Review: various devices for delivery of aerosol treatment can be equally efficacious


What are the relative efficacies and harms associated with various devices for delivery of aerosol treatment?

METHODS

Data sources: Medline, EMBASE/Excerpta Medica, and Cochrane Library.

Study selection and assessment: English language randomised controlled trials in which the same drug was administered using different devices. Studies comparing devices of the same type or comparing oral or parenteral treatment with aerosol treatment were excluded.

Outcomes: included forced expiratory volume in 1 second (FEV1) and symptoms/physical findings.

MAIN RESULTS

59 trials met the selection criteria, most of which tested β2 agonists. Types of devices studied included nebulisers (intermittent and continuous), metered dose inhalers (MDIs) with or without spacers or holding chambers, and dry powder inhalers ( DPIs). The results of the meta-analyses are summarised in the table. No meta-analysis showed any significant differences between devices for FEV1 or symptoms in any clinical setting or patient population. 3 trials assessed delivery of β2 agonists in patients receiving mechanical ventilation (infants with bronchiolitis and adults with asthma or chronic obstructive pulmonary disease [COPD]). Meta-analysis was not done, but 2 of the 3 studies found no difference between nebulisers and MDIs with or without a spacer/holding chamber for airway mechanics. 7 trials (6 clinical laboratory trials) assessed delivery of β2 agonists or anticholinergic agents for outpatient treatment of COPD and found no difference between devices (nebuliser, MDI, MDI with spacer, or DPI).

CONCLUSION

Devices used for the delivery of aerosol treatment (bronchodilators and steroids) in various clinical settings and patient populations can be equally effective.

Commentary

The meta-analysis by Dolovich et al included 59 RCTs and showed equivalent improvement in pulmonary function with different inhaled medication delivery devices. Of particular importance was that no differences were noted in the effectiveness of nebulisation compared with delivery by MDIs with spacers. Use of MDIs alone was not studied in most of the reviewed trials, and evidence of their effectiveness when used without spacers is weak. The findings have implications for practice in that other qualitative or individual level factors can be considered when determining which devices to prescribe. The authors note that patients’ skills in using medication devices were not assessed in these individual trials. This is an important consideration given the association between poor inhaler technique and reduced medication delivery and the improvements in inhaler technique that can be obtained with training. The authors’ recommendation to select, when feasible, the same medication delivery device for different prescribed medications in a given patient is sound and practical advice in that patient education is limited to one device. This could facilitate patient skill acquisition and reduce variability in technique over time and between medications. The findings of equivalence of device effectiveness can eliminate both patient and provider concerns about out-of-pocket medication costs as lower cost options can be selected if appropriate. A further consideration in medication and delivery selection is patient preference. Given that medication delivery is equally effective, prescribing according to a patient’s preference may in fact improve treatment adherence. Rather than narrowing the options available to practitioners and patients, the results of this meta-analysis support a wide range of medication delivery options, such that other qualitative factors can be considered when making treatment decisions.

Sharon D Horner, RN, PhD
University of Texas at Austin
Austin, Texas, USA


Comparison of the effectiveness of different devices for delivery of aerosol treatment*

<table>
<thead>
<tr>
<th>Patients and clinical setting</th>
<th>Comparison</th>
<th>Number of trials (n)</th>
<th>Outcome</th>
<th>Weighted mean difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults and children in the ED or ICU</td>
<td>Nebuliser v MDI + spacer/holding chamber for short acting β2 agonists</td>
<td>9 (510)</td>
<td>FEV1</td>
<td>0.13 (0.04 to 0.31)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11 (708)</td>
<td>Symptom scores</td>
<td>0.01 (0.32 to 0.34)</td>
</tr>
<tr>
<td>Adults in the ED/ICU</td>
<td>Continuous v intermittent nebulisation for short acting β2 agonists</td>
<td>3 (137)</td>
<td>FEV1</td>
<td>0.07 (0.63 to 0.77)</td>
</tr>
<tr>
<td>Adult and child inpatients</td>
<td>Nebuliser v MDI + spacer/holding chamber for short acting β2 agonists</td>
<td>3 (102)</td>
<td>FEV1</td>
<td>0.05 (0.43 to 0.44)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 (91)</td>
<td>Symptom scores</td>
<td>0.03 (0.36 to 0.43)</td>
</tr>
<tr>
<td>Adult outpatients</td>
<td>DPI v MDI + spacer/holding chamber for corticosteroids†</td>
<td>2 (44)</td>
<td>FEV1</td>
<td>0.09 (0.33 to 0.51)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 (257)</td>
<td>Symptom scores</td>
<td>0.08 (0.47 to 0.62)</td>
</tr>
</tbody>
</table>

*ED = emergency department; ICU = intensive care unit; MDI = metered dose inhaler; DPI = dry powder inhaler; FEV1 = forced expiratory volume in 1 second. CI defined in glossary.
†All but 1 of the trials were clinical laboratory trials.
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