Review: \( \beta \) agonist delivery by metered dose inhaler with a valved holding chamber (compared with a nebuliser) reduces admissions in preschool children and infants with acute asthma or wheezing


Q: What is the relative efficacy of \( \beta \) agonists delivered by metered dose inhaler (MDI) with a valved holding chamber (VHC) or by nebuliser in infants and preschool children with acute exacerbations of wheezing or asthma?

**METHODS**

Data sources: Medline (1966–2003), EMBASE/Excerpta Medica (1980–2003), Cochrane Controlled Trials Register; and reference lists of included studies, reviews, and texts.

Study selection and assessment: randomised controlled trials (RCTs) in any language that compared \( \beta \) agonist delivery by MDI + VHC with delivery by nebuliser in infants and children <5 years of age who presented to the emergency department (ED) or equivalent setting with acute exacerbation of wheezing or asthma. Exclusion criteria: studies of admitted patients. Methodological quality of individual studies was assessed using the 5 point Jadad scale (adequacy of randomisation, blinding, and handling of withdrawals and dropouts).

Outcomes: primary outcome was admission to hospital; secondary outcomes included final clinical score.

**MAIN RESULTS**

6 RCTs (491 children, 1–60 mo) met the selection criteria. 3 studies scored 5 out of 5 on the Jadad scale, and 3 scored 3 out of 5. All trials used a multiple dose \( \beta \) agonist protocol: 5 trials used salbutamol (albuterol), and 1 used terbutaline. Treatment duration was 40–120 minutes. 5 trials used jet nebulisers, and 1 used an ultrasonic nebuliser.

Meta-analysis was done using a random effects model. Fewer children who received \( \beta \) agonists by MDI + VHC than by nebuliser were admitted to hospital (table). Meta-analysis of 5 trials (n = 427) that assessed clinical severity using various clinical scores showed a greater decrease in severity with delivery by MDI + VHC compared with delivery by nebuliser (standardised mean difference –0.44, 95% CI –0.68 to –0.20).

**CONCLUSION**

Delivery of \( \beta \) agonists by metered dose inhaler with a valved holding chamber is associated with fewer hospital admissions and a greater reduction in clinical severity than delivery by nebuliser in infants and preschool children with acute exacerbations of wheezing or asthma.

**Commentary**

The review by Castro-Rodriguez and Rodrigo addresses whether children <5 years of age with an acute episode of wheezing or asthma should be treated with \( \beta \) agonists delivered by MDI + VHC or by nebuliser. The finding that delivery by MDI + VHC is more effective than delivery by nebuliser in reducing the need for hospital admission has important implications. Families of children with asthma may visit the ED or urgent care centre to receive nebulised treatment if this is not available at home. Given that treatment by MDI + VHC is more likely to reduce the need for hospital admission than nebulisation, nurses should feel confident in their teaching and recommendation that nebulised treatment is not necessary and that treatment with a MDI + VHC is more effective in managing acute asthma. It is important to explain to parents that the dosing of bronchodilators is increased substantially during management of an acute attack compared with the usual 1–2 puffs that are used in daily management. Parents’ perception that nebulised treatment is superior to MDI + VHC may be due, in part, to a lack of understanding of the different doses used in acute situations and that the same drug is being delivered in the MDI + VHC and the nebuliser. The suggestion that fewer side effects may occur with delivery by MDI + VHC could make parents feel more comfortable with this treatment. In many cases, a child’s acute episode of asthma can be managed appropriately at home. It is essential for parents to have an action plan that details the dosing and administration of medications using a VHC to manage acute asthma at home and clear criteria for seeking medical attention (eg, incomplete relief or difficulty breathing or completing a sentence).

None of the studies included in the review by Castro-Rodriguez and Rodrigo included patients with life threatening asthma (ie, possibly requiring ventilation), and this may limit the generalisability of the findings to such patients. The findings of Castro-Rodriguez and Rodrigo inform the continued debate on the use of MDIs + VHCs and nebulisers. Nurses have an important role as knowledge translators in asthma care, especially in advising and triaging in primary care offices, teaching home management of acute asthma, and guiding parental response to acute episodes. This study has many implications for nurse-parent interactions around asthma treatment.

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**\( \beta \) agonist delivery by metered dose inhaler (MDI) with a valved holding chamber (VHC) v delivery by nebuliser in children <5 years of age with acute exacerbation of asthma or wheezing**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of trials (n)</th>
<th>MDI + VHC</th>
<th>Nebuliser</th>
<th>RRR (95% CI)</th>
<th>NNT (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital admission</td>
<td>6 (491)</td>
<td>11%</td>
<td>22%</td>
<td>52% (23 to 71)</td>
<td>9 (7 to 20)</td>
</tr>
</tbody>
</table>

*Abbreviations defined in glossary; RRR, NNT, and CI calculated from control event rate and odds ratio and CI reported in article.*