Noninvasive ventilation was cost-effective for reducing in-hospital mortality in COPD


**QUESTION**
In patients with chronic obstructive pulmonary disease (COPD), is noninvasive ventilation more cost-effective than standard medical treatment for reducing in-hospital mortality?

**DESIGN**
Cost-effectiveness analysis from a randomized (allocation concealed*), unblinded,* controlled trial with follow-up to discharge from hospital†.

**SETTING**
25 medical wards in 14 hospitals in the United Kingdom.

**PATIENTS**
236 patients [mean age 69 y, 54% men]† admitted to hospital with an acute exacerbation of COPD, respiratory acidosis (pH 7.25 to 7.35) secondary to respiratory failure, and respiratory rate > 23 breaths per minute.

**INTERVENTION**
118 patients were allocated to noninvasive ventilation (bilevel positive-pressure ventilation through a face or nasal mask; inspiratory pressure initially 10 cm H2O, increased to 20 cm H2O; expiratory pressure 5 cm H2O, with target duration 24 h on day 1, 16 h on day 2, 8 h on day 3, and discontinued on day 4; and maintenance of SpO2 at 85% to 90%) in addition to standard medical treatment. 118 patients were allocated to standard medical treatment (controlled oxygen to maintain SpO2 at 85% to 90%; nebulized salbutamol, 5 mg, every 4 to 6 h; nebulized ipratropium bromide, 500 µg, every 6 h; prednisolone, 30 mg, once daily for ≥ 5 d; and an antibiotic).

**MAIN COST AND OUTCOME MEASURES**
Incremental cost-effectiveness of in-hospital mortality. Costs were identified for wards, noninvasive ventilation, and intensive care units (ICUs) and estimated in 1997 to 1998 British pounds.

**MAIN RESULTS**
Fewer patients died or were intubated in the noninvasive ventilation group than in the standard treatment group (Table). Noninvasive ventilation led to a saving of £49 362 in overall costs (particularly ICU costs) (Table). The mean cost difference between standard and noninvasive treatment groups was a saving of £645 (95% CI –2310 to 386) per patient receiving noninvasive ventilation. A cost-effectiveness acceptability curve showed 80% probability that noninvasive ventilation was cheaper and more effective.

**CONCLUSION**
In patients with chronic obstructive pulmonary disease, noninvasive ventilation was cost-effective for reducing in-hospital mortality.

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*See Glossary.

**Cost-effectiveness of noninvasive ventilation vs standard medical treatment for chronic obstructive pulmonary disease‡**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Noninvasive ventilation (£)</th>
<th>Standard medical treatment (£)</th>
<th>RRR (95% CI)</th>
<th>NNT (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>10%</td>
<td>20%</td>
<td>50% (6 to 74)</td>
<td>10 (6 to 100)</td>
</tr>
<tr>
<td>Need for intubation</td>
<td>15%</td>
<td>27%</td>
<td>44% (6 to 66)</td>
<td>9 (5 to 70)</td>
</tr>
<tr>
<td>Costs</td>
<td>Noninvasive ventilation (£)</td>
<td>Standard medical treatment (£)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ward</td>
<td>139 243</td>
<td>127 355</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noninvasive ventilation</td>
<td>26 664</td>
<td>3390</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>52 981</td>
<td>142 576</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>288 073</td>
<td>337 435</td>
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</tr>
</tbody>
</table>

‡Abbreviations defined in Glossary; RRR, NNT, and CI calculated from data in article.

**COMMENTARY**

In patients with acute exacerbation of COPD, clinical trials have shown that noninvasive positive-pressure ventilation (NIPPV) decreases intubation rates and hospital mortality (1). Based on the strength of this evidence, contemporary guidelines for the management of COPD recommend the use of NIPPV in selected patients with acute exacerbations (2).

The study by Plant and colleagues extends our knowledge about the utility of NIPPV for this indication by showing that it is cost-effective in the United Kingdom. However, as the authors point out, the generalizability of these results to other countries may be limited. In the United Kingdom, COPD patients with mild-to-moderate acidosis generally receive NIPPV on the regular hospital ward. However, most of the cost savings achieved by NIPPV in the current study related to reduced use of ICUs. The economic benefit of NIPPV will not be as great in hospitals where this modality is frequently delivered in an ICU, as is the case in the United States and Europe. However, progressive experience with NIPPV may allow more patients to be treated outside the ICU without adversely affecting the rate of clinical success (3).

Another issue regarding generalizability relates to the use of support personnel. In the current study, NIPPV was delivered and monitored by regular nursing staff, and remarkably, only 26 extra minutes of nursing time was required per patient. In most U.S. hospitals, respiratory therapists would provide NIPPV, which would probably increase personnel costs.

Additional economic analyses of NIPPV can be expected as its use becomes more frequent and extends to other settings. A recent study showed the cost-effectiveness of using NIPPV for outpatients with COPD who have frequent exacerbations necessitating hospital admission (4).

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**References**