

Nebulisers and spacers

Pressurised metered dose inhalers (pMDIs) used in the management of asthma or chronic obstructive pulmonary disease (COPD) are best administered through a small volume spacer.

In the past, there has been a belief that salbutamol delivered via a nebuliser is more effective than inhaled therapy during acute exacerbations of asthma or COPD. However, comparison of nebulised salbutamol therapy with pressurised metered dose inhalers (pMDIs) plus spacer shows no difference in clinical outcomes among patients with asthma or COPD. There is also no clear evidence supporting the use of nebulisers over pMDI plus spacer based on severity of the exacerbation.

Benefits of spacers

Spacers should be used with pMDIs for all residents in aged care facilities, as co-ordination between inhalation and actuation of inhaler can be extremely challenging. Spacers significantly increase the amount of bronchodilator delivered to the lungs.

The use of a spacer is recommended with inhaled corticosteroids (ICS) to reduce the risk of local adverse effects such as oral thrush and dysphonia, and to increase delivery to the lungs.

The best way to deliver inhaled medicines via a pMDI and spacer is to shake the device, ask the person to breathe out all the way into the spacer, actuate a single puff into the spacer and have the resident immediately take a slow, steady and deep breath over 3 to 5 seconds from the spacer. Then hold their breath for 5 seconds. This process should be repeated after shaking the device again.

Salbutamol nebulules

Salbutamol nebulules are a short-acting beta2-receptor stimulant, indicated for the relief of bronchospasm in patients with asthma or COPD, and for acute prophylaxis against exercise-induced asthma or in other situations known to induce bronchospasm.

The Pharmaceutical Benefits Schedule (PBS) restricts the prescription of salbutamol nebulules to patients with asthma and COPD unable to use an oral pressurised inhalation device via a spacer. Salbutamol nebulules are available as 2.5mg/2.5mL and 5mg/2.5mL.

In adults, the recommended dose for relief of bronchospasm is one 5mg/2.5mL nebulule via a nebuliser every 4 to 6 hours. Doses may be reduced in older persons initially, and then gradually increased if insufficient effect.

Single dose units are packed in strips of 5 ampoules per foil pouch. They should be used within 3 months of opening the foil pouch. Fresh dilutions should be prepared for each inhalation and any solution remaining in the nebuliser after treatment should be discarded immediately.

Following inhalation of salbutamol, the onset of action is 5 to 15 minutes. Only 10-20% of the dose reaches the lungs. Salbutamol reaching the lungs acts rapidly and directly on bronchial smooth muscle to provide relief of shortness of breath, wheezing and cough.

Ipratropium nebulules

Ipratropium is an anticholinergic bronchodilator indicated for relief of bronchospasm in patients with asthma or COPD.

The Pharmaceutical Benefits Schedule (PBS) restricts the prescription of ipratropium nebulules to patients with asthma and COPD unable to use an oral pressurised inhalation device via a spacer.

Atrovent Nebulising Solution is available as 250microg/mL and 500mcg/mL unit dose vials. The usual adult dose is 250-500 microg 4 times daily via a nebuliser. The nebulules must be diluted to 2-3mL with normal saline for nebulisation. Diluted solutions should be freshly prepared before use and any solution remaining in the nebuliser, on completion of inhalation, should be discarded.

Following inhalation, 10-30% of the dose is generally deposited in the lungs. The major part of the dose is swallowed and passes into the gastrointestinal tract.

Atrovent and Ventolin nebulules may be administered together.

Comparison

Salbutamol delivered via nebuliser requires a higher dose than salbutamol administered via a pressurised metered dose inhaler, without added therapeutic benefit. The dose equivalent to 5mg of salbutamol delivered by nebuliser is 10-15 puffs of 100microg salbutamol by pMDI plus spacer.

Nebulisers deliver a lower fraction of the prescribed dose than a pMDI plus spacer – approximately 10% versus 20-30% - and therefore larger doses are prescribed.

Administration of salbutamol by pMDI plus spacer is more effective than by nebuliser because a greater dose is delivered in a shorter period of time and a larger dose is delivered to the lungs as the result of greater targeting efficiency.

Extrapulmonary adverse effects such as tremor, heart rate and anxiety are more likely with salbutamol delivery via nebuliser compared to pMDI plus spacer, related to the increased dose. Nebuliser use is associated with greater increases in heart rate than with use of a pMDI plus spacer, suggesting a larger systemically absorbed dose is administered by nebulisers.

Acute asthma management

The Australian Asthma Handbook recommends use of a salbutamol pMDI plus spacer for the management of acute asthma attacks. For a mild to moderate asthma flare-up, 4 to 12 puffs of salbutamol should be administered via a spacer. If symptoms are severe, 12 puffs can be administered via a spacer. It is only in a life-threatening situation in hospital that salbutamol nebuliser via continuous nebulisation driven by oxygen are indicated.

Tidal breathing with 4 breaths in and out without removing the spacer may be used during an acute attack.

Infection control

Use of nebulisers can disseminate aerosols and potentially contribute to spread of respiratory viral infections. The Australian Asthma Handbook states that use of nebulisers carries a high risk of transmitting viral infections because they generate aerosol particles that can spread for several metres and remain airborne for more than 30 minutes. The Australian Asthma Handbook further states that use of nebulisers increases the risk of transmitting respiratory infections to staff and other patients.

If use of a nebuliser is needed in settings where COVID-19 infection is possible, strict infection control procedures should be followed. For patients with known current COVID-19 infection Australian guidelines recommend against the use of a nebuliser.

Care of spacers

Plastic spacers should be cleaned once a month. Spacers should be washed in warm water with liquid dishwashing detergent and allowed to air dry without rinsing or wiping.

If a new plastic spacer must be used immediately, it can be primed by firing multiple puffs (at least 10 puffs) of the medicine from the pMDI into the spacer at the same time. This is to reduce the electrostatic surface charge inside the spacer, which reduces the proportion of medicine available for delivery to the lungs.

Non-plastic spacers such as cardboard ones or the newer polyurethane/antistatic polymer spacers do not require preparation before first use.

Summary

Use of pMDIs with a spacer is at least as effective as a nebuliser for the delivery of salbutamol, even during symptomatic exacerbations or flare-ups of asthma or COPD. Spacers should be used with all pMDIs for residents in aged care facilities.

References

National Asthma Council Australia. *Australian Asthma Handbook*.
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