

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

Plant PK, Owen JL, Parrott S, Elliott MW. Cost effectiveness of ward based non-invasive ventilation for acute exacerbations of chronic obstructive pulmonary disease: economic analysis of randomised controlled trial. *BMJ*. 2003;326:956-9.

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.

†Plant PK, Owen JL, Elliott MW. *Lancet*. 2000;355:1931-5.

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

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

‡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 per-

sonnel. 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

1. Lightowler JV, Wedzicha JA, Elliott MW, Ram FS. *BMJ*. 2003;326:185.
2. Pauwels RA, Buist AS, Calverley PM, et al. *Am J Respir Crit Care Med*. 2001;163:1256-76.
3. Carlucci A, Delmastro M, Rubini F, Fracchia C, Nava S. *Intensive Care Med*. 2003;29:419-25.
4. Tuggey JM, Plant PK, Elliott MW. *Thorax*. 2003;58:867-71.