

The Impact of CFC to HFA Inhalers: What Pharmacists Need to Know

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Learning Objectives

Pharmacists:

After completing this lesson, the pharmacist should be able to:

- ✓ Describe how CFC (chlorofluorocarbons) use in aerosols became an environmental issue and highlights of the Montreal Protocol;
- ✓ Summarize the FDA's phase out process for CFC inhalers;
- ✓ Discuss the prevalence of asthma and chronic obstructive pulmonary disorder (COPD), and the use of inhalers in their treatment;
- ✓ Explain how inhaler formulations change with the conversion from CFC to HFA-based products, including taste and spray characteristics;
- ✓ Describe steps that need to be taken with patients when converting them from CFC to HFA-based inhalers, including dosing considerations and cost implications; and,
- ✓ Explain the pharmacist's role in getting information to patients on the conversion and steps that can be taken to do so.

Pharmacy Technicians:

After completing this lesson, the pharmacy technician should be able to:

- ✓ Describe how CFC (chlorofluorocarbons) use in aerosols became an environmental issue and highlights of the Montreal Protocol;
- ✓ Summarize the FDA's phase out process for CFC inhalers;
- ✓ Explain how inhaler formulations change with the conversion from CFC to HFA-based products, including taste and spray characteristics;
- ✓ Describe steps that need to be taken with patients when converting them from CFC to HFA-based inhalers, including dosing considerations and cost implications; and,
- ✓ Discuss the importance of flagging inhaler prescriptions for pharmacist consultation.

The transition of inhalers that use chlorofluorocarbons (CFCs) to those that use hydrofluoroalkanes (HFAs) has economic and clinical impact for patients. The transition is an outgrowth from environmental concerns that led to an international agreement called the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol) in 1987. The agreement provided for the phase-out of CFCs, which have been shown to damage the earth's protective ozone layer. The FDA issued a final regulation on March 31st, 2005 that requires the phase out of all CFC albuterol metered-dose inhalers by December 31, 2008. The transition of inhalers will require pharmacists to educate patients on changes in taste, spray characteristics, and trailing effects among others. Keeping patients compliant with therapy is essential for cost-effective management of asthma and chronic obstructive pulmonary disease (COPD.)

The Montreal Protocol

During the 1970s, scientists became aware of a relationship between the level of stratospheric ozone and industrial use of CFCs. Ozone (O₃), which causes respiratory problems when it occurs in elevated concentrations near the ground, shields the Earth from potentially harmful solar radiation when in the stratosphere. Excessive exposure to solar radiation is associated with adverse health effects such as skin cancer and cataracts, as well as other adverse environmental effects. Emissions of CFCs and other ozone depleting substances (ODSs) reduce stratospheric ozone concentrations through a catalytic reaction, thereby allowing more solar radiation to reach the Earth's surface. Because of this, environmental scientists from the United States and other countries advocated ending all uses of these chemicals.

CFCs are organic compounds that contain carbon, chlorine, and fluorine atoms and are used as solvents and as propellants in self-pressurized aerosol products, such as metered dose inhalers (MDIs.) CFCs are very stable in the troposphere, the lowest part of the atmosphere. They move to the stratosphere, a region that begins about 6 to 10 miles above Earth's surface and extends up to about 31 miles altitude. Within the stratosphere, there is a zone about 10 to 25 miles above the Earth's surface in which ozone is relatively highly concentrated--the ozone layer. Once in the stratosphere, CFCs are gradually broken down by strong ultraviolet light, where they release chlorine atoms that then deplete ozone. Depleting ozone by allows more ultraviolet-B (UV-B) radiation to reach the Earth's surface, where it increases skin cancers and cataracts, and damages some marine organisms, plants, and plastics. In the late 1980s, scientists began searching for CFC replacements. The most suitable compounds identified were the hydrofluoroalkanes HFA 134a (tetrafluoroethane) and HFA 227 (heptafluoropropane), collectively known as HFAs.

The international effort to craft a coordinated response to the global environmental problem of stratospheric ozone depletion culminated in 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. (See <http://www.unep.org/ozone/pdfs/Montreal-Protocol2000.pdf> for more information.

One hundred and ninety-one countries have now ratified the Montreal Protocol, and the overall usage of CFCs has been dramatically reduced. In 1986, global consumption of CFCs totaled about 1.1 million metric tons annually, and by 2000, total annual consumption had been reduced to fewer than 0.1 million metric tons. This decline amounts to about a 90-percent decrease in consumption and is a key measure of the success of the Montreal Protocol. Within the United States, consumption of ODSs, and CFCs in particular, has fallen sharply—consumption of CFC-11 and CFC-12 is about 20 percent of 1990 consumption.

Under the Montreal Protocol, production of CFCs in any year by any country is banned after the phase-out date unless the Parties to the Montreal Protocol agree to designate the use as "essential" and approve a quantity of new production for that use. Each year, each Party nominates the amount of CFCs needed for each essential use and provides the reason why such use is essential. Agreement on both the essentiality and the amount of CFCs needed for each nominated use has been reached by consensus at the annual Meeting of the Parties. EPA has generated a series of estimates of the environmental and public health benefits of the Montreal Protocol between 1990 and 2165 if the treaty is fully implemented. The benefits include:

- Ø reductions of nonfatal skin cancers by hundreds of millions;
- Ø six million fewer fatalities due to skin cancer; and,
- Ø 27.5 million cataracts avoided.

The value of these and related benefits is estimated to equal \$4.3 trillion in present value when discounted at 2 percent over the period of 175 years or about \$6 trillion after adjusting for inflation between 1990 and 2004. This estimate includes all benefits of total global ODS emission reductions expected from the Montreal Protocol and is based on reductions from a baseline scenario in which ODS emissions would continue to grow for decades but for the Montreal Protocol.

CFCs, Inhalers and the FDA

Nearly all of the CFCs inhaled into the lungs from an MDI are almost immediately exhaled into the environment. Essentially all of the CFCs released from an MDI end up in the atmosphere with resulting harm to the stratospheric ozone layer. The United States evaluated the environmental effect of eliminating the use of all CFCs in an environmental impact statement (EIS) in the 1970s (see 43 FR 11301, March 17, 1978). As part of that evaluation, FDA concluded that the continued use of CFCs in medical products posed an unreasonable risk of long-term biological and climatic impacts (see Docket No.96N-0057). In 1990, Congress enacted Title VI of the Clean Air Act, which codified the decision to fully phase out the use of CFCs over time. On March 31, 2005, the FDA announced that albuterol metered-dose inhalers (MDIs) using CFC propellants must no longer be produced, marketed or sold in the United States after December 31, 2008. Several criteria were used in making FDA's determination to phase out the CFC albuterol inhaler products, including:

- Ø At least two non-CFC products with the same active drug are marketed with the same route of administration, for the same indication, and with approximately the same level of convenience of use

as the CFC product that contains that active ingredient;

- Ø Supplies and production capacity for the non-CFC product will exist by December 31, 2008 at levels sufficient to meet patient needs;
- Ø Adequate U.S. post marketing use data are available for the non-CFC product; and,
- Ø Patients who are required to use the CFC product for medical reasons will be adequately served by the alternative non-CFC product and other available products.

The FDA final rule that gives manufacturers significantly more time to make the transition to CFC-free products than some experts had recommended. In June 2004 members of the FDA's Pulmonary-Allergy Drugs Advisory Committee suggested that CFC-based albuterol products be phased out by Dec. 31, 2005. The FDA said the new phase-out date would give manufacturers of CFC-free inhalers enough time to ramp up production of their products to ensure there are enough environmentally friendly inhalers to meet public demand. The FDA said the new regulation is necessary because private markets are very unlikely to preserve levels of stratospheric ozone sufficient to protect the public health. Individual users of albuterol MDIs have no significant private incentive to switch to non-ozone depleting albuterol HFA MDIs. In fact, each user would bear all of the costs and virtually none of the benefits of such a switch, as the environmental and health benefits would tend to be distributed globally and occur decades in the future. Thus, the outcome of a private market would be continued use of the albuterol MDI available at the lowest price, even if the social value of reducing emissions were clearly much greater than the price premium for non-ozone depleting albuterol HFA MDIs.

The FDA summarized the rule's objective to reduce atmospheric emissions of ODSs, specifically CFCs and noted they "are ending the essential use designation for ODSs used in albuterol MDIs. They said removing this essential-use designation will comply with obligations under the Montreal Protocol and the Clean Air Act, thereby reducing emissions that deplete stratospheric ozone, while preserving access to essential drugs by minimizing adverse effects on affected patient populations.

To view the final rule, go to

<http://www.fda.gov/OHRMS/DOCKETS/98fr/03p-0029.pdf>.

For additional information, go to:

<http://www.fda.gov/cder/mdi/default.htm>.

The Role of the Pharmacist in the Conversion

Albuterol MDIs are among the most widely used drug products for the treatment of asthma and COPD. Because of albuterol's rapid onset of action, they are frequently used as "rescue" inhalers to treat bronchospasms during acute episodes. Albuterol MDIs can be considered life saving for some patients at certain times and they are very important in controlling symptoms for many other patients. Because of the importance of these drugs, the seamless conversion of patients from CFC to HFA formulations is critical. Several studies have shown the positive impact the community pharmacist can have on outcomes with patients with asthma. One project, a liaison council of the American College of Asthma, Allergy, and Immunology (ACAAI) and the American Pharmacists

Association (APhA,) has identified numerous areas for pharmacist involvement in optimal management of patients with asthma and allergies. These include:

- Ø Educating patients on their disease state;
- Ø Counseling patients on the roles of their medications;
- Ø Educating patients on the skills necessary to manage their medication use;
- Ø Educating patients on environmental control measures that help to control asthma and allergies;
- Ø Assessing the efficacy and tolerability of treatments;
- Ø Monitoring adherence to therapy; and,
- Ø Advising on nonprescription medications.

The pharmacist can play a key role in helping patients understand the differences between CFC and HFA inhalers, their dosing, cost and other considerations through the transition.

Asthma

Many Americans are affected by asthma, a serious chronic lung condition characterized by episodes or attacks of inflammation and narrowing of the small airways in response to asthma triggers. Over the past two decades, the burden of asthma in the United States has increased. However, within the last few years, mortality and hospitalizations due to asthma have decreased and asthma prevalence has stabilized, possibly indicating a higher level of disease management. While asthma is a reversible obstructive lung disease, it can be a life-threatening if not properly managed.

More than 22 million people in the United States have asthma, including 6.5 million children under age 18, according to the Centers for Disease Control and Prevention (CDC). Without appropriate treatment, asthma can significantly limit individuals' activities and result in asthma exacerbations, which can lead to hospitalization and even death. The CDC estimates that 4,000 Americans die from asthma exacerbations each year.

Close to 1.9 million emergency room visits were attributed to asthma in 2002 and there were 4,261 deaths attributed to asthma. In 2003, asthma accounted for an estimated 12.8 million lost school days in children and 24.5 million lost work days in adults. Asthma ranks within the top ten prevalent conditions causing limitation of activity and costs our nation \$16.1 billion in health care costs annually, with \$11.5 billion in indirect costs (e.g. lost productivity) and another \$4.6 billion in direct costs. Prescription drugs represented the largest single indirect cost, at \$5 billion. The value of lost productivity due to death represented the largest single indirect cost at \$1.7 billion.

Asthma breathing problems usually happen in "episodes," but the inflammation underlying asthma is continuous. An asthma episode is a series of events that result in narrowed airways. These include: swelling of the lining, tightening of the muscle, and increased secretion of mucus in the airway. The narrowed airway is responsible for the difficulty in breathing with the familiar "wheeze." Asthma medications help reduce underlying inflammation in the airways and relieve or prevent symptomatic airway narrowing. Control of inflammation should lead to reduction in airway sensitivity and help prevent airway obstruction.

Despite the numerous drugs available, asthma is still poorly controlled. One study reported that 72 percent of men and 86 percent of women with asthma had symptoms 15 years after they were first diagnosed with the disease. Only 19 percent of these people, however, were still seeing a doctor and only 32 percent used any medication to regularly manage their asthma. A recent survey found that 48 percent of people with asthma say that the disease limits their ability to take part in sports and recreation, 36 percent say it limits their normal physical exertion and 25 percent say it interferes with their social activities.

Treatment Guidelines

There are four components to asthma management, according to the new Expert Panel Report 3 (EPR3):
Guidelines for the Diagnosis and Management of Asthma:

- Ø Measures of assessment and monitoring;
- Ø Education for a partnership in asthma care.
- Ø Control of factors contributing to asthma severity and comorbid conditions that affect asthma; and
- Ø Pharmacologic therapy.

The new report may be accessed at:

<http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm>.

One of the first things pharmacists can do to help patients with asthma is to help them understand common triggers and appropriate avoidance and control strategies. Avoiding exposure to allergens with proven sensitivity, including common triggers, is important. So is avoiding exertion during high pollution periods. Common triggers include tobacco smoke, dust mites, animal dander, mold, strong odors/sprays, and exercise/sports, among others. Pharmacists can play an important role in educating patients with the goal to help them take the actions needed to control their asthma. These actions include:

- Ø Taking daily medications for long-term control as prescribed;
- Ø Using delivery devices effectively—metered dose inhalers, spacers, nebulizers;
- Ø Identifying and controlling factors that make asthma worse;
- Ø Monitoring peak flow and/or symptoms; and
- Ø Following the written action plan when symptoms or episodes occur.

A number of patient brochures are available through the *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma 1997* treatment guidelines and the National Heart, Lung and Blood Institute, including:

- Ø What Everyone Should Know About Asthma Control
- Ø How To Control Things That Make Your Asthma Worse
- Ø How To Use Your Metered-Dose Inhaler the Right Way
- Ø Asthma Action Plan
- Ø School Self-Management Plan
- Ø How To Use Your Peak Flow Meter

Visit the website

<http://www.nhlbi.nih.gov/health/public/lung/index.htm> for more information.

Albuterol inhalers are a cornerstone “quick relief” pharmacotherapy for patients with asthma. Yet, 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.

Long-term daily peak flow monitoring is recommended for those with moderate or severe persistent asthma or patients with a history of severe exacerbations. Pharmacists can also train patients to use their peak flow meter using the same four skills-training steps described for inhalers. Specific recommendations regarding peak flow monitoring include:

- Ø Use the patient’s own personal best peak flow as the standard against which peak flow
- Ø measurements should be compared;
- Ø Use the same peak flow meter and, when needed, replace with same brand.
- Ø Measure peak flow first thing in the morning before medications.
- Ø A drop in peak flow below 80 percent of personal best indicates a need for added medications.
- Ø A drop in peak flow below 50 percent of personal best indicates a severe exacerbation.

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.

COPD

Although chronic obstructive pulmonary disease (COPD) and asthma share some clinical features, such as airflow obstruction, they are two distinct disorders, requiring distinct treatment approaches. 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 120,000 Americans in 2002. Beginning in 2000, women have exceeded men in the number of deaths attributable to COPD. In 2002, over 61,000 females died compared to 59,000 males. Smoking is the primary risk factor for COPD. 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. 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 never smokers. In 2002, 11.2 million U.S. adults were estimated to have COPD. However, close to 24 million U.S. adults have evidence of impaired lung function, indicating an under diagnosis of COPD. In 2004, the cost to the nation for COPD was approximately \$37.2 billion, including healthcare expenditures of \$20.9 billion in direct health care expenditures, \$7.4 billion in indirect morbidity costs and \$8.9 billion in indirect mortality costs. A recent American Lung Association survey revealed that half of all COPD patients (51%) say their condition limits their ability to work. It also limits them in normal physical exertion (70%), household chores (56%), social activities (53%), sleeping (50%) and family activities (46%).

Treatment Guidelines

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 which make 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. The American College of Physicians published COPD treatment guidelines in the November 6, 2007 *Annals of Internal Medicine*, accessible at: <http://www.annals.org/cgi/reprint/147/9/633.pdf>. The guidelines offer evidence-based strategies to assess and monitor COPD, reduce risk factors, manage stable COPD, and treat exacerbations.

COPD is not curable, and many of its symptoms are irreversible. The GOLD and the newer ATS/ERS criteria use postbronchodilatory spirometry measurements to stage severity. Stage I (mild) is defined as a postbronchodilatory FEV₁ of $\geq 80\%$ of predicted value. The ratio of FEV₁/FVC is $< 70\%$ for Stages I to IV of COPD. Symptoms may or may not be present. Stage II (moderate) is characterized by worsening airflow and a postbronchodilatory FEV₁ of between 50% and 79% of predicted values. In Stage III (severe), further worsening occurs and postbronchodilatory FEV₁ deteriorates to between 30% and 49% of predicted values. Finally, Stage IV (very severe) is defined as postbronchodilatory FEV₁ $\leq 30\%$ of predicted value, with or without symptoms.

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.

Albuterol inhalers are commonly used for patients in stage I, and as a supplemental therapy with a long-acting bronchodilator for patients in stage II. 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.

Like asthma, pharmacists are in a position to play a key role in the management of patients with COPD. 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 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.

The Move from CFCs to HFAs

The transition to HFA propellants has caused many current and prospective manufacturers of MDI inhalers to research advances in MDI technology. Pharmacists should be aware that these technical changes have led to greatly improved therapeutic benefits, including dosing consistency, less temperature sensitivity, optimal dose release during inhalation and longer shelf life. For example, changes to valve design provide dosing consistency. Another difference between HFA inhalers and their CFC counterparts is their temperature sensitivity with HFA MDIs less sensitive to temperature due to the higher volatility of HFA propellants. These new HFA propellants are capable of significantly improved drug delivery efficiency compared to CFC MDIs or conventional dry powder inhalers (DPIs.) Key differences between CFC and HFA propellants are shown in table One.

HFAs are generally similar to CFCs in terms of patient safety and efficacy. There are some specific differences, however, between the CFC and HFA inhalers that are product dependent on the product and generally center on priming the inhaler. Pharmacists should counsel patients accordingly per the manufacturer instructions in Table Two.

The overall cost to the industry related to the CFC to HFA transition globally was estimated at \$1 billion US in 1999.

FDA Orange Book Ratings and Product Substitution

HFA-propellant formulations of inhaled drugs are not generically interchangeable with their CFC counterparts nor may they be across HFA products. Specifically, none of the albuterol sulfate HFA products are AB rated in the FDA Orange Book (www.fda.gov/cder/ob); rather they are BX rated. Drug products that FDA considers not to be therapeutically equivalent to other pharmaceutically equivalent products, (i.e. drug products for which actual or

potential bioequivalence problems have not been resolved by adequate evidence of bioequivalence.) are designated BC, BD, BE, BN, BP, BR, BS, BT, BX, or B*. Often the problem is with specific dosage forms rather than with the active ingredients. Specifically, a BX code is assigned to specific drug products for which the data that have been reviewed by the Agency are insufficient to determine therapeutic equivalence under the policies stated in this document. In these situations, the drug products are presumed to be *therapeutically inequivalent* until the Agency has determined that there is adequate information to make a full evaluation of therapeutic equivalence.

The practical impact of the BX rating is that available albuterol sulfate HFA inhalers are not generically substitutable for one another nor are they substitutable for their CFC counterpart. As such, physicians writing prescriptions should specify ProAir HFA, Proventil HFA or Ventolin HFA. Product substitution laws vary state by state. As a result, while generic substitution is not permissible when the FDA Orange Book ratings are used, some states might have different substitution guidelines. As such, pharmacists are encouraged to revisit their state product substitution laws related to BX-rated products.

Steps for Patients in Converting Inhalers

There are a number of important factors to consider when patients convert from CFC to HFA inhalers, including possible dosing adjustments, differing spray characteristics that may impact patient perception and inhaler use and cost considerations.

While most new HFA inhaler formulations are comparable in safety and efficacy to their CFC counterparts, there may be instances where dosing adjustments for patients are required. This is because HFA formulation MDI are more efficient at drug delivery than their counterparts. Pharmacists should counsel patients to carefully self-monitor their conditions. If the medicine seems to become less effective, if their condition worsens or they begin to experience side effects, they should be advised to see their physician to assess whether dosage adjustments may be necessary. It is important to let patient know that HFA is an inert propellant and it has not been shown to interact with active ingredients in inhalers or to cause any other side effects.

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 before they begin using the HFA inhalers about these differences 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.

There are also cost implications for converting patients from CFC to HFA-based inhalers as well since the available albuterol sulfate HFA-based inhalers are not substitutable with the generic CFC formulation and each carries a higher average wholesale price.

For patients who have financial issues, pharmacists should work with them to see if they may access any patient assistant programs. The Pharmaceutical Research and Manufacturers Association (PhRMA), along with many

coalition partners, operates a coordinated website that allows patients to determine their eligibility for manufacturer and state assistance programs. The website is www.pparx.org. If the patient does not qualify for any programs, pharmacist may want to work with their physician caregivers to see there are any suitable alternative medications which may be available generically.

Pharmacist Counseling Tips

In summary, for the most part, patients switching from CFC to HFA-based inhaler formulations should experience little change. A quick “Your Questions Answered” fact sheet may also be accessed at www.youlunghhealth.org/headlines/cdc_inhalers_qa.cfm outlining the reasons behind the CFC phase out, how the new inhalers compare to the older ones, and addressing some cost, insurance and access issues. Pharmacists should advise patients:

- Ø 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.
- Ø the spray is softer and warmer, avoiding the “cold spray effect” associated with CFC inhalers.
- Ø 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.
- Ø the HFA and CFC formulations for each inhaler and drug are comparable in efficacy and safety.
- Ø that HFA is an inert propellant that does not interact with the active ingredient in inhalers or cause any other side effects.
- Ø like the CFC counterparts, patients should avoid spraying HFA formulations in their eyes.
- Ø if their medication seems to become less effective or if asthma worsens, pharmacists should instruct patients to seek immediate medical attention.

Table One
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

Table Two
HFA Inhalers: Specific Patient Instructions*

Product	Manufacturer	Adult Dosing	Priming Required	Usage Notes
Short Acting Beta ₂ Agonists				
Albuterol				
ProAir HFA 8.5 grams, 200 metered doses	Teva Specialty Pharmaceuticals	2 puffs every 4-6 hours; each puff delivers 90 mcg albuterol base	3 Test Sprays before use and after no use for 2 weeks	Shake well before use; Clean mouthpiece weekly
Proventil HFA 6.7 grams, 200 metered doses	Schering-Plough Laboratories	2 puffs every 4-6 hours; each puff delivers 90 mcg albuterol base	4 Test Sprays before use and after no use for 2 weeks	Shake well before use; Clean mouthpiece weekly
Ventolin HFA 18 grams, 200 metered doses	GlaxoSmithKline	2 puffs every 4-6 hours; each puff delivers 90 mcg albuterol base	4 Test Sprays before use and after no use for 2 weeks	Shake well before use; Clean mouthpiece weekly
Xopenex HFA 15 grams, 200 metered doses	Sepracor	2 puffs every 4-6 hours; each puff delivers 90 mcg levalbuterol	4 Test Sprays before use and after no use for 3 days	Shake well before use; clean mouthpiece weekly
Anticholinergics				
Ipratropium				
Atrovent HFA 12.9 grams, 200 metered doses	Boehringer Ingelheim,	2 puffs, 4 times a day; each puff delivers 17 mcg ipratropium	2 Test Sprays before use and after no use for 3 days	Does not require shaking; Clean mouthpiece weekly
Corticosteroids				
Beclomethasone				
QVAR HFA 40 mcg, 7.3 grams; 100 metered doses 80 mcg, 7.3 grams; 100 metered doses	IVAX Laboratories	40-80 mcg 2 times a day;	2 Test Sprays before use and after no use for 10 days	Does not require shaking; Clean mouthpiece weekly
Fluticasone				
Flovent HFA 44mcg, 10.6 grams, 120 metered doses 110 mcg, 12 grams, 120 metered doses, 220 mcg, 12 grams, 120 metered doses	GlaxoSmithKline	88mcg-440 mcg 2 times a day depending on use of other agents	4 Test Sprays before use and after no use for 7 days or if dropped	Shake well before use; Clean mouthpiece weekly

** Information compiled from each product's prescribing information leaflet accessed via the Internet on August 25, 2005.*