Treatment of Stable Chronic Obstructive Pulmonary Disease: the GOLD Guidelines

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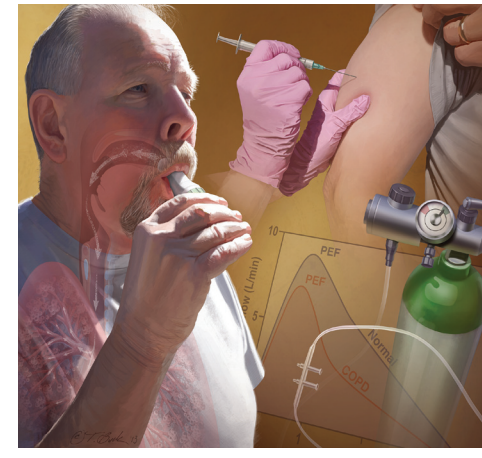
Chronic obstructive pulmonary disease (COPD) is a common problem in primary care. COPD is diagnosed with spirometry only in clinically stable patients with a postbronchodilator forced expiratory volume in one second/forced vital capacity ratio of less than 0.70. All patients with COPD who smoke should be counseled about smoking cessation. Influenza and pneumococcal vaccinations are recommended for all patients with COPD. The Global Initiative for Chronic Obstructive Lung Disease assigns patients with COPD into four groups based on the degree of airflow restriction, symptom score, and number of exacerbations in one year. Pulmonary rehabilitation is recommended for patients in groups B, C, and D. Those in group A should receive a short-acting anticholinergic or short-acting beta$_2$ agonist for mild intermittent symptoms. For patients in group B, long-acting anticholinergics or long-acting beta$_2$ agonists should be added. Patients in group C or D are at high risk of exacerbations and should receive a long-acting anticholinergic or a combination of an inhaled corticosteroid and a long-acting beta$_2$ agonist. For patients whose symptoms are not controlled with one of these regimens, triple therapy with an inhaled corticosteroid, long-acting beta$_2$ agonist, and anticholinergic should be considered. Prophylactic antibiotics and oral corticosteroids are not recommended for prevention of COPD exacerbations. Continuous oxygen therapy improves mortality rates in patients with severe hypoxemia and COPD. Lung volume reduction surgery can improve survival rates in patients with severe, upper lobe–predominant COPD with heterogeneous emphysema distribution. (*Am Fam Physician.* 2013;88(10):655-663. Copyright © 2013 American Academy of Family Physicians.)



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▶ **See related editorial on page 650.**

▶ **Patient Information:** A handout on this topic is available at http://familydoctor.org/familydoctor/en/diseases-conditions/chronic-obstructive-pulmonary-disease/treatment.html.

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Chronic obstructive pulmonary disease (COPD) is a common problem in primary care. The estimated prevalence is 6.3% (15 million persons) in the United States,[1] with more than 126,000 deaths each year.[2] COPD treatments aim to improve quality of life and control symptoms while reducing exacerbation risk, which can lead to increased morbidity and mortality.

This article summarizes expert consensus guidelines from the Global Initiative for Chronic Obstructive Lung Disease (GOLD) for nonpharmacologic and pharmacologic interventions for patients with stable COPD.[3] The GOLD guidelines are widely used in the management of COPD. (Disclosure: the GOLD program is funded by pharmaceutical companies that make medications for COPD, and the board of directors, committee members, and reviewers have ties to the pharmaceutical industry. See http://www.goldcopd.org/disclosure-statements.html.)

Although some of the GOLD recommendations are derived from outcome-oriented evidence, the guidelines have not been shown to provide better clinical outcomes than other guidelines on COPD management, such as those from the National Institute for Health and Care Excellence[4] or the joint guidelines from the American College of Physicians, American College of Chest Physicians, American Thoracic Society, and European Respiratory Society.[5] A comparison of treatment guidelines is shown in *Table 1*.[3-5] The joint guideline from the American College of Physicians uses the forced expiratory volume in one second (FEV_1) to guide treatment

SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	*Evidence rating*	*References*
Suspected COPD should be confirmed by spirometry in stable patients with a postbronchodilator forced expiratory volume in one second/forced vital capacity ratio of less than 0.70.	C	3
Smoking cessation is recommended for all patients with COPD who smoke.	C	14, 15
Patients in GOLD group A should be treated with a short-acting anticholinergic or short-acting beta$_2$ agonist on an as-needed basis.	A	19-21
Patients in GOLD group B should be treated with a long-acting anticholinergic or long-acting beta$_2$ agonist.	A	22-29
Patients in GOLD group C or D should be treated with a long-acting anticholinergic or a combination of an inhaled corticosteroid and long-acting beta$_2$ agonist.	B	3, 24, 28, 34, 37, 38
Long-term oxygen therapy improves mortality rates in patients with severe hypoxemia and COPD.	A	42, 43

COPD = chronic obstructive pulmonary disease; GOLD = Global Initiative for Chronic Obstructive Lung Disease.

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to http://www.aafp.org/afpsort.

Table 1. Comparison of Recommendations for Treatment of Chronic Obstructive Pulmonary Disease

American College of Physicians/American College of Chest Physicians/American Thoracic Society/European Respiratory Society guideline[5]

FEV_1 = 60% to 80% predicted: inhaled bronchodilators may be used

FEV_1 < 60% predicted: long-acting anticholinergic or long-acting beta$_2$ agonist recommended; combination therapy may be used (long-acting anticholinergic, long-acting beta$_2$ agonist, or inhaled corticosteroid)

Global Initiative for Chronic Obstructive Lung Disease guideline[3]

Patient group A*: short-acting anticholinergic or short-acting beta$_2$ agonist as needed

Patient group B*: long-acting anticholinergic or long-acting beta$_2$ agonist

Patient group C or D*: long-acting anticholinergic or combination of long-acting beta$_2$ agonist plus inhaled corticosteroid

National Institute for Health and Care Excellence guideline[4]

Patients with breathlessness and exercise limitation: short-acting beta$_2$ agonist or short-acting anticholinergic as needed

Patients with persistent breathlessness *and* exacerbations despite therapy above:

- $FEV_1 \geq 50\%$ predicted: long-acting anticholinergic or long-acting beta$_2$ agonist
- $FEV_1 < 50\%$ predicted: long-acting anticholinergic or combination of long-acting beta$_2$ agonist and inhaled corticosteroid

Patients with persistent breathlessness *or* exacerbations despite therapy above:

- $FEV_1 \geq 50\%$ predicted: long-acting beta$_2$ agonist plus inhaled corticosteroid, or combination of long-acting anticholinergic, long-acting beta$_2$ agonist, and inhaled corticosteroid
- $FEV_1 < 50\%$ predicted: long-acting anticholinergic, long-acting beta$_2$ agonist, and inhaled corticosteroid

FEV_1 = forced expiratory volume in one second.

**—See Figure 1 for definition of patient groups.*

Information from references 3 through 5.

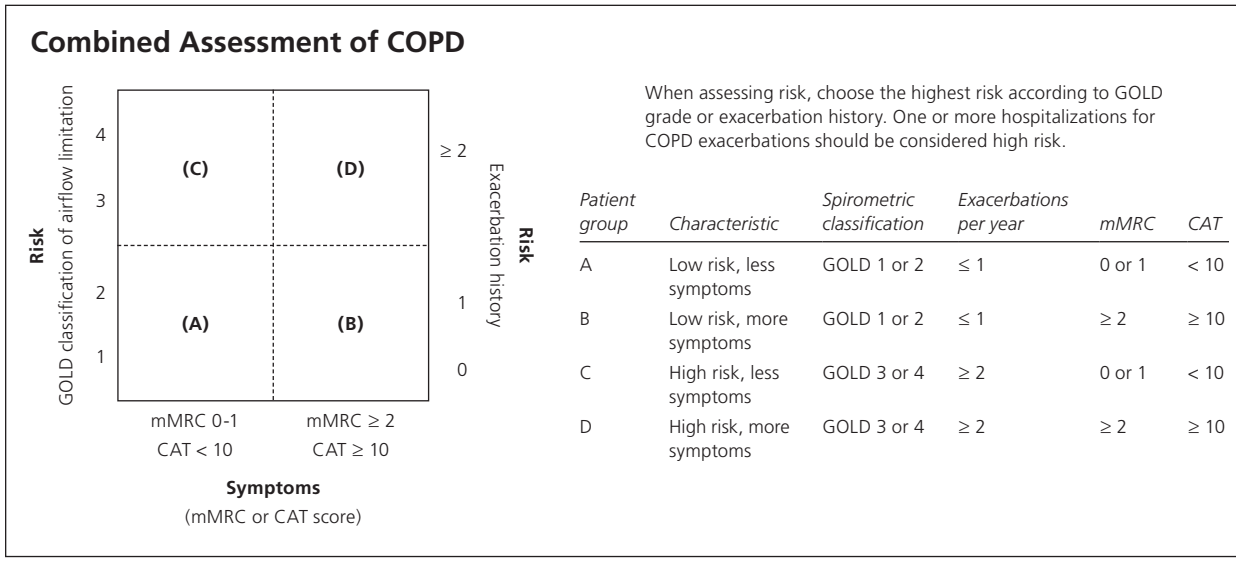
decisions, whereas the National Institute for Health and Care Excellence guideline focuses on symptoms of breathlessness and exacerbations. The GOLD guideline combines the subjective and objective components of COPD to classify severity and guide treatment recommendations.

Diagnosis

A diagnosis of COPD should be considered in patients with progressive dyspnea, chronic cough, or increased sputum production with risk factors (e.g., smoking). COPD can be diagnosed with spirometry only in stable patients (i.e., those not experiencing an acute exacerbation of symptoms) with a postbronchodilator FEV_1/forced vital capacity ratio of less than 0.70.[3] The diagnosis of COPD and interpretation of spirometry results have been reviewed previously.[6,7]

Assessment

GOLD classifies persons with COPD into four groups based on the severity of disease, as assessed by the following criteria: the degree of airflow restriction, a patient symptom score, and the number of exacerbations in one year *(Figure 1)*.[8] This grading system uses objective spirometry data and subjective symptoms because the degree of airflow restriction does not always correlate well with symptoms.[9] The degree of airflow restriction is graded as mild, moderate, severe, or very severe *(Table 2)*.[8] Persons with mild or moderate airflow restriction are assigned to group



When assessing risk, choose the highest risk according to GOLD grade or exacerbation history. One or more hospitalizations for COPD exacerbations should be considered high risk.

Patient group	*Characteristic*	*Spirometric classification*	*Exacerbations per year*	*mMRC*	*CAT*
A	Low risk, less symptoms	GOLD 1 or 2	≤ 1	0 or 1	< 10
B	Low risk, more symptoms	GOLD 1 or 2	≤ 1	≥ 2	≥ 10
C	High risk, less symptoms	GOLD 3 or 4	≥ 2	0 or 1	< 10
D	High risk, more symptoms	GOLD 3 or 4	≥ 2	≥ 2	≥ 10

Figure 1. Combined assessment of COPD. (CAT = COPD Assessment Test; COPD = chronic obstructive pulmonary disease; GOLD = Global Initiative for Chronic Obstructive Lung Disease; mMRC = modified Medical Research Council Dyspnea Scale.)

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A or B, whereas those with severe or very severe airflow restriction are assigned to group C or D.

COPD symptoms are assessed subjectively using one of two validated patient symptom questionnaires.[10] Because FEV_1 does not necessarily correlate with patient symptoms, and because improvement of a patient's health status and reduction in symptoms are the goals of treatment, the inclusion of symptom questionnaires allows for the diagnostic assessment to match treatment goals, similar to the guidelines from the National Institute for Health and Care Excellence.[3] GOLD recommends the use of the COPD Assessment Test (CAT) or the modified Medical Research Council Dyspnea Scale (mMRC, *Table 3*).[11] The CAT is available at http://www.catestonline.org/ *(eFigure A)*, and the CAT and the mMRC are available in the smartphone app COPD Pocket Consultant Guide (http://bit.ly/1aTrkIs). Patients with a CAT score less than 10 or an mMRC score of 0 or 1 are assigned to group A or C. Those with a CAT score of 10 or more or an mMRC score of 2 or more are assigned to group B or D.

The third component used to determine the GOLD group is the number of COPD exacerbations in one year. GOLD defines an exacerbation as an acute event characterized by worsening of respiratory symptoms beyond normal day-to-day variations that leads to a change in medication.[3] Exacerbations are associated with higher mortality.[12,13] Patients with no or one exacerbation per year are assigned to group A or B, and those with two or more are assigned to group C or D. If there is a discrepancy when all three components are considered, the patient should be assigned to the higher-risk group.

Patients with COPD should be reassessed every two to three months. Symptom questionnaires (e.g., CAT, mMRC), smoking cessation (if applicable), and exacerbation history should be reviewed. Repeat spirometry is recommended on a yearly basis.[3]

Table 2. Classification of Severity of Airflow Limitation in Chronic Obstructive Pulmonary Disease*

In patients with $FEV_1/FVC < 0.70$:

- GOLD 1 (mild): $FEV_1 \geq 80\%$ predicted
- GOLD 2 (moderate): $50\% \leq FEV_1 < 80\%$ predicted
- GOLD 3 (severe): $30\% \leq FEV_1 < 50\%$ predicted
- GOLD 4 (very severe): $FEV_1 < 30\%$ predicted

FEV_1 = forced expiratory volume in one second; FVC = forced vital capacity; GOLD = Global Initiative for Chronic Obstructive Lung Disease.

**—Based on postbronchodilator FEV_1.*

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Treatment

COPD treatment is guided by the patient group assignment. As disease severity increases, long-acting inhalers and combination therapies are added to provide additional symptom control and reduce the risk of exacerbations.

SMOKING CESSATION

Patients who smoke should be assisted with smoking cessation through counseling and effective medications.[14,15] The American Academy of Family Physicians' Ask and Act Tobacco Cessation Program provides online resources for physicians and patients (http://bit.ly/1fV71eZ).

IMMUNIZATIONS

Influenza vaccination reduces COPD exacerbations and is recommended yearly.[16] The Centers for Disease Control and Prevention recommends pneumococcal vaccination for all adults 19 years and older who have chronic lung disease, including COPD. However, a meta-analysis of seven studies did not show a decrease in pneumonia rates, hospital admissions, or emergency department visits in patients with COPD who received the pneumococcal vaccine.[17]

PULMONARY REHABILITATION

Pulmonary rehabilitation has been shown to improve exercise tolerance, reduce dyspnea, and improve health-related quality of life in patients similar to those in GOLD groups B through D.[18]

INHALED MEDICATIONS

For patients in group A, a short-acting anticholinergic (e.g., ipratropium [Atrovent HFA]) or short-acting $beta_2$ agonist (e.g., albuterol, levalbuterol [Xopenex HFA], pirbuterol [Maxair Autohaler]) is recommended on an as-needed basis for mild intermittent symptoms. A meta-analysis of 13 studies found that short-acting $beta_2$ agonists improved lung function, dyspnea, and fatigue, and decreased breathlessness compared with placebo.[19] A 2006 Cochrane review that included 3,912 patients showed a small benefit in quality of life and lung function in those receiving ipratropium compared with albuterol.[20] Combination therapy with scheduled albuterol and ipratropium has been shown to increase FEV_1 but does not affect patient symptom scores.[21] It is not known if as-needed dosing is more or less effective than scheduled administration.

For patients in group B, long-acting inhaled medications should be used. Options include long-acting anticholinergics (e.g., tiotropium [Spiriva], aclidinium [Tudorza Pressair]) or long-acting $beta_2$ agonists (e.g., arformoterol [Brovana], formoterol [Foradil], indacaterol [Arcapta], salmeterol [Serevent Diskus]). Tiotropium has been shown to improve quality-of-life scores, with a number needed to treat of 14 to prevent one exacerbation and 30 to prevent one hospitalization over one year.[22] If tiotropium is prescribed, patients should be switched from ipratropium or ipratropium/albuterol (Combivent) to albuterol alone as short-acting rescue medication.

Long-acting $beta_2$ agonists reduce exacerbation risk and improve FEV_1 and daily symptom scores.[23] A randomized, double-blind trial of 6,112 patients with moderate to severe COPD showed that salmeterol improved FEV_1 and decreased exacerbation risk, but did not reduce mortality.[24] Indacaterol is a once-daily long-acting $beta_2$ agonist that improves FEV_1 and reduces rescue use of albuterol.[25] In patients with comorbid asthma or an unclear diagnosis, monotherapy with a long-acting $beta_2$ agonist is contraindicated because it may increase cardiovascular mortality.[26]

Tiotropium reduces exacerbations and COPD-related hospitalizations compared with long-acting $beta_2$ agonists, but does not affect mortality.[27] For patients whose symptoms are not controlled with tiotropium or a long-acting $beta_2$ agonist alone, a combination of tiotropium and a long-acting $beta_2$ agonist is recommended based on short-term outcomes of improved symptom scores and higher FEV_1.[28,29]

A 2008 meta-analysis found an association between the use of inhaled anticholinergics (ipratropium and tiotropium) and cardiovascular mortality in patients

Table 3. Modified Medical Research Council Dyspnea Scale

Score	*Description of breathlessness*
0	I get breathless only with strenuous exercise.
1	I get short of breath when hurrying on level ground or walking up a slight hill.
2	On level ground, I walk slower than other people my age because of breathlessness, or I have to stop for breath when walking at my own pace.
3	I stop for breath after walking about 100 yards or after a few minutes on level ground.
4	I am too breathless to leave the house, or I am breathless when dressing.

Information from reference 11.

Table 4. Initial Pharmacologic Management of Chronic Obstructive Pulmonary Disease

*Patient group**	*First choice*	*Second choice*	*Alternatives*
A	Short-acting anticholinergic as needed (e.g., ipratropium [Atrovent HFA]) *or* Short-acting beta$_2$ agonist (e.g., albuterol) as needed	Long-acting anticholinergic (e.g., tiotropium [Spiriva]) *or* Long-acting beta$_2$ agonist (e.g., salmeterol [Serevent Diskus]) *or* Short-acting beta$_2$ agonist and short-acting anticholinergic	Theophylline
B	Long-acting anticholinergic *or* Long-acting beta$_2$ agonist	Long-acting anticholinergic and long-acting beta$_2$ agonist	Short-acting anticholinergic as needed and/or short-acting beta$_2$ agonist as needed Theophylline
C	Inhaled corticosteroid (e.g., fluticasone [Flovent]) and long-acting beta$_2$ agonist *or* Long-acting anticholinergic	Long-acting anticholinergic and long-acting beta$_2$ agonist	Phosphodiesterase-4 inhibitor (e.g., roflumilast [Daliresp]) Short-acting anticholinergic as needed and/or short-acting beta$_2$ agonist as needed Theophylline
D	Inhaled corticosteroid and long-acting beta$_2$ agonist *or* Long-acting anticholinergic	Inhaled corticosteroid and long-acting anticholinergic *or* Inhaled corticosteroid and long-acting beta$_2$ agonist and long-acting anticholinergic *or* Inhaled corticosteroid and long-acting beta$_2$ agonist and phosphodiesterase-4 inhibitor *or* Long-acting anticholinergic and long-acting beta$_2$ agonist *or* Long-acting anticholinergic and phosphodiesterase-4 inhibitor	Short-acting anticholinergic as needed and/or short-acting beta$_2$ agonist as needed Theophylline

**—See Figure 1 for definition of patient groups.*

Information from reference 8.

with COPD.[30] However, a subsequent randomized, double-blind trial with 5,993 patients demonstrated decreased cardiovascular and overall mortality with tiotropium after four years of follow-up.[31] A large cohort study of U.S. veterans showed an increased risk of cardiovascular events with the use of ipratropium in the previous six months.[32] Given this association, ipratropium should be avoided in patients with cardiovascular disease.

Patients in GOLD groups C and D should be prescribed a long-acting anticholinergic or a combination of an inhaled corticosteroid and long-acting beta$_2$ agonist.[3] Compared with tiotropium alone, fluticasone/salmeterol (Advair) improved daily symptom scores and decreased mortality (number needed to treat = 40), but increased the incidence of pneumonia (number needed to harm = 25) and did not change the rate of exacerbations.[33] Patients with poorly controlled symptoms should start triple therapy with an inhaled corticosteroid, long-acting anticholinergic, and long-acting beta$_2$ agonist. The data for triple therapy are inconsistent, with studies showing improvement in lung function and symptom scores but conflicting results regarding reduction in exacerbation rates compared with tiotropium alone.[28,34] A summary of initial treatment options and common medications is presented in *Table 4*[8] *and Table 5*,[35] and patient instructions for inhaler use are reviewed in *eFigure B*.

Table 5. Medications Commonly Used for Treating Chronic Obstructive Pulmonary Disease

Medication	*Dosage*	*Cost**	*Potential adverse effects*
Short-acting anticholinergic			
Ipratropium (Atrovent HFA)	Two puffs every six hours as needed	$236 per inhaler	Anaphylaxis, angioedema, bronchospasm (paradoxical), glaucoma (narrow-angle), hypersensitivity reaction, laryngospasm
Short-acting beta$_2$ agonists			
Albuterol	Two puffs every four to six hours as needed	$33 per inhaler (generic)	Angina, angioedema, arrhythmias, bronchospasm (paradoxical), hypertension, hypokalemia, QT-interval prolongation, seizures
Levalbuterol (Xopenex HFA)	Two puffs every four to six hours as needed	$55 per inhaler	Anaphylaxis, arrhythmias, bronchospasm (paradoxical), hypersensitivity reaction, hypertension, hypokalemia, metabolic acidosis, paresthesia, syncope
Pirbuterol (Maxair Autohaler)	One or two puffs every four to six hours as needed	$450 per inhaler	Arrhythmias, bronchospasm (paradoxical), hypersensitivity reaction, hypertension, hypokalemia, seizures
Long-acting anticholinergics			
Aclidinium (Tudorza Pressair)	One dose twice per day	$237 for 60 doses	Atrioventricular block, bronchospasm (paradoxical), cardiopulmonary arrest, heart failure, hypersensitivity reaction
Tiotropium (Spiriva)	One dose per day	$282 for 30 doses	Angioedema, bronchospasm (paradoxical), glaucoma, hypersensitivity reaction
Long-acting beta$_2$ agonists			
Arformoterol (Brovana)	15 mcg twice per day (nebulizer only)	$249 for 30 vials (15 mcg per vial)	Arrhythmias, bronchospasm (paradoxical), hypersensitivity reaction, hypokalemia, lung cancer
Formoterol (Foradil)	One dose every 12 hours	$200 for 60 doses	Anaphylaxis, arrhythmias, asthma exacerbation, atrial fibrillation, bronchospasm (paradoxical), hypertension, hypokalemia, metabolic acidosis
Indacaterol (Arcapta)	One capsule per day	$187 for 30 capsules	Arrhythmias, bronchospasm (paradoxical), hypersensitivity reaction, hypokalemia, seizure disorder
Salmeterol (Serevent Diskus)	One puff every 12 hours	$205 per inhaler	Anaphylaxis, angioedema, arrhythmias, bronchospasm (paradoxical), fever, glaucoma, hypersensitivity reaction, hypertension, hypokalemia, paresthesia, pelvic inflammatory disease, vasculitis
Inhaled corticosteroids			
Beclomethasone (Qvar, 40 to 80 mcg per puff)	40 to 320 mcg twice per day	$176 per inhaler	Anaphylaxis, angioedema, bronchospasm, hypersensitivity reaction, glaucoma, suicidal ideation
Budesonide (Pulmicort, 90 to 180 mcg per puff)	180 to 360 mcg twice per day	$120 to $135 per inhaler, depending on dosage	Adrenal insufficiency, angioedema, benign intracranial hypertension, bronchospasm, glaucoma, hypersensitivity reaction, hypertension, hypokalemia, leukocytosis
Ciclesonide (Alvesco, 80 to 160 mcg per puff)	80 to 160 mcg twice per day	$188 per inhaler	Angioedema, bronchospasm (paradoxical), elevated liver enzymes, increased intraocular pressure

continued

**—Estimated retail price based on information obtained at http://www.goodrx.com and http://www.drugpriceinfo.com (accessed August 20, 2013).*

Table 5. Medications Commonly Used for Treating Chronic Obstructive Pulmonary Disease *(continued)*

Medication	*Dosage*	*Cost**	*Potential adverse effects*
Inhaled corticosteroids *(continued)*			
Fluticasone (Flovent HFA, 44 to 220 mcg per puff; Flovent Diskus, 100 to 250 mcg per puff)	44 to 500 mcg twice per day	$130 to $275 per inhaler, depending on dosage and delivery system	Anaphylaxis, angioedema, asthma exacerbation, bronchospasm (paradoxical), Churg-Strauss syndrome, fever, hypersensitivity reaction, muscle injury, vasculitis, wheezing
Mometasone (Asmanex, 220 mcg per puff)	One or two puffs per day	$181 per inhaler	Anaphylaxis, angioedema, bronchospasm, fever, hypersensitivity reaction, increased intraocular pressure, wheezing
Combination medications			
Budesonide/formoterol (Symbicort)	Two puffs twice per day	$222 to $253, depending on dosage	Anaphylaxis, angioedema, arrhythmias, bronchospasm, glaucoma, hypersensitivity reaction, hypertension, hypokalemia, hypotension, increased intraocular pressure, tachycardia
Fluticasone/salmeterol (Advair)	One puff twice per day (Diskus); two puffs twice per day (HFA)	$235 to $380 per inhaler, depending on dosage and delivery system	Anaphylaxis, angioedema, arrhythmias, asthma exacerbation, bronchospasm, hypertension, hypokalemia, myocardial ischemia, stridor, tachycardia, wheezing
Ipratropium/albuterol (Combivent Respimat)	One or two puffs every six hours as needed	$280 per inhaler	Anaphylaxis, angioedema, arrhythmias, exacerbation of chronic obstructive pulmonary disease, glaucoma, hypersensitivity reaction, hypertension, hypokalemia, increased intraocular pressure, metabolic acidosis, myocardial ischemia, tachycardia
Mometasone/formoterol (Dulera)	Two puffs twice per day	$241 per inhaler	Adrenal suppression, angioedema, arrhythmias, asthma exacerbation, bronchospasm, glaucoma, hypersensitivity reaction, hypokalemia, seizures, vasculitis
Other			
Roflumilast (Daliresp)	500 mcg per day	$215 for 30 500-mcg tablets	Arrhythmias, elevated liver enzymes, hypersensitivity reaction, lung cancer, paresthesia, prostate cancer, renal failure, suicidal ideation
Theophylline (extended-release)	300 mg per day initially, then titrate by serum levels	$10 (generic) for 30 300-mg tablets	Arrhythmias, hyperthyroidism, intractable vomiting, peptic ulcer disease, seizures, status epilepticus

**—Estimated retail price based on information obtained at http://www.goodrx.com and http://www.drugpriceinfo.com (accessed August 20, 2013).*

Information from reference 35.

ORAL MEDICATIONS

Theophylline can be added or used as an alternative in patients whose symptoms are not controlled with triple therapy or who cannot afford inhaler therapy. Theophylline requires drug level monitoring and improves lung function parameters, but has uncertain effects on symptoms and exacerbations.[36]

Roflumilast (Daliresp), an oral phosphodiesterase-4 inhibitor approved for use in patients with COPD and chronic bronchitis symptoms, can also be added to long-acting bronchodilators in patients in group C or D. Studies have demonstrated improvement in FEV_1 but inconsistent results regarding reduction of exacerbation rates.[37,38]

Prophylactic antibiotic therapy is not recommended to prevent COPD exacerbations. Although erythromycin and azithromycin (Zithromax) have shown a reduced risk of exacerbations,[39,40] there are insufficient data about the effects on macrolide resistance and long-term adverse effects to recommend their use.

Oral corticosteroids do not improve quality of life or reduce exacerbation rates, and are not recommended for patients with stable COPD.[41]

OXYGEN

Long-term oxygen therapy is recommended for patients with COPD and severe hypoxemia (oxygen saturation

Table 6. BODE Index for Predicting Mortality in Patients with Chronic Obstructive Pulmonary Disease

	Points			
Component	*0*	*1*	*2*	*3*
Body mass index (kg per m^2)	> 21	≤ 21	—	—
Obstruction: percentage of predicted FEV_1	≥ 65	50 to 64	36 to 49	≤ 35
Dyspnea: mMRC score (Table 3)	0 or 1	2	3	4
Exercise: distance walked in six minutes (meters)	≥ 350	250 to 349	150 to 249	≤ 149

NOTE: *Scores range from 0 to 10; higher scores indicate a greater risk of death. Patients with scores of 6 or greater meet criteria for referral for lung transplantation.*

FEV_1 = forced expiratory volume in one second; mMRC = modified Medical Research Council Dyspnea Scale.

Adapted from Celli BR, Cote CG, Marin JM, et al. The body-mass index, airflow obstruction, dyspnea, and exercise capacity index in chronic obstructive pulmonary disease. N Engl J Med. *2004;350(10):1007.*

less than 88% or partial arterial oxygen pressure less than 55 mg Hg). Supplemental oxygen improves endurance and exercise capacity in patients with moderate to severe COPD.[42] A multicenter randomized trial with 203 patients who had hypoxemia and COPD demonstrated that continuous oxygen therapy had benefits on survival rates compared with nocturnal oxygen therapy.[43] The goal oxygen saturation should be approximately 90% to avoid respiratory acidosis.[44]

SURGERY

Lung volume reduction surgery improves five-year survival rates in patients with severe COPD and heterogeneous distribution of emphysema with upper lobe predominance.[45] Conversely, patients with severe COPD and FEV_1 less than 20%, homogenous emphysema, or low carbon monoxide diffusion capacity have increased 30-day mortality after lung volume reduction surgery.[46]

Lung transplantation may improve quality of life and functional capacity in selected patients with severe COPD. Criteria for referral include a score greater than 5 on the BODE (body mass index, obstruction, dyspnea, exercise) Index[3] *(Table 6[47])*.

Data Sources: A PubMed search was completed in Clinical Queries using the key terms COPD treatment and COPD therapy. The search included meta-analyses, randomized controlled trials, clinical trials, and reviews. Also searched were EBSCO Host Academic Search Premier, DynaMed, Essential Evidence Plus, and UpToDate. Search Date: October 2012.

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Your name:

Today's date:

CAT
COPD Assessment Test

How is your COPD? Take the COPD Assessment Test™ (CAT)

This questionnaire will help you and your healthcare professional measure the impact COPD (Chronic Obstructive Pulmonary Disease) is having on your wellbeing and daily life. Your answers, and test score, can be used by you and your healthcare professional to help improve the management of your COPD and get the greatest benefit from treatment.

For each item below, place a mark (X) in the box that best describes you currently. Be sure to only select one response for each question.

Example: I am very happy 0 X 2 3 4 5 I am very sad

			SCORE
I never cough	0 1 2 3 4 5	**I cough all the time**	
I have no phlegm (mucus) in my chest at all	0 1 2 3 4 5	**My chest is completely full of phlegm (mucus)**	
My chest does not feel tight at all	0 1 2 3 4 5	**My chest feels very tight**	
When I walk up a hill or one flight of stairs I am not breathless	0 1 2 3 4 5	**When I walk up a hill or one flight of stairs I am very breathless**	
I am not limited doing any activities at home	0 1 2 3 4 5	**I am very limited doing activities at home**	
I am confident leaving my home despite my lung condition	0 1 2 3 4 5	**I am not at all confident leaving my home because of my lung condition**	
I sleep soundly	0 1 2 3 4 5	**I don't sleep soundly because of my lung condition**	
I have lots of energy	0 1 2 3 4 5	**I have no energy at all**	
		TOTAL SCORE	

eFigure A. COPD Assessment Test.

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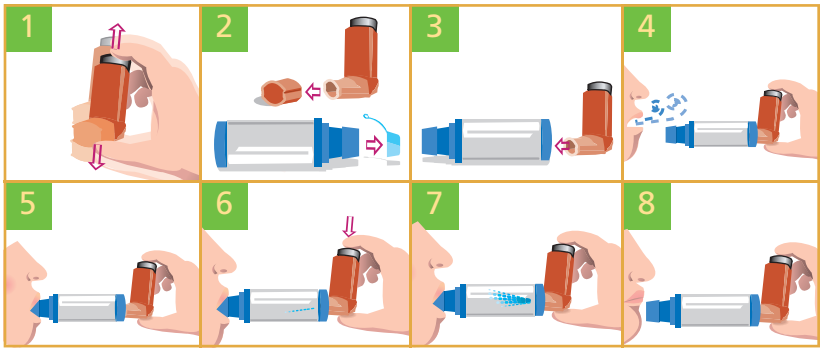
Medications: Asthma Basics Booklet

MDI and spacer

The Asthma Society recommends that anyone, of any age, using an MDI should consider using a spacer. Spacers are available for purchase from pharmacies.

To use your MDI with a spacer:

1. Shake the inhaler well before use (three or four shakes)
2. Remove the cap from your inhaler, and from your spacer, if it has one
3. Put the inhaler into the spacer
4. Breathe out, **away** from the spacer
5. Bring the spacer to your mouth, put the mouthpiece between your teeth and close your lips around it
6. Press the top of your inhaler once
7. Breathe in **slowly** until you've taken a full breath
   If you hear a whistle sound, you are breathing in too fast
   Slowly breathe in
8. Hold your breath for about ten seconds, then breathe out



eFigure B. Directions for appropriate inhaler use. (MDI = metered-dose inhaler.)

Asthma.ca
Asthma Society of Canada

MDI (puffer)

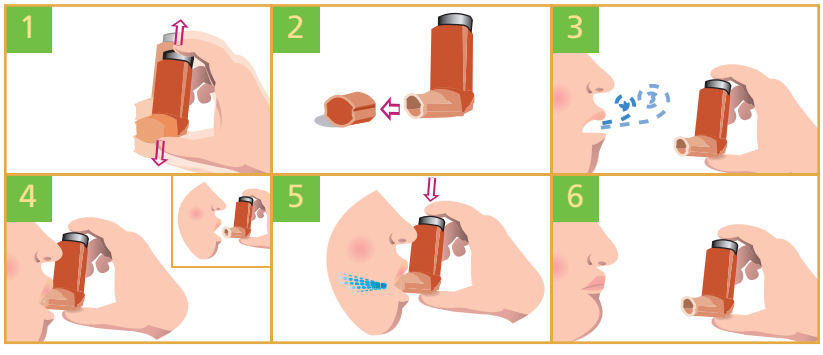
You should follow the instructions packaged with your medication.
The following is one way to use your inhaler.
To use your MDI without a spacer:

1. Shake the inhaler well before use (three or four shakes)
2. Remove the cap
3. Breathe out, **away** from your inhaler
4. Bring the inhaler to your mouth. Place it in your mouth between your teeth and close your mouth around it.
5. Start to breathe in **slowly**. Press the top of your inhaler **once** and keep breathing in **slowly** until you've taken a full breath
6. Remove the inhaler from your mouth, and hold your breath for about ten seconds, then breathe out

If you need a second puff, wait 30 seconds, shake your inhaler again, and repeat steps 3-6.

Always write down the number of puffs you've taken so that you can anticipate when you need to refill your prescription.

Store all MDI's at room temperature.



continued

continued

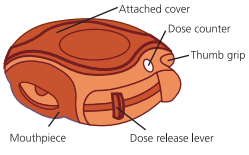
Medications: Asthma Basics Booklet

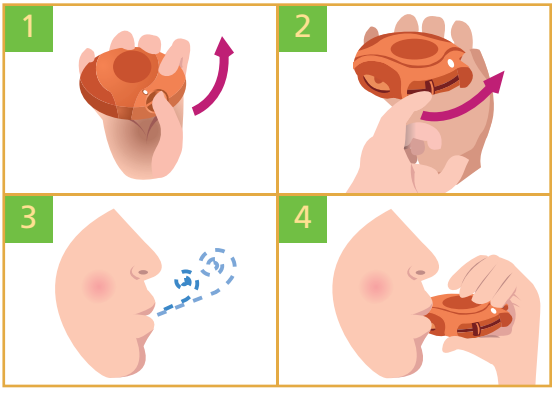
DISKUS®

To use your DISKUS® do the following for one dose:

1. Open your DISKUS®: hold it in the palm of your hand, put the thumb of your other hand on the thumb grip and push the thumb grip until it clicks into place
2. Slide the lever away from you as far as it will go to get your medication ready
3. Breathe out **away** from the device
4. Place the mouthpiece gently in your mouth and close your lips around it
5. Breathe in deeply until you've taken a full breath
6. Remove the DISKUS® from your mouth
7. Hold your breath for about ten seconds, then breathe out slowly

Always check the number in the dose counter window to see how many doses are left.





Do not use a spacer with the DISKUS®, Turbuhaler® or any other dry powder inhaler

eFigure B. Directions for appropriate inhaler use.

Asthma.ca
Asthma Society of Canada

Turbuhaler®

To use your Turbuhaler®, do the following for one dose:

1. Unscrew the cap and take it off. Hold the inhaler upright
2. Twist the coloured grip of your Turbuhaler® as far as it will go, then twist it all the way back. You've done it right when you hear a "click"
3. Breathe out **away** from the device
4. Put the mouthpiece between your teeth, and close your lips around it. Breathe in forcefully and deeply through your mouth
5. Remove the Turbuhaler® from your mouth before breathing out
6. Always check the number in the dose counter window under the mouthpiece to see how many doses are left. For the Turbuhalers® that do not have a dose counter window, check the window for a red mark, which means your medication is running out. When finished, replace the cap

*__Symbicort®__: **For first time use**, hold the inhaler upright, turn the grip as far as it will go in one direction and then turn it back again as far as it will go in the opposite direction. Repeat this procedure twice.