

Chronic Obstructive Pulmonary Disease

Author:
Marsha K. Millonig, MBA, RPh
President/CEO
Catalyst Enterprises, LLC

E.L.F. Publications, Inc. is accredited by the Accreditation Council for Pharmacy Education as a provider of continuing pharmaceutical education. This program has been approved for 1.5 contact hour (0.15 CEU).

Universal Program Numbers:
406-000-09-001-H01P & 406-000-09-001-H01T
The expiration date for this program is 1/31/10.



Learning Objectives:

Pharmacists:

After completing this continuing education article, pharmacists should be able to:

1. Discuss the prevalence of chronic obstructive pulmonary disorder (COPD)
2. Describe COPD treatment guidelines
3. Explain the pharmacist's role in helping patients with COPD
4. Demonstrate the proper use of inhalers
5. Explain how inhaler formulations changed with the conversion from CFC to HFA-based products, including taste and spray characteristics;
6. Discuss the pharmacist's role in enhancing compliance with COPD treatment and management

Pharmacy Technicians:

After completing this lesson, pharmacy technicians should be able to:

1. Discuss the prevalence of chronic obstructive pulmonary disorder (COPD)
2. Describe COPD treatment guidelines
3. Explain the pharmacist's role in helping patients with COPD
4. Demonstrate the proper use of inhalers
5. Explain how inhaler formulations changed with the conversion from CFC to HFA-based products, including taste and spray characteristics;
6. Discuss the pharmacist's role in enhancing compliance with COPD treatment and management.

Chronic Obstructive Pulmonary Disease (COPD) is the fourth leading cause of death in the United States, with 120,000 people in the US dying from the disease annually. While 12 million Americans are living with diagnosed COPD, another 12 million are estimated to suffer from the condition yet are not receiving treatment. Management of COPD includes reducing risk factors associated with the disease and pharmacologic management of symptoms. Pharmacists can play an important role in educating patients with COPD, helping them comply with their medication therapy regimens, and improve their health outcomes.

COPD refers to two lung diseases, chronic bronchitis and emphysema, that are characterized by obstruction to airflow that interferes with normal breathing. Both of these conditions frequently co-exist, hence physicians prefer the term COPD. The disease is the fourth leading cause of death in America, claiming the lives of over 120,000 Americans in 2002. COPD mortality rates have increased steadily since 1970 while rates for heart disease, cancer, and stroke have declined. Slightly more women than men are affected. According to estimates by the National Heart, Lung, and Blood Institute, in 2007 the annual cost to the nation for COPD was \$42.6 billion. This included \$26.7 billion in direct health care expenditures, \$8 billion in indirect morbidity (illness-related) costs and \$7.9 billion in indirect mortality (death-related) costs.

Approximately 80 to 90 percent of COPD deaths are caused by smoking. Female smokers are nearly 13 times as likely to die from COPD as women who have never smoked. Male smokers are nearly 12 times as likely to die from COPD as men who have never smoked.

Other risk factors of COPD include air pollution, second-hand smoke, history of childhood respiratory infections, and heredity (as many as 100,000 people in the U.S. may have a genetic deficiency, called alpha-1 antitrypsin, which raises their risk for COPD.) Occupational exposure to certain industrial pollutants also increases the odds for COPD. A recent study found that the fraction of COPD attributed to work was estimated as 19.2% overall and 31.1% among those who never smoked.

An American Lung Association survey revealed that half of all COPD patients (51%) say their condition limits their ability to work. The condition also limits them in normal physical exertion (70%), household chores (56%), social activities (53%), sleeping (50%), and family activities (46%).

In 2007, the NIH's National Heart, Lung, and Blood Institute (NHLBI) launched COPD Learn More Breathe Better, a national campaign designed to improve awareness among those at greatest risk for the disease in order for them to receive treatment that can improve their quality of life and slow the disease's progression.

What is COPD?

"COPD is a preventable and treatable disease with some significant extrapulmonary effects that may contribute to the severity in individual patients. Its pulmonary component is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with abnormal inflammatory response of the lung to noxious particles or gases." This working definition of COPD is from the Global Initiative for Chronic Obstructive Lung Disease

(GOLD.) GOLD was launched in 1997 in collaboration with the NHLBI and World Health Organization and works with health care professionals and public health officials around the world to raise awareness of COPD and to improve prevention and treatment of this lung disease. GOLD has developed evidence-based guidelines for COPD management called *Global Strategy for Diagnosis, Management, and Prevention of COPD*. Updated guidelines were released in November 2008 and are available at GOLD - the Global initiative for chronic Obstructive Lung Disease (www.goldcopd.com).

Two major conditions associated with COPD are emphysema and chronic bronchitis. In emphysema, lung alveoli are destroyed. In chronic bronchitis, cough and sputum production occurs but airflow is not necessarily limited. Asthma can also co-exist with COPD. In asthma, airflow limitations are reversible. Airflow limitations in COPD are caused by a mixture of small airway disease and destruction of lung parenchyma.

A chronic cough is often the first symptom of COPD and may develop years before other symptoms occur. In addition to a productive cough, progressive dyspnea on exertion and impaired exercise intolerance are also present. As COPD progresses, the dyspnea and gas exchange worsens, resulting in a further negative cycle where patients become disconditioned due to lack of exercise, making their dyspnea worse. The quality of life for a person suffering from COPD diminishes as the disease progresses. At the onset, there is minimal shortness of breath. People with COPD may eventually require supplemental oxygen and may have to rely on mechanical respiratory assistance.

Pharmacists can help improve adherence for patients with COPD using treatment guidelines. In addition to GOLD, and incorporated into GOLD, are the American Thoracic Society (ATS)/European Respiratory Society criteria.

How is COPD Diagnosed?

COPD is usually diagnosed through spirometry, often measured in a doctor's office. Spirometry measures how well the lungs exhale. In the test, a person breathes into a mouthpiece connected to an instrument called a spirometer. The spirometer records the amount and rate of air that is breathed in and out over a specified time. FEV is the forced expiratory volume in one second while the FVC is the forced vital capacity. Table 1 shows how spirometry results help classify COPD severity.

Table 1
Severity Classification for COPD

Severity	Post-BD FEV₁/FVC	Predicted FEV₁
At Risk	>0.7	≥ 80%
Mild COPD (Stage I)	< 0.7	≥ 80%
Moderate COPD (Stage II)	< 0.7	≥ 50% up to 80%
Severe COPD (Stage III)	< 0.7	≥ 30% up to 50%
Very Severe COPD (Stage IV)	< 0.7	< 30% OR < 50% plus chronic respiratory failure

American Thoracic Society, 2005.

Patient characteristics are also used to help classify COPD severity. Patients in the “at risk” category often experience a morning cough. In Stage I, there are no physical limitations but symptoms are often experienced during exercise. In Stage II, activities are limited and symptoms are more chronic. In Stage III, the patient may be restricted in what they can do, dyspnea is chronic and they may experience frequent exacerbations. In Stage IV, patients often live a “bed-to-chair” existence and end of life planning may be appropriate.

Management of COPD

The four components of COPD management include:

1. Assessing and monitoring the disease
2. Reducing risk factors associated with the disease
3. Managing stable COPD through education, and pharmacologic and non-pharmacologic interventions
4. Managing disease exacerbations

Prevention is the number one goal, particularly for patients identified in Stage 0. Non-pharmacological therapies used in managing COPD include smoking cessation, immunizations to prevent respiratory infections, pulmonary

rehabilitation programs, and oxygen therapy. The maintenance treatment of COPD utilizes a step-up approach with therapies added as the disease progresses and the severity of symptoms increases. Regular treatment must be maintained at the same level for long periods of time, with adjustment made as needed to treat disease progression and/or side effects. Because no existing medication is currently known to modify the long-term decline in lung function that is characteristic of COPD, therapy is aimed at decreasing symptoms and complications.

Avoidance of risk factors is common across all stages of COPD; these include smoking cessation, reducing indoor pollution, reducing occupational exposure, and immunization. The importance of smoking cessation cannot be overemphasized. Pharmacists should be prepared to offer assistance with smoking cessation programs and OTC and prescription smoking cessation products. In addition, pharmacists should take the opportunity to reinforce smoking cessation at every patient visit. Research has shown even brief interventions may be effective. In one study, a 3-minute intervention led to reduced smoking rates of 5% to 10%.

Brief Strategies for Smoking Cessation

The Five A’s for Patients Willing to Quit

Ask about tobacco use.	Identify and document tobacco use status for every patient at every visit. (Brief Strategy A1)
Advise to quit.	In a clear, strong and personalized manner urge every tobacco user to quit. (Brief Strategy A2)
Assess willingness to make a quit attempt.	Is the tobacco user willing to make a quit attempt at this time? (Brief Strategy A3)
Assist in quit attempt.	For the patient willing to make a quit attempt, use counseling and pharmacotherapy to help him or her quit. (Brief Strategy A4)
Arrange followup.	Schedule followup contact, preferably within the first week after the quit date. (Brief Strategy A5)

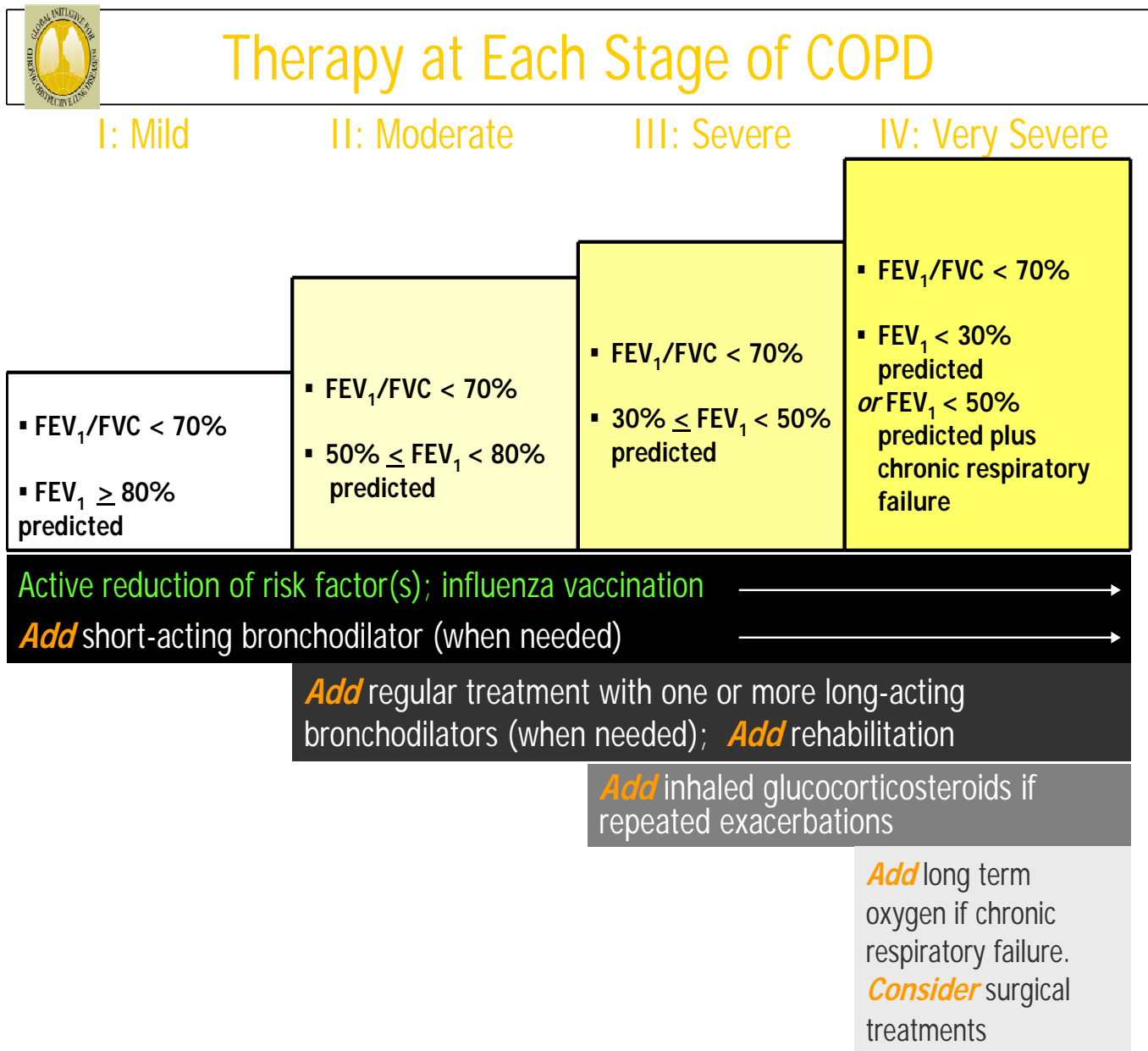
The 5 R’s for patients unwilling to quit include: relevance, risks, rewards, roadblocks, and repetition.

Influenza vaccination is also a cornerstone of risk reduction. Pharmacist-provided influenza administration has grown in the past decade and 49 states now allow pharmacists to give flu vaccinations.

Finally, reducing indoor pollutants is important. Pharmacists can counsel patients to vacuum often to reduce dander and mites, use high-filtering furnace filters and change them monthly, and to have air ducts cleaned annually.

Step Therapy for COPD

Step therapy is used in the management of COPD. The GOLD teaching slide set depicts this step therapy as follows:



The primary medications used for treatment of COPD include short-acting and long-acting inhaled β_2 -agonists, the inhaled anticholinergic therapies, theophylline, and inhaled or in some cases systemic corticosteroids.

For patients in stage I (Mild), the addition of a short-acting bronchodilator, such as albuterol or ipratropium, is recommended on an as-needed basis. For patients in stage II (Moderate), regular treatment with a long-acting bronchodilator is recommended, with supplemental use of a short-acting bronchodilator for rescue. Long-acting β_2 -agonists, such as inhaled formoterol and salmeterol, have a duration of action ≥ 12 hours and require twice-daily dosing. Inhaled ipratropium bromide is a short-acting anticholinergic with a duration of action of six to eight hours. Tiotropium

bromide has a duration of action ≥ 24 hours and requires once-daily dosing. A combination of short-acting β_2 -agonists and an anticholinergic agent is also recommended at this stage, since combining drugs with different mechanisms may increase the degree of bronchodilation achieved without increasing side effects. Single drugs may be administered in combination, or a combination product may be used. In the United States, albuterol and ipratropium are available as a combination product. Regular treatment with more than one long-acting bronchodilator may be needed for patients in this stage of COPD. Oral theophylline may also be used in Stage II, although it is less preferred because of its associated risks of toxicity.

For patients in stage III (Severe), the addition of inhaled corticosteroid (ICS) agents as part of regular maintenance therapy is recommended if the patient experiences repeated exacerbations while receiving bronchodilator therapy. ICS agents include beclomethasone, fluticasone, and triamcinolone. For patients requiring both a bronchodilator and ICS agents, a combination product of fluticasone/salmeterol is available. Finally, for patients in stage IV (very severe), the administration of long-term oxygen is recommended if the patient experiences chronic respiratory failure. Continuous-oxygen therapy, for >15 hours per day, has been shown to increase survival in patients with chronic respiratory failure.

Bronchodilator drugs commonly used in treating COPD include:

- ◆ Beta2-agonists:
 - Short-acting
 - (not available in US)
 - Albuterol
 - Terbutaline
 - Long-acting
 - Formoterol
 - Salmeterol
- ◆ Anticholinergics:
 - Short-acting
 - Ipratropium bromide (not available in US)
 - Long-acting
 - Tiotropium
- ◆ Combination short-acting Beta2-agonists plus anticholinergic in one inhaler
 - (not available in US)
 - Albuterol/Ipratropium
- ◆ Methylxanthines:
 - Aminophylline (slow release preparations)
 - Theophylline (slow release preparations)
- ◆ Inhaled glucocorticosteroids
 - Beclomethasone
 - Budesonide
 - Fluticasone
 - Triamcinolone
- ◆ Combination long-acting Beta2-agonists plus glucocorticosteroids on one inhaler
 - Formoterol/Budesonide
 - Salmeterol/Fluticasone
- ◆ Systemic glucocorticosteroids
 - Prednisone
 - Methylprednisone

The choice depends on the availability of the medication and the patient's response. The GOLD guidelines report that all categories of bronchodilators have been shown to increase exercise capacity in COPD. Regular treatment with long acting bronchodilators is more effective and convenient than treatment with short-acting bronchodilators, but more expensive. Regular use of a long-acting beta₂-agonist or long-acting anticholinergic improves health status. Theophylline is effective in COPD, but due to its potential toxicity, inhaled bronchodilators are preferred when available. All studies that have shown efficacy of theophylline in COPD were done with slow-release preparations.

Combining drugs with different mechanisms and durations of action might increase the degree of

bronchodilation for equivalent or lesser side effects. A combination of a short-acting beta₂-agonist and an anticholinergic produces greater and more sustained improvements in FEV₁ than either alone and does not produce evidence of tachyphylaxis over 90 days of treatment. Combination of a beta₂-agonist, an anticholinergic and/or theophylline may produce additional improvements in lung function, and health status. Increasing the number of drugs usually increases costs, and an equivalent benefit may occur by increasing the dose of one bronchodilator when side effects are not a limiting factor. Increasing the dose of either a beta₂-agonist or an anticholinergic, especially when given by a wet nebulizer, appears to provide subjective benefit in acute episodes.

The Pharmacist's Role in COPD Management

Pharmacists are in a position to play a key role in the management of patients with COPD. Pharmacists should teach and reinforce the following information and skills at every opportunity, including:

- basic information about the disease,
- roles of medication,
- the need to adhere to prescribed treatment regimens including medications, environmental control,
- self-management skills, including advice on when to seek help, and
- drug administration skills including how to use inhalers, spacers, and holding chambers.

Helping patients understand the importance of smoking cessation and offering programs to do so is important. Smoking cessation is the single most effective intervention to reduce the risk of developing COPD and the only intervention that has been shown to slow its progression. If a pharmacist doesn't offer a program directly, they should determine which smoking cessation resources are available in the community and make this information available to patients.

Inhalation Techniques

Inhalation therapy is a cornerstone of treatment. Teaching patients proper inhalation techniques outlined earlier is important. COPD is amenable to therapy. A management strategy consisting of combined pharmacotherapy and non-pharmacotherapeutic interventions can effectively improve symptoms, activity levels, and quality of life, even in patients with severe COPD.

Most patients use their inhalers incorrectly, and this skill deteriorates over time. Patients' poor technique results in less medication getting to the airways. The initial inhaler training can be done in minutes with the simple skills-training method:

1. **Tell** the patient the steps and give written instructions.
2. **Demonstrate** how to use the inhaler following each of these steps.
3. Ask the patient to **demonstrate** how to use the inhaler. Let the patient refer to the handout on the first training. Subsequently, use patient handouts as a checklist to assess the patient's technique.

4. **Tell** patients what they did right and what they need to improve. Have them demonstrate their technique again, if needed. Focus the patient on improving one or two key steps (e.g., timing of actuation and inhalation) if the patient made multiple errors.

It's important to remember that patients cannot be expected to perform a task they never agreed to do or one that is only mentioned once to them. Thus, two essential clinician activities for successful patient education are asking the patient for a verbal, sometimes written, agreement to take specific action(s) and following up and reinforcing the patient for the actions during subsequent visits or phone calls.

HFA Inhalers

CFC-based albuterol inhalers were phased out December 31, 2008 by the FDA in accordance with the Montreal

Protocol, an international agreement to regulate and reduce production of ODSs. The United States became a party to the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol) on January 1, 1989. The Montreal Protocol project's website may be accessed at <http://www.unep.org/ozone/pdfs/Montreal-Protocol2000.pdf>. Other CFC-based inhalers are scheduled for phase out by the end of 2010.

While significant educational outreach and awareness efforts have been undertaken by the government and private organizations, transitioning patients is still a challenge. While the new MDIs are actually more effective drug delivery devices than the CFC-based inhalers, they taste and smell different and many patients perceive they are not working as a result.

Physical Differences Between CFC and HFA Propellants

Parameter	CFC Formulation	HFA Formulation
Taste	Differs from HFA "harder"	Differs from CFC "softer"
Spray volume	Higher	Lower
Spray force	Higher	Lower by about 1/3 rd
Spray temperature	Lower	Higher (86° F)
Dose delivery from nearly empty canister	Erratic	More consistent
Dose delivery under different temperatures	Variable	More consistent

Source: Tscheng DZ. CPJ/RPC 2002;21-24.

http://www.pharmacists.ca/content/cpjpdfs/june02/alternatives_to_CFCcontainingMDIs.pdf

Accessed August 25, 2005

Patients switching to the HFA formulations may notice a softer and warmer spray with a slightly different, possibly bitter taste or inhalation sensation than the CFC version of their medication. It is critical to educate patients about these differences before they begin using the HFA inhalers because the patient may perceive they are "not getting the dose" and use more puffs than necessary causing possible adverse reactions and product waste. Spacers can also be used with HFA formulations.

Pharmacists should advise patients:

- that HFA sprays tend to have a slightly different taste and inhalation sensation than their CFC counterparts. Patients may not perceive they are getting the right of amount of medication because of the spray differences.
- the spray is softer and warmer, avoiding the "cold spray effect" associated with CFC inhalers.
- about priming their inhalers as some HFA formulations will require different priming than their CFC counterparts. Pharmacists should become familiar with each formulation and advise patients accordingly.
- About cleaning their inhaler mouth pieces weekly because the HFA formulation may clog more easily than the CFC counterparts
- the HFA and CFC formulations for each inhaler and drug are comparable in efficacy and safety.

- that HFA is an inert propellant that does not interact with the active ingredient in inhalers or cause any other side effects.
- like the CFC counterparts, patients should avoid spraying HFA formulations in their eyes.
- if their medication seems to become less effective or if asthma worsens, pharmacists should instruct patients to seek immediate medical attention.

Finally, a number of excellent patient resources have been developed as part of the COPD Learn More Breathe Better Campaign, including brochures about the disease, public/patient education slide sets and educational videos. You may access them at: <http://www.nhlbi.nih.gov/health/public/lung/copd/campaign-materials/index.htm>.

References are available on request.