Technician Tutorial: Dispensing Inhaled Medications

Inhalation is a great way to get medications directly into the lungs. Inhaled medications delivered via inhalers and less commonly, nebulizers, are usually used to treat conditions associated with breathing problems such as asthma or chronic obstructive pulmonary disease (COPD). In fact, just a puff or two from the right inhaler can mean the difference between life and death in extreme situations. However, inhaled meds can be tricky for patients to “get right.” There are a number of things that can go wrong with inhaled meds in relation to use, storage, etc. This PL Technician Tutorial looks at ways pharmacy technicians can help patients make the most of their inhaled medications.

M.K. is a 33-year-old male patient with a history of asthma. He comes in with a new Rx for Advair Diskus, 1 inhalation every 12 hours. M.K. has been using an albuterol inhaler on an as-needed basis plus a steroid inhaler (fluticasone) for quite some time. He won’t be getting the fluticasone inhaler refilled, but he will need to keep getting his albuterol inhaler (Proventil HFA) in addition to the Advair Diskus.

What types of medications come in inhaled dosage forms?
Meds that come in inhaled forms usually help open up the airways so patients with breathing problems can breathe normally. These meds include:
- steroids, such as fluticasone, that reduce swelling in the airways
- beta-agonists, such as albuterol (called salbutamol in Canada), that open up airways
- anticholinergic drugs, such as ipratropium, which relax airways and reduce secretions.

Tobramycin, an antibiotic, is another example of a med that comes in inhaled forms. It can be used to treat serious lung infections, such as in patients with cystic fibrosis.

What are the different types of inhalers?
Inhalers are generally referred to as either MDIs (metered-dose inhalers) or DPIs (dry powder inhalers). MDIs may also be called HFAs in reference to the chemical propellant (hydrofluoroalkanes), HFA MDIs, or “wet” inhalers. You may remember that MDIs used to have chlorofluorocarbons, or CFCs, as propellants. Those have been phased out because CFCs can harm the environment. There’s also a new type of inhaler called a soft mist inhaler, or SMI. SMIs mechanically aerosolize medicine and do not contain a chemical propellant. It is important to know that the different types of inhalers have nuances, such as requirements to twist a base, move a lever, pierce a capsule, etc.

MDIs are usually L-shaped. Some available MDIs include albuterol (ProAir HFA [U.S.], Proventil [U.S.], Ventolin HFA [salbutamol in Canada]), beclomethasone (QVAR), ciclesonide (Alvesco), cromolyn (Intal [U.S.]), fluticasone/salmeterol (Advair HFA), ipratropium (Atrovent), and levalbuterol (Xopenex HFA [U.S.]). These HFA MDIs have a chemical propellant, as mentioned in the previous section. The chemical
propellant helps spray the medication out of the canister and into the patient’s airways via the mouth. This is similar to the way hairspray and spray paint are expelled from their cans.

Proper use of an MDI requires a certain amount of coordination on the part of the patient. At the same time as the device is compressed to release a dose, the patient must inhale the medicine through the mouth and into the airways. MDIs typically require a long, slow breath upon inhalation.

Spacer devices or valved holding chambers (essentially a spacer with a one-way valve) can be used with MDIs to help make them easier for patients to use. These devices allow for some flexibility when the patient is trying to coordinate deploying the inhaler with his or her inhalation. This can be tough for some people, such as children and the elderly. The device is attached to the inhaler as an extension of the mouthpiece, and holds the medication that is sprayed out of the MDI until the patient inhales it.

**DPIs** are usually disk- or tube-shaped. Some available DPIs include formoterol (Foradil, Oxeze [Canada]), tiotropium (Spiriva), fluticasone/salmeterol (Advair Diskus), fluticasone (Flovent Diskus), salmeterol (Serevent Diskus), and budesonide (Pulmicort Flexhaler [U.S.], Pulmicort Turbuhaler [Canada]). DPIs have powder in the inhaler device that is propelled into the lungs by the force of the patient’s inhalation. They do not have a propellant like MDIs. Arcapta (indacaterol [U.S.]), Foradil, and Spiriva have the powder in separate capsules, which the patient must place into the inhaler device before use. Unlike MDIs, DPIs should be used with a short, fast, and forceful inhalation.

DPIs are considered to be easier to use than MDIs. In fact, DPIs were introduced to overcome the problems of poor technique associated with MDIs. However, one in three patients uses his or her DPI incorrectly. One problem that occurs is when patients swallow the capsules meant for use with a DPI, instead of placing the capsule in the inhaler device. When these capsules are taken orally, they do not help loosen up the airways as they would if their contents were inhaled into the lungs.

Unlike MDIs, DPIs should not be used with spacer devices. This is because the patient’s inhalation actually sucks the drug into the airways, as opposed to both the compression of the inhaler device and the patient’s inhalation with MDIs.

As mentioned, **SMIs**, or soft mist inhalers, are new on the market. The only ones available so far are albuterol/ipratropium (Combivent Respimat [U.S.]) and olodaterol (Striverdi Respimat). Combivent Respimat replaced the old Combivent formulation, which was a CFC MDI. SMIs are most similar to MDIs, and they are used in much the same way. The soft mist inhalers look like a short tube. Instead of a propellant, a spring mechanism inside the device aerosolizes the medicine.

**What is a nebulizer?**

A nebulizer is a machine, sometimes called a “breathing machine,” that changes medication from liquid into mist. Nebulizers can be used for hospital inpatients, or they can be used at home for outpatients. Nebulizers can be good for small children or for elderly patients who have trouble using inhalers. Meds given via nebulizers might be referred to as “breathing treatments.”

Nebulizers come in different sizes and require either plugging in to an electrical outlet or a battery. Some are quite compact, and others are larger. They typically have a mouthpiece or mask, an air compressor, a cup where the medication is placed, and tubing that connects the cup and compressor.

Inhaled meds such as albuterol, levalbuterol, and ipratropium come in formulations made especially for nebulizers. They are typically packaged in convenient individual doses, in plastic vials (also called nebules in Canada). Patients may need to mix these solutions with each other, such as albuterol and ipratropium. Or they may need to dilute the medication with 0.9% saline, such as for concentrated albuterol (0.5%, which
comes as 2.5 mg/0.5 mL vial or 5 mg/mL in 20 mL vials [10 mL bottles in Canada]). Some inhaled meds must be used with a specific type of nebulizer. This information can be found in the med’s package insert.

When M.K. hands you his new Rx for Advair Diskus, he mentions that his other inhalers haven’t been working well enough. He says he guesses that the Advair is going to replace his steroid inhaler.

**What should I watch for when inputting prescriptions for inhalers?**

Choose the right med. If a patient asks for a refill of his or her “breathing med,” make sure you ask specifically which one if the patient uses more than one inhaler. This is often the case, that a patient uses more than one “breathing med.” It’s typical for a patient to use a scheduled “controller” such as an inhaled steroid, and a PRN “reliever” such as albuterol. A controller med is used every day, just like a blood pressure medication or a diabetes medication, and helps keep the airways open all the time. A reliever med is used when a patient has trouble breathing, to open up the airways quickly, and as needed.

Be careful with inhalers that come in multiple strengths, such as Flovent, Symbicort, etc. Be sure to choose the right strength. Likewise, watch for inhalers that come as both a DPI and MDI version such as Advair and Flovent. Be sure to choose the right type of inhaler. A number of medications that come in inhalers, such as fluticasone and ipratropium, also come as nasal sprays with similar names. Avoid mix-ups by checking with the pharmacist if you have any confusion over which dosage form or dose is to be dispensed.

Watch for a correct sig. As you can see, inhaled steroids are usually used on a scheduled basis, such as once daily or BID. Short-acting beta-agonists such as albuterol (or salbutamol in Canada) are often used on a PRN basis. These aren’t hard and fast rules though. In fact, the long-acting beta-agonists, formoterol (Foradil, etc) and salmeterol (Serevent, etc), should not be used on a PRN basis. They are the same class of drug as albuterol. But albuterol’s action is quick and short, whereas formoterol’s and salmeterol’s actions are slower and longer. If you see these drugs prescribed PRN, alert the pharmacist. He or she might need to contact the prescriber for clarification.

Enter the correct days’ supply. Be sure to enter the correct days’ supply for inhalers. Check to see how many “puffs” there are in one inhaler. This information can usually be found on the box or outer wrapping of the inhaler. If it is not on the box or outer wrapping, check the package insert.

**Example:** A patient brings in a prescription for an albuterol (ProAir) inhaler 2 puffs four times daily PRN. You figure that this is up to 8 puffs per day. A ProAir inhaler has 200 puffs. What is the days’ supply?

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\frac{200 \text{ puffs/inhaler}}{8 \text{ puffs/day}} = x \text{ days/inhaler}
\]

\[
x = 25 \text{ days/inhaler}
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*You calculate the days’ supply of Advair Diskus for M.K.* There are 60 inhalations per DPI. M.K. will use two inhalations each day, so one DPI is a 30-day supply. You also double check with M.K. to see if he needs a refill of his albuterol inhaler. He thanks you and says “no,” that he has a good supply for now.

**Is there any special labeling for inhalers?**

If you apply a label directly to an inhaler, be careful not to cover up the dose counter (if there is one) or any other important information. Also avoid putting the label in a place where it could interfere with use of the device.
Use-by dates. Many inhalers will have a “use-by” date that applies after they are removed from their outer wrapping. This means that the manufacturer’s expiration date (stamped on the box, canister, or other packaging) is null and void if it extends past the amount of time allowed after the outer wrapping is removed. This information is included in the product’s package insert. Sometimes use-by times will vary between different sizes or strengths of the same brand of inhaler (e.g., Flovent Diskus [U.S.]). These shorter times to expiration are assigned based on stability testing. The reduced potency of these expired products could hypothetically lead to reduced efficacy for patients who continue to use them. See our PL Chart, Correct Use of Inhaler Devices, for the “use-by” or “beyond-use” dating for the different inhalers (U.S. subscribers; Canadian subscribers).

Include an auxiliary label indicating the use-by date on these products, or mark the use-by date as recommended by the manufacturer’s instructions. Also, remember that the manufacturer’s expiration date should be used if it’s shorter than the use-by date after removal of protective packaging.

Shake well. MDI inhalers that are suspensions, such as Flovent HFA, Proventil HFA, Symbicort, and Xopenex HFA should get a “shake well” label. Shaking these inhalers before use helps mix the drug and propellant to ensure the patient will get a uniform dose each time.

Storage. Moisture in a DPI can create problems, like caking of the dry powder medicine. It’s very important for patients to keep their DPIs dry. DPIs should be stored in a dry place, not in a bathroom cabinet or close to a sink area. Place an auxiliary label indicating this on the packaging, if you have such a label available.

Note that formoterol (Foradil) capsules must be stored in the fridge prior to dispensing, but patients can store them at room temp.

Patients might hear that they need to store their inhalers upright. This isn’t true for most inhalers.

MedGuides. In the U.S., be sure to dispense a MedGuide with formoterol- and salmeterol-containing inhalers, including Advair, Dulera, Serevent, and Symbicort. These meds can be dangerous if they are not used correctly. As mentioned, they aren’t meant for use on a PRN basis as rescue inhalers like albuterol because they take longer to act.

Other. Dry powder capsules (e.g., Foradil, Spiriva, etc) should always be labeled as “not for oral use” when they are dispensed. Patients should be instructed to keep these capsules in their original packaging, not in any other kind of storage container such as a pill box, prior to use.

Besides special labeling, the pharmacist may wish to speak with patients who are new to inhalers, or to those who have questions about using their inhalers. It is important that these patients understand how to properly use their inhalers, not only with regard to administration of the medication, but also for cleaning the device, priming the device, etc. The instructions can vary between the different types of inhalers as well as the different brands of inhalers that are the same type. We have PL Patient Education Handouts that you can have ready for patients with inhalers. These can help with tips for priming, cleaning, etc:  
- Tips for Correct Use of Inhalers (U.S. subscribers; Canadian subscribers)  
- Video Instructions for Different Inhaler Devices (U.S. inhaler devices)

We also have a PL Chart that is very useful, with the different types of available inhalers, brands for each, and steps for use and care: Correct Use of Inhaler Devices (U.S. subscribers; Canadian subscribers).
You place an auxiliary label with the use-by date on the outer packaging of the Advair Diskus, along with instructions to store it in a dry place. You also get a patient education handout and a MedGuide ready for M.K.

**I’ve heard of the “float test.” Is this a good way to tell if an MDI is empty or not?**

Patients should never float their inhalers in water to find out whether or not they are empty. This method is not reliable. Plus, it could actually damage or clog the inhaler.

It’s important for patients to make sure they always have enough medication in their inhalers, or that they have a fresh refill on hand. You can tell patients how many puffs are in their inhalers. Some inhalers actually have dose counters, so that a patient can tell exactly how many puffs are left. To know exactly how many puffs are left in inhalers without dose counters, patients have to keep track of how many puffs they’ve used. They should write down the day they started the inhaler and the day it should be empty. It’s not a bad idea for patients who are using inhalers on a PRN basis to go ahead and keep an extra on hand, just in case.

**What should I watch for when inputting prescriptions for nebulizer solutions?**

As for inhalers, make sure you calculate the days’ supply correctly with nebulizer solutions. Use the number of vials (nebulules) per box, not mLs of medication per box. Each vial is considered single-use and excess medication from an open vial must be discarded, not saved for later use.

However, when entering the quantity of nebulizer solutions, use the total number of mLs per box, not the number of vials. This is the number most computer systems will require.

For example, if a patient comes in with an Rx for levalbuterol (Xopenex) 0.31 mg/3 mL nebulized three times daily x 1 box, the days’ supply would be 24 vials/box / 3 vials/day = 8 days/box. If the patient is getting one box, you would enter a quantity of 72 mL into the computer, not 24 vials or 1 box. You would calculate the quantity by multiplying the number of vials per box by the volume of each vial: 24 vials/box X 3 mL/vial = 72 mL/box.

Also keep in mind that nebulizer solutions are typically billed under Medicare Part B, which means a diagnosis code is required, along with exact directions for use, etc.

**What should I watch for when dispensing prescriptions for nebulizer solutions?**

Be very careful with strengths and volumes of nebulizer solutions. These can be easy to mix up. For example in the U.S., albuterol nebulizer solutions come in 0.63, 1.25, and 2.5 mg per 3 mL vials and 2.5 mg per 0.5 mL (0.5%) vials. Multiple strengths/volumes of salbutamol are also available in Canada. Keep in mind that albuterol and levalbuterol can be easy to mix up as well.

As mentioned, 0.5% albuterol solution may require dilution with 0.9% saline prior to use in a nebulizer. You will need to dispense the saline as well as the albuterol.

Dispense nebulizer solutions in their original packaging. The vials/nebulules of medication are packaged in foil pouches to protect them from light. Let patients know they need to keep them in their foil pouches prior to use. This includes after opening the pouch, if there are multiple vials/nebulules per foil pouch.

Keeping vials/nebulules in their packaging also helps prevent mix-ups with similar looking vials/nebulules when patients are using multiple nebulized meds. It can be very difficult to read drug names and strengths that may be embossed on the packages and not printed in colored ink. This may be especially important in the hospital setting, where individual doses may be dispensed for inpatients.
In the inpatient setting, be sure vials/nebules are appropriately dated if they are removed from light protective packaging when dispensed. For example, Xopenex (U.S.) is only good for one week once removed from its foil pouch. Learn and follow any other policies or practices your pharmacy has in place for dispensing these meds.

**Is there any special labeling for nebulizer solutions?**
As for capsules that come with DPIs, place a “do not swallow” label on nebulizer solutions to let patients know they are only to be used with a nebulizer for inhalation. Use a “refrigerate” label with the inhaled enzyme medication, dornase alfa (Pulmozyme). Also, tell patients to be sure and fill out the “use-by date” labels that come with some nebulizer solutions. Similar to the Xopenex example in the previous section, Pulmicort (U.S.) expires 14 days after the foil pouch is opened (three months for Canadian Pulmicort) and Brovana (U.S.) expires after 42 days if stored at room temperature.

In the U.S., similar to inhalers with these ingredients, be sure to dispense a MedGuide with arformoterol (Brovana) and formoterol (Perforomist) nebulizer solutions.

As the pharmacist is talking with M.K. about his new inhaler, M.K. asks how he can tell if he has doses left in his albuterol inhaler. He says he had a bad asthma attack recently and had plenty of albuterol on hand, but it has crossed his mind that he would be in big trouble if his albuterol inhaler were ever empty. The pharmacist tells M.K. not to put the inhaler in water for the “float test.” He advises M.K. to have an extra inhaler available, and to be sure to pay close attention to the number of inhalations remaining on the device’s dose counter. He also tells M.K. that if there is no dose counter, he should write down the date of his last refill to have at least a rough idea of how much of this “reliever” med is left.

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