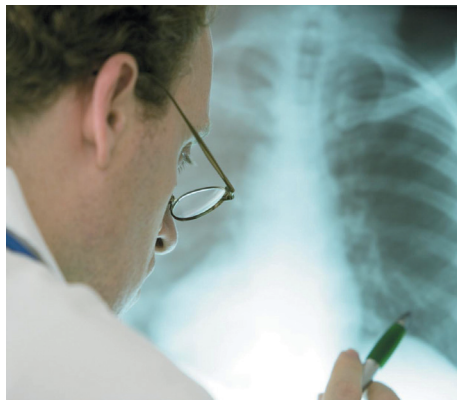


Chronic Obstructive Pulmonary Disease (COPD) Backgrounder

What is the prevalence and incidence of COPD?

COPD affects up to 210 million people worldwide⁴ and is the third leading cause of death worldwide¹, accounting for nearly 6% of all deaths⁵. Almost 27 million people, or 8% of the population are affected by COPD in the United States⁶. In Europe, 3–6% of adults are estimated to be affected⁷. According to the World Health Organization (WHO), total deaths from COPD are projected to increase by more than 30% over the next 10 years unless urgent action is taken to reduce the risk factors⁸.



What causes COPD?

Smoking is the primary cause of COPD¹, with female smokers 13 times and male smokers 12 times more likely to die from COPD than non-smokers⁹. However, smoking is not the only cause of COPD and in some parts of the world it may not even be the major cause¹. Exposure to second-hand smoke or other indoor or outdoor pollutants can increase a person's chance of developing COPD¹. Some people with COPD have worked for many years in places that are very dusty or smoky, and the American Thoracic Society (ATS) has concluded that occupational exposure accounts for 10–20% of either symptoms or functional impairment consistent with COPD¹.

Who is at risk of COPD?

The prevalence of COPD in women has increased over the last two decades although worldwide it remains higher in men than women¹⁰. This is because of increased tobacco use among women and the higher risk of exposure to indoor air pollution (such as solid fuel used for cooking and heating)⁸. Some people with COPD have lived in homes filled with fumes from cooking stoves or fumes from heaters used to warm the home. In addition, COPD is often considered to be a disease of later years, but estimates suggest that 50% of those with COPD are now less than 65 years old, resulting in increases in absenteeism, premature retirement¹¹ and reductions in workforce participation^{11,12}.

What is COPD?

Chronic obstructive pulmonary disease (COPD) is a progressive, life-threatening disease that makes it hard to breathe, with symptoms that have a destructive impact on patients' function and quality of life (QoL)^{1,2}. COPD is associated with tobacco smoking, air pollution or occupational exposure, which causes obstruction of airflow in the lungs resulting in shortness of breath¹. Over time, the disease causes patients to become less active³.

What are the symptoms of COPD?

The most common symptoms of COPD are shortness of breath, abnormal sputum (a mix of saliva and mucus in the airway), a chronic cough, wheezing and chest tightness¹. Daily activities, such as walking up a short flight of stairs, can become very difficult as the condition gradually worsens⁸.

Many patients report morning as being the worst time of day for experiencing COPD symptoms^{13–16} with almost half of patients with COPD experiencing shortness of breath in the morning¹². Many patients say shortness of breath contributes to their morning routine taking longer to complete than it used to, affecting getting up, showering and getting dressed^{13,16}.

In addition, many COPD patients have other existing health conditions that further impair their functional capacity and quality of life¹⁷. The most common comorbidities include ischemic heart disease, diabetes, skeletal muscle wasting, cachexia, osteoporosis, depression and lung cancer¹⁷.

What are COPD exacerbations?

An exacerbation (or flare-up) of COPD is an acute event characterized by a worsening of the patient's respiratory symptoms that is beyond day-to-day variations and leads to a change in medication¹. Exacerbations of COPD can be precipitated by several factors. The most common causes appear to be viral upper respiratory tract infections and infection of the tracheobronchial tree¹.

Exacerbations are a significant contributor to shortness of breath, and increase the rate of disease progression as well as increase deterioration in health status and risk of death¹⁸. They are also often very frightening for patients¹⁹. According to the ECLIPSE study, each exacerbation experience by a patient contributes to an additional FEV₁ (lung function) decline of 2 mL to 3 mL per year²⁰.

Exacerbations are also associated with significant mortality and high socioeconomic costs (particularly because of the frequent need for hospitalization)¹. Prevention of exacerbations is therefore a key goal of COPD management¹.

How is COPD diagnosed?

COPD can be diagnosed by a simple test called spirometry that measures how much air a person can inhale and exhale, and how fast air can be breathed out. Most people with COPD are not diagnosed until the disease is well advanced and 60-85% of mild to moderate COPD patients are thought to remain undiagnosed²¹. Around 25% of adults aged 40 years and older have mild airflow obstruction²¹, and 1 in 10 has moderate COPD or worse²¹. Physicians may consider COPD and perform spirometry if any of these indicators are present in someone over the age of 40¹:

- Chronic cough
- Phlegm production
- Shortness of breath that worsens over time, is worse with exercise and is present every day
- History of exposure to tobacco smoke, occupational dusts and chemicals, smoke from home cooking or heating fuels

However, COPD is often under-diagnosed because patients are not properly tested to detect the disease²². Since patients may attribute symptoms to their smoking habit or aging, they do not seek help and remain undiagnosed until they experience serious worsening of their condition. Delayed diagnosis results in patients suffering symptoms and limitations that could otherwise be alleviated by treatment as well as missing the potential opportunity to slow the progress of the disease²³. This contributes to the fact that at diagnosis, up to 50% of lung function may already have been lost²⁴.

What are the guidelines for COPD management?

In 2011, the *Global Initiative for Chronic Obstructive Lung Disease* (GOLD) released their Strategy for the Diagnosis, Management and Prevention of COPD, with the latest evidence for best practice¹. Further updates took place in 2013, 2014 and 2015.

According to the recommendations, effective management should be based on an individualized assessment of the patient in order to:

- Reduce current symptoms (relieve symptoms, improve exercise tolerance, improve health status)
- Reduce future risk (prevent disease progression, prevent/treat exacerbations, reduce mortality)

GOLD encourages physicians to assess patients against these two criteria in order to select the optimum treatment to manage their condition. GOLD classifies patients into four groups (see table below).

What are the main treatments for COPD?

According to GOLD, bronchodilators are central to COPD treatment and are recommended for all types of COPD patients¹.

Bronchodilators work by relaxing and opening air passages in the lungs. Most bronchodilators are inhaled through an inhaler device. Depending on the severity of the disease, either short-acting or long-acting inhaled bronchodilators may be prescribed.

Inhaled short-acting bronchodilators work quickly (within five minutes), and last from four to six hours²⁵. They help to decrease shortness of breath and are sometimes described as rescue medications.

Inhaled long-acting bronchodilators are used regularly to open the airways and keep them open for up to 24 hours with once daily dosing and

12 hours with twice daily dosing. There are two main types of long-acting bronchodilators:

- Long-acting beta₂-agonists (LABAs) which act on the beta₂-adrenergic receptor, causing smooth muscle relaxation and dilation of the bronchial passages
- Long-acting anticholinergics which work by inhibiting muscarinic receptors in the bronchial airways, which leads to muscle relaxation and improved lung function (also seen with LABAs)
- Bronchodilators are available as single (LABA or LAMA) or dual therapies (LABA/LAMA). They can also be used in combination with inhaled corticosteroids

Inhaled corticosteroids (ICS) are recommended for patients at high risk of COPD exacerbations. Regular treatment with inhaled corticosteroids may decrease the frequency of exacerbations in COPD patients with an FEV₁ <60%¹.

Group	Risk and symptoms	Recommended first choice treatment	Alternative choice treatment
Group A	Patients have lower risk of exacerbations and lower levels of symptoms	SABA or SAMA (as required basis)	Long-acting anticholinergic LABA SABA and short-acting anticholinergic
Group B	Patients have lower risk of exacerbations but more symptoms	Long-acting bronchodilators– LABA or long-acting anticholinergic	Long-acting anticholinergic and LABA
Group C	Patients have high risk of exacerbations but experience less symptoms	Inhaled corticosteroids ICS+LABA or long-acting anticholinergic	Long-acting anticholinergic and LABA Long-acting anticholinergic and phosphodiesterase-4 inhibitor LABA and phosphodiesterase-4 inhibitor
Group D	Patients are at high risk of exacerbations and experience more symptoms	ICS+LABA or long-acting anticholinergic	ICS+LABA and long-acting anticholinergic ICS+LABA and phosphodiesterase-4 inhibitor Long-acting anticholinergic and LABA Long-acting anticholinergic and phosphodiesterase-4 inhibitor

Adapted from GOLD 2015¹

COPD treatments may contain either a single medication or a combination of medications in one inhaler, such as a bronchodilator, a corticosteroid, or a combination of bronchodilator and corticosteroid. Fixed dose combinations of different bronchodilators are also currently in development. Additional treatment can include antibiotics, oxygen therapy, pulmonary rehabilitation and surgery. Pneumonia and influenza vaccines should also be given to COPD patients. All COPD patients are advised to live a healthy lifestyle by exercising, avoiding cigarette smoke and other air pollutants.

GOLD strategy versus real-world prescribing

Despite the updated GOLD strategy, pharmacological management of COPD doesn't always follow guidelines²⁶. Current evidence suggests there is widespread use of ICS in the absence of any clear clinical rationale²⁷ and in patients who do not have a history of exacerbations^{28,29}. In addition, implementation of treatment guidelines in primary care is often suboptimal, with bronchodilators often not prescribed in patients in line with GOLD treatment guidelines²⁶.

Inadequate treatment can cause an unnecessary increase in total COPD cost and influence patient outcomes³⁰. If COPD patients are not treated to guidelines, they may not experience the expected improvements in their condition, which can have negative consequences for QoL³⁰ and inappropriate use of ICS increases costs and puts patients at risk of side effects²⁷.

What is the economic and workplace burden of COPD?

Between 20% and 40% of people with COPD are likely to retire prematurely due to their disease, which results in average lifetime earnings losses of \$316,000 (£200,000) per individual¹¹ and thereby incurring increased healthcare utilization costs, reducing their personal tax and pension contributions, and increasing disability allowance costs to governments.

Beyond the individual patient, COPD also puts a major burden on society. WHO estimates that globally, COPD results in annual loss of productivity of 27,700 years (measured by disability adjusted life years – DALYs)¹¹. In the EU, total direct costs of respiratory disease are estimated to be about 6% of total healthcare budget, with COPD accounting for 56% of this cost (38.6 billion Euros)¹.

References

- Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease. Updated 2015. http://www.goldcopd.org/uploads/users/files/GOLD_Report_2015_Apr2.pdf. Last accessed 02 September 2015.
- Joshi M *et al.* Symptom burden in chronic obstructive pulmonary disease and cancer. *Obstructive, occupational and environmental diseases*. 2012;**18**(2).
- Pitta F, Troosters T, Spruit MA, *et al.* Characteristics of Physical Activities in Daily Life. *Am J Respir Crit Care Med* 2005;**171**:972–977. Available at: <http://www.atsjournals.org/doi/pdf/10.1164/rccm.200407-855OC>. Last accessed 02 September 2015.
- Global Alliance Against Chronic Respiratory Diseases (GARD). Global surveillance, prevention and control of chronic respiratory diseases: a comprehensive approach. Available at: http://www.who.int/gard/publications/GARD_Manual/en/. Last accessed 02 September 2015.
- World Health Organization. Chronic Obstructive Pulmonary Disease Factsheet No. 310, Available at: <http://www.who.int/mediacentre/factsheets/fs310/en/index.html>. Last accessed 02 September 2015.
- NIH NHLBI Chartbook 2012. Available at: https://www.nhlbi.nih.gov/files/docs/research/2012_ChartBook_508.pdf. Last accessed 02 September 2015.
- OECD iLibrary. Available at <http://www.oecd-ilibrary.org/sites/9789264183896-en/01/16/index.html?itemId=/content/chapter/9789264183896-19-en>. Last accessed 02 September 2015.
- World Health Organization. Chronic Obstructive Pulmonary Disease Factsheet No. 315, Available at: <http://www.who.int/mediacentre/factsheets/fs315/en/>. Last accessed 01 September 2015.
- American Lung Association. Chronic Obstructive Pulmonary Disease Fact Sheet. February 2010. <http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html>. Last accessed 02 September 2015.
- Aryal S, az-Guzman E, Mannino DM. Influence of sex on chronic obstructive pulmonary disease risk and treatment outcomes. *Int J Chron Obstruct Pulmon Dis* 2014;**9**: 1145-1154.
- Fletcher MJ *et al.* COPD Uncovered: An International survey on the impact of chronic obstructive pulmonary disease (COPD) on a working age population. *BMC Public Health* 2011;**11**:612.
- daCosta M *et al.* The burden of chronic obstructive pulmonary disease among employed adults. *Int J Chron Obstruct Pulmon Dis* 2012;**7**:211-219. Published online 2012 March 19. doi: 10.2147/COPD.S29280. Last accessed 1 July 2013.
- Partridge MR, Karlsson N, Small IJ. Patient insight into the impact of chronic obstructive pulmonary disease in the morning: an internet survey. *Curr Med Res Opin* 2012;**28**(8):1405.
- Barnett M. Chronic obstructive pulmonary disease: a phenomenological study of patients' experiences. *J Clin Nurs*. 2005;**14**(7):805-812.
- Small S *et al.* Impact of morning symptoms experienced by COPD patients on exacerbation risk, rescue inhaler usage and normal daily activities. ERS 2012, Poster session. P3476.
- Kessler R *et al.* Symptom variability in patients with severe COPD: a pan-European cross-sectional study. *Eur Respir J* 2011;**37**:264-272.
- Barnes PJ. Chronic Obstructive Pulmonary Disease: Effects beyond the lungs. *PLoS Med* 2010;**7**(3): e1000220. Doi:10.1371/journal.pmed.1000220. Last accessed 1 July 2013.
- Adams R, Chavannes N, Jones K, Ostergaard MS, Price D. Exacerbations of chronic obstructive pulmonary disease—a patients' perspective. *Prim Care Respir J*. 2006;**15**(2):102-109.
- Vestbo J *et al.* (2012). Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease, GOLD executive summary [published online ahead of print August 9, 2012]. *Am J Respir Crit Care Med*. doi: 10.1164/rccm.201204-0596PP. Last accessed 1 July 2013.
- Vestbo J *et al.* (2011). Changes in forced expiratory volume in 1 second over time in COPD. *New England Journal of Medicine*. 2011;**365**:1184-92.
- Decramer M *et al.* Chronic Obstructive Pulmonary Disease. *Lancet* 2012; **379**:1341-51.
- Tinkelman DG, Price D, Nordyke RJ, Halbert RJ. Misdiagnosis of COPD and asthma in primary care patients 40 years of age and over. *Journal of Asthma* 2006;**43**:1-6.
- Price D, Yawn B, Brusselle G, Rossi A (2012) Risk-to-benefit ratio of inhaled corticosteroids in patients with COPD. *Prim Care Respir J* ONLINE FIRST. <http://dx.doi.org/10.4104/pcri.2012.00092>. Last accessed 02 September 2015.
- Doherty D, *et al.* Chronic obstructive pulmonary disease: consensus recommendations for early diagnosis and treatment. *Journal of Family Practice*. November 2006.
- American Thoracic Society. What are beta-agonists? <http://www.thoracic.org/clinical/copd-guidelines/for-patients/what-kind-of-medications-are-there-for-copd/what-are-beta-agonists.php>. Last accessed 02 September 2015.
- Jones R, Østrem A. Optimising pharmacological maintenance treatment for COPD in primary care. *Primary Care Respiratory Journal* 2011;**20**(1):33-45.
- Lucas AEM, Smeenk FWJM, Smelee IJ, van Schayck CP. Overtreatment with inhaled corticosteroids and diagnostic problems in primary care patients, an exploratory study. *Family Practice* 2008;**25**:86-91.
- Thomas M, Stonham C, Marshall S. Inappropriate overuse of inhaled corticosteroids in patients with moderate COPD in UK primary care. ERS 2011. Tuesday 27 September 2011; 471 Disease management in specific primary care populations; P4623.
- Small S, Broomfield, S, Higgins V. Quantification and treatment patterns of real-world patients classified by the GOLD 2011 strategy. ERS 2012, Abstract number 853371.
- Miguel-Diez J *et al.* Inappropriate use of Inhaled Corticosteroids for COPD Patients: Impact on Health Costs and Health Status. *Lung* 2011;**189**:199-206.