Authors' objectives
To assess drug delivery using metered-dose inhalers in conjunction with spacers (MDI-spacers), compared with nebuliser delivery, in the treatment of asthma, especially acute asthma.

Searching
MEDLINE (from 1987 to 2000) and International Pharmaceutical Abstracts (from 1970 to 2000) were searched; the search terms were stated. In addition, the reference lists from identified studies were checked and the respiratory education team at Dunedin hospital was contacted.

Study selection
Study designs of evaluations included in the review
The inclusion criteria were not explicitly defined in terms of the study design. Studies of the following designs were specified in either the tables or the text: randomised controlled trials (RCTs), controlled trials, cohort studies and reviews.

Specific interventions included in the review
Studies of devices for delivering beta-agonists or corticosteroids were eligible for inclusion. The stated focus of the review was studies that compared aerosol delivery devices and some studies of individual devices. The drugs used in the included studies were salbutamol, terbutaline, fenoterol and metaproterenol.

Participants included in the review
Studies of patients of any age who had airway disease were included. Studies of patients with conditions other than asthma or acute wheezing were excluded. The included studies were of adults and children with acute exacerbations of asthma.

Outcomes assessed in the review
The inclusion criteria were not explicitly defined in terms of the outcomes. The review's authors stated that the outcomes examined were efficacy of the delivery device, cost-effectiveness, portability and reported side-effects. According to the tables presented in the review, the included studies reported the following: the length of stay in an emergency department; drug delivered to lung; forced expiratory volume in 1 second; acceptance by patients; reduction in wheezing; patient preference; speed of treatment response; and bronchodilation. The authors used the term 'therapeutic response' when describing results in the text, but they did not define this term.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Validity was not formally assessed in the review. The authors stated that they considered randomised controlled studies 'more powerful' and that the sample size and study duration were used to assess the reliability of the studies, but no further details were reported.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. The tabulated information included details of the findings of comparative studies, one review conducted
predominantly in adults, and studies conducted mostly in children.

**Methods of synthesis**

*How were the studies combined?*

The studies were grouped according to the predominant age group of participants (adults or children and infants). The authors then summarised the studies by reporting the findings, in terms of therapeutic response, of the majority of the studies.

*How were differences between studies investigated?*

Differences among the studies were not discussed.

**Results of the review**

The authors stated that 22 studies were included. This number appeared to comprise one review (375 adults and 686 children) 7 comparative studies mainly in adults (254 participants) and 14 studies of unspecified design mainly in children (995 participants). In addition, one cohort study and one review were mentioned in the text of the review.

Adults (or predominantly adults).

The authors stated that the studies suggest that MDI-spacers and nebulisers provide similar therapeutic response. One review (16 studies of adults and children) found that MDI-spacers were equivalent to nebulisers, they increased the rate of response and they reduced children’s length of stay in the emergency department; one comparative study (12 patients) found that the MDI improved drug delivery to the lungs compared with a nebuliser; 5 comparative studies found that the MDI was as effective in treating acute asthma as the nebuliser. One cohort study (sample size not reported) found that, in patients with pre-existing cardiac disease, beta-agonists delivered using a MDI-spacer reduced cardiac death in comparison with those delivered by a nebuliser.

Infants and children.

From the tables, 13 of the 14 studies found that MDI-spacers were as effective or more effective than nebulisers; the study outcomes were reported in terms of efficacy, reduction in wheezing, speed of treatment response, dose of drug required, lung deposition, relief and bronchodilation. Three of the studies found greater acceptance by the patients for the MDI than the nebuliser. One study found that MDI-volumatic provided less relief than a jet nebuliser.

**Cost information**

The authors stated that 3 studies reported that MDI-spacers were more cost-effective than nebulisers, but no supporting evidence was presented.

**Authors' conclusions**

MDI-spacers were reported to be effective in many studies. The authors also concluded that the evidence supports the equivalence of MDI-spacers and nebulisers.

**CRD commentary**

This was a poorly reported review that did not present adequate evidence to support the authors' conclusion. The review question was clear in terms of the intervention and participants, but it was unclear in terms of the study design and outcomes. Only two databases were searched and this may have resulted in the omission of other relevant studies. The keywords were stated, but it was unclear whether any language restrictions had been applied. No attempt was made to locate unpublished studies, thus raising the possibility of publication bias. The methods used to select the studies, assess validity and extract the data were not described. Hence, efforts made to reduce errors and bias cannot be judged. Potential bias in the selection of studies and reporting of the results cannot be excluded. In addition, it was unclear what criteria were used to select 'some' studies evaluating individual devices. The validity of the included studies was not
assessed. Reviews were included without any assessment of their quality and without stating whether attempts had been made to exclude studies already included in these reviews.

The information reported on the included studies was inadequate. Details of the study design, duration, setting and dose of intervention, selection of participants, asthma severity, outcomes measures and definitions, and values and statistical significance of the results were lacking. Many of the included studies were small and may have been inadequately powered to detect a significant difference, rather than showing equivalence of efficacy as the authors reported. It was not stated how summary results for inclusion in the review were selected; it is possible that only the positive results were reported. Results from one RCT were selectively reported in the text, but it was not stated why this very small RCT (18 patients) was highlighted. The authors' conclusions were not supported by the evidence presented.

**Implications of the review for practice and research**

Practice: The authors stated that MDI-spacers can be used instead of nebulisers to treat patients with acute asthma. However, there was insufficient evidence in the review to support this.

Research: The authors did not state any implications for further practice.

**Bibliographic details**


**Indexing Status**

Subject indexing assigned by CRD

**MeSH**

Acute Disease; Administration, Inhalation; Adrenal Cortex Hormones /therapeutic use; Adrenergic beta-Agonists /therapeutic use; Aerosols; Asthma /drug therapy; Bronchodilator Agents /administration & dosage; Nebulizers and Vaporizers

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**Record Status**

This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.