for COPD include the following (although the evidence for these therapies is of variable quality):

- short-term antibiotics for acute exacerbations
- short-term oral corticosteroids (to reduce airway inflammation) for acute exacerbations
- theophylline or aminophylline to encourage bronchodilation to improve lung function, or to act as a steroid-sparing agent (although their use is not favoured due to the limited evidence of benefit and the toxicity risks)
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- mucolytics to reduce the viscosity of the respiratory mucus and reduce exacerbation frequency
- anxiolytics (roflumilast in ex-smokers) and antidepressants for the management of depression and anxiety associated with COPD.³

Long-term oral corticosteroids may be initiated by respiratory specialists although they are not usually recommended³. Long-term prophylactic macrolide use, eg, azithromycin, is occasionally used in select high-risk patients and studies have shown that this may reduce exacerbation rates¹¹. It should be noted that oral corticosteroids in COPD have been linked with increased risk of sepsis¹² and NICE lists long-term steroid use as a risk factor for the development of sepsis.¹³

A respiratory specialist would be able to assess the need for oxygen, and potentially long-term oxygen therapy (LTOT), which may also be prescribed.³ Note that it is recommended that oxygen should be regarded as a drug.¹⁴ For more information about LTOT, access the British Thoracic Society (BTS) guideline for home oxygen use in the Thorax article BTS Guidelines for Home Oxygen Use in Adults.

For further information about the recommended pharmacological therapies and appropriate monitoring, access the following guidance documents:

- GOLD's Pocket guide to COPD diagnosis, management, and prevention: A guide for healthcare professionals.
- NICE CKS, Chronic obstructive pulmonary disease.
- NICE guideline Chronic obstructive pulmonary disease in over 16s: diagnosis and management [NG115].

Vaccination against pneumococcal disease (causing pneumococcal pneumonia) and influenza is recommended for those with COPD¹⁵,¹⁶. For more information on pneumococcal vaccinations, visit the NICE CKS Immunizations – pneumococcal and for more information on influenza vaccinations, visit the NICE CKS Immunizations - seasonal influenza.

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Non-pharmacological treatment

Smoking cessation
In current smokers, smoking cessation is the most effective treatment for COPD.¹

Non-invasive ventilation
This is often only offered during acute type 2 respiratory failure, although on occasion, pressurised air administered by a mask or nasal cannula can help to support breathing, especially at night. This can help to improve oxygen saturations¹. More information can be found in the BTS guideline Non-invasive ventilation in acute respiratory failure.

Breathing control techniques
Techniques can be used to help reduce breathlessness. Information on these different techniques can be found on the British Lung Foundation’s Breathing control techniques page.

Pulmonary rehabilitation
This is a specialised programme focusing on physical exercise training, education, dietary advice, and psychological and emotional support.²
Visit the following NHS Choices page on *Pulmonary rehabilitation* and watch the embedded video to learn more about pulmonary rehabilitation.

More information about pulmonary rehabilitation can be found on the British Lung Foundation’s page *Pulmonary rehabilitation or PR*.

**Lung surgery**
Surgery would only usually be considered for a small number of people. Surgeries include bullectomy (removal of an air pocket), lung volume reduction surgery (removal of a damaged section of lung) and lung transplant.²

**Multidisciplinary team support**
Physiotherapy can be beneficial for a person with excessive sputum³. Referral to a dietetic service should be considered for those who have a body mass index (BMI) less than 20 kg/m² or more than 25 kg/m².³ Other services which should be considered include occupational therapy and psychosocial services.

**Patient support**
The British Lung Foundation has a page dedicated to supporting people with COPD, *COPD (chronic obstructive pulmonary disease)*.

NHS Choices also has a dedicated COPD page, *Chronic obstructive pulmonary disease (COPD)*.

To learn more about one project that supports COPD patients, visit the Eden Project *Healthy walking group* information page and watch the following video: *Healthy walking club at the Eden Project*

Further resources
NICE quality standard *Chronic obstructive pulmonary disease in adults (QS10)* covers the assessment, diagnosis and management of COPD.

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Information on Asthma-COPD Overlap (ACOS) can be found in the following GOLD document, *Diagnosis of Diseases of Chronic Airflow Limitation: Asthma, COPD and Asthma- COPD Overlap Syndrome (ACOS)*.

If you would like to look at the evidence relating to the use of LABA/LAMA therapy compared to LABA/ICS therapy and the withdrawal of ICS, then access the following articles in *The New England Journal of Medicine*:

- Indacaterol-glycopyrokonium versus salmeterol-fluticasone for COPD.
- Withdrawal of inhaled glucocorticoids and exacerbations of COPD.

If you would like to look at the evidence for the triple inhalers access the following:


CPPE has the following resources to support your COPD learning:

**COPD - Consulting with the avatar patient** e-learning.
This programme has been developed in collaboration with Keele University and NHS Education for Scotland. Consulting with James, the interactive avatar patient gives you the opportunity to take your patient-centred consultation skills on a test drive in a safe environment and check your knowledge and shared decisions around medicines for COPD.

**COPD and asthma medication reviews** workshop.
This study day supports you to conduct medication reviews with patients who have asthma and COPD, and take action to reduce disease burden, improve quality of life and reduce risk of hospital admission.

**Inhaler technique for health professionals: getting it right** e-learning.
In this e-learning programme we explore the reasons why we need to improve how we help patients with their inhaler devices. We look at how the devices work and why making simple changes when we are counselling patients could improve outcomes for both the patient and the health professional.

CPPE’s *Smoking* gateway page is a collection of content relating to smoking cessation.
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