

# Spacers were better and less expensive than nebulizers for giving albuterol to children with moderate to severe acute asthma

Leversha AM, Campanella SG, Aickin RP, Asher MI. Costs and effectiveness of spacer versus nebulizer in young children with moderate and severe acute asthma. *J Pediatr.* 2000 Apr;136:497-502.

## QUESTION

In young children seen in the emergency department for moderate and severe acute asthma, is delivery of albuterol by metered-dose inhaler (MDI) and spacer a cost-effective alternative to delivery by nebulizer?

## DESIGN

Randomized (allocation concealed\*), blinded {patients, clinicians, and outcome assessors}†, \* controlled trial with 48-hour follow-up.

## SETTING

A children's hospital in Auckland, New Zealand.

## PATIENTS

60 children who were 1 to 4 years of age (mean age 34 mo, 64% boys), had a known history of asthma, and presented to the emergency department with an acute exacerbation of asthma that was rated as moderate to severe. Exclusion criteria were inhaled bronchodilator use in the hour before presentation, immediate admission to the intensive care unit, or a coexisting medical condition, such as pneumonia. Follow-up was complete.

## INTERVENTION

Children were allocated to albuterol, 600 µg by MDI and spacer ( $n = 30$ ), or to albuterol, 2.5 mg by nebulizer over 10 minutes ( $n = 30$ ). Treatments were repeated as needed at 20-minute intervals (maximum 6 treatments).

## MAIN COST AND OUTCOME MEASURES

The main outcome measures were clinical severity scores, heart rate, respiratory rate, oxygen saturation rate, and wheezing (score 0 [none] to 4 [silent chest]) at 60 minutes; admission to hospital; and visits to the emergency department at 48 hours. Fixed costs, human resources, and investigation and treatment costs were assessed in 1996 New Zealand dollars.

## MAIN RESULTS

Wheezing was reduced more in the spacer group after the first treatment than in the nebulizer group (mean difference in wheeze score 0.45, 95% CI 0.07 to 0.9,  $P = 0.03$ ). The increase in heart rate after first treatment was smaller in the spacer group than in the nebulizer group (mean difference 8.1 beats/min, CI 5.3 to 16.4,  $P < 0.01$ ). After

adjustment for sex, fewer children in the spacer group than in the nebulizer group required admission to the hospital (33% vs 60%,  $P = 0.04$ ; number needed to treat 4). Mean total costs were lower for the spacer group than for the nebulizer group (\$825 vs \$1282,  $P = 0.03$ ). Groups did not differ for clinical severity score, respiratory rate, oxygen saturation, tremor, or hyperactivity.

## CONCLUSION

In children seen in the emergency department for moderate and severe asthma, delivery of albuterol by metered-dose inhaler and spacer was a cost-effective alternative to delivery by nebulizer.

*Sources of funding: Asthma and Respiratory Foundation of New Zealand. Boehringer Ingelheim NZ Ltd. supplied the AeroChambers.*

*For correspondence: Dr. A. Leversha, General Paediatrics, Starship Children's Hospital, Private Bag 92-024, Auckland, New Zealand. FAX 64-9-837-8957.* ■

\*See Glossary.

†Information provided by author.

## COMMENTARY

Evidence has been building on the effectiveness of MDIs and spacers for the delivery of salbutamol to children with acute asthma (1, 2). This study by Leversha and colleagues adds to the body of evidence and also provides data on the cost-effectiveness of MDIs and spacers relative to nebulizer delivery systems. On the basis of this study and previous randomized trials, I think pediatric emergency departments should adopt MDIs and spacers as the primary delivery system for children presenting with acute asthma.

The 60% admission rate in the nebulizer group seems to be strikingly high. Most of the cost savings in the spacer group resulted from avoiding admissions. The explanation for this marked difference in admission rates between groups may be the fact that patients with severe disease were enrolled in the trial and that MDIs and spacers are that much more effective than nebulizers. However, in this relatively small trial of 60 patients, one must also consider the role of chance and statistical fluctuations because of the small sample size. Previous research on children did not show a reduced probability of hospital admission but did show that use of MDIs and spacers resulted in a shorter length of stay in the emergency department (2).

This study used high-quality methods (low risk for bias). The investigators ensured allocation concealment, and if the Jadad quality scale were applied, they would score top marks (5 out of 5) for this study (3).

We can therefore be confident that MDIs and spacers are at least as effective as nebulizers for delivery of salbutamol. Given the possibility that they are more cost-effective, it makes potential economic sense to adopt MDIs and spacers as our standard of care in pediatric emergency departments.

*Terry Klassen, MD  
University of Alberta  
Edmonton, Alberta, Canada*

## References

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