A CURRENT REVIEW OF SPACER AND VALVED HOLDING CHAMBER TECHNOLOGY

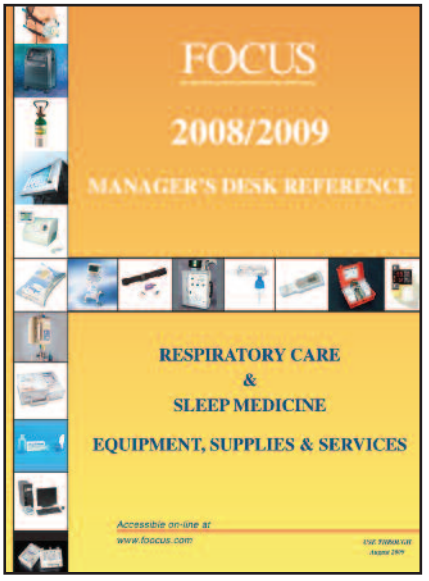
By Stephanie Richardson

Although only a handful of advances have been made during the past few years in the realm of spacers and holding chambers, that doesn't mean they are any less important to asthma management. Here, we will take a look at what the marketplace has to offer respiratory therapists and patients who uses these devices as part of asthma therapy.

Anti-static chambers

The electrostatic attraction of aerosol particles to a holding chamber's walls can reduce medication delivery, especially if there is a delay between actuation and inhalation. Multiple studies have determined that holding chambers made from non-electrostatic materials can increase drug delivery.

Non-electrostatic metal holding chambers extend the amount of time available for patients to inhale their medication. Because of the extended time for inhalation, non-electrostatic holding chambers are helpful for patients struggling with MDI technique because they have a larger window wherein they can inhale the drug. Lung deposition can be increased up to 60 percent with the use on a non-electrostatic device.



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Valved holding chambers made from transparent polymers can accumulate electrostatic charge during the manufacturing process. Although that charge can be removed by washing with ionic detergent, most respiratory therapists and patients prefer a device that can be used right out of the box.

Anondized aluminum holding chambers have no electric charge, so patients receive more of their medication. Some other chambers have been redesigned with anti-static polymers, which provide a clear chamber through which an RT can visualize the medication.

One of these devices has a built-in duckbill valve. This patent-pending feature is designed to open with minimal inspiratory effort for patients with low tidal volume and ensures a low loss of medication. The valve also closes upon expiration so medication does not go back into the chamber. The resulting cyclonic inspiratory flow pattern allows more medication to remain suspended in the chamber and available for inhalation.

Another anti-static valved holding chamber that has a duckbill valve also operates with a baffle system. The baffle is located in front of the duckbill valve and promotes the impaction of large, non-respirable particles on the walls of the holding chamber prior to inhalation. That means side effects can be reduced because oral deposition is decreased.

The system works on lower resistance and requires less effort to open by patients unable to take a deep breath. The one-way valve also prevents patients from exhaling into the chamber, ensuring medication is available for the next breath.

The smallest spacers

Possibly one of the smallest spacers available to patients is just 1 inch long and weighs in at less than 1 oz. Despite their size, researchers showed these small spacers outperformed larger devices in regard to the amount of respirable dose delivered to patients. They also are proven to reduce "impactor throat" deposition by more than 70 percent.

Some tiny spacers have a built-in screen wall that prevents large particles of aerosol medicine from depositing in a patients mouth or throat. At the same time, this helps increase the amount of small drug particles that pass through to the lungs. The screen also helps ensure adequate coordination time between MDI actuation and inhalation.

Patients and RTs trying to join in the "green" movement will be glad to know that these spacers last four to six months

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before they require replacing. And because they are made with plastic polyethylene, they are recyclable.

Paper holding chambers

A new alternative to traditional and non-electrostatic holding chambers is popping up in doctors' offices across the country. Collapsible holding chambers built from cardboard material offer patients multiple uses (up to one week) and can exceed the efficacy of their plastic counterparts.

Researchers found that in a busy, municipal hospital ER, bronchodilator therapy for adults with acute exacerbation of asthma can be administered just as efficaciously using a paper holding chamber as with a conventional nebulizer. This may result in savings in time and effort invested by the RT and, thus, a savings in total cost for treatment.

Beyond that, these disposable devices reduce worries of infection control, and they can increase patient compliance because they are portable and convenient. Paper holding chambers are also a cost-conscious treatment option for patients with acute asthma during the short term.

What about face masks?

Integrating a face mask with a valved holding chamber is a proven way to facilitate the inhalation of asthma medicines from MDIs in children and adults. However, face masks have only recently been recognized as an important part of effective aerosol delivery.

Studies have shown that a tight seal provided by a face mask is crucial for optimal aerosol deposition to the lungs. However, it can be difficult to get a good seal, especially in children who can be fidgety or uncooperative during asthma treatment.

A face mask's design will have an impact on how good of a seal can be obtained. Designers consider several factors when developing masks, including shape, material, weight, flexibility and dead space. By optimizing these characteristics, manufacturers can improve maximize future face mask designs. This kind of optimization can reduce the variability of dose introduced to a patient's respiratory tract while making the mask more comfortable and patient-friendly.

One such design has a soft, curved lip that is more comfortable for patients due to a less forceful seal. This particular mask is available with an inspiratory flow indicator, which assists caregivers by providing visual confirmation that the mask has a satisfactory seal. If a good seal is achieved, the indicator will move toward the patient during inhalation and return to its original position during exhalation.

Another face mask is shown to reduce dead space by up to 25 percent more than others. This mask is built with reinforcements that help prevent the mask from collapsing. Although these masks are available in three sizes, they all fit the standard size holding chamber so patients can use the same holding chamber even if they outgrow their mask.

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