

# Noninvasive intermittent ventilation reduced intubation and mortality in immunosuppressed patients with acute respiratory failure

Hilbert G, Gruson D, Vargas F, et al. Noninvasive ventilation in immunosuppressed patients with pulmonary infiltrates, fever, and acute respiratory failure. *N Engl J Med*. 2001 Feb 15;344:481-7.

## QUESTION

In immunosuppressed patients with hypoxemic acute respiratory failure caused by pulmonary infiltrates and fever, is noninvasive intermittent ventilation (NIV) in a pressure-support ventilation (PSV) mode through a full face mask more effective than standard medical care?

## DESIGN

Randomized (allocation concealed\*), unblinded,\* controlled trial with follow-up to hospital discharge.

## SETTING

A 16-bed intensive-care unit (ICU) in a university hospital in Bordeaux, France.

## PATIENTS

94 consecutive patients with immunosuppression were evaluated, and 52 (mean age 49 y, 72% men) were studied. Inclusion criteria included pulmonary infiltrates, temperature > 38.3°C, severe dyspnea at rest, respiratory rate > 30 breaths/min, and PaO<sub>2</sub>:FiO<sub>2</sub> ratio < 200. Exclusion criteria included need for emergency intubation, chronic obstructive pulmonary disease, respiratory failure of cardiac origin, and PaCO<sub>2</sub> > 55 mm Hg with acidosis. Follow-up was complete.

## INTERVENTION

Treatment was the same for all 52 patients except that 26 patients received volume-targeted NIV through a full face mask in a PSV mode (mean pressure support 15 ± 2 cm H<sub>2</sub>O) with positive end expiratory pressure (mean 6 ± 1 cm H<sub>2</sub>O) for ≥ 45 minutes, alternating every 3 hours with spontaneous breathing. Intubation was initiated by using predefined criteria.

## MAIN OUTCOME MEASURES

Need for endotracheal intubation and mechanical ventilation.

## MAIN RESULTS

Patients in the NIV group had lower rates of intubation ( $P = 0.03$ ), ICU mortality ( $P = 0.03$ ), and hospital mortality ( $P = 0.02$ ) than did patients who received standard care (Table). The groups did not differ for dura-

tion of ventilatory assistance (6 d for all patients,  $P = 0.6$ ) or length of ICU stay (7 d in the NIV group vs 9 d in the usual-care group for all patients,  $P = 0.1$ ).

## CONCLUSION

In immunosuppressed patients with hypoxemic acute respiratory failure caused by pulmonary infiltrates and fever, noninvasive ventilation delivered intermittently through a full face mask in a pressure support ventilation mode reduced the need for intubation and decreased mortality more than did standard medical care.

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\*See Glossary.

## Noninvasive ventilation (NIV) through a face mask vs usual care in immunosuppressed patients with hypoxemic respiratory failure assessed at hospital discharge†

Outcomes	NIV	Usual care	RRR (95% CI)	NNT(CI)
Need for intubation	46%	77%	40% (4 to 62)	4 (2 to 24)
Intensive care unit mortality	38%	69%	44% (4 to 68)	4 (2 to 29)
Hospital mortality	50%	81%	38% (5 to 60)	4 (2 to 21)

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

## COMMENTARY

Techniques for ventilatory support, such as NIV and continuous positive airway pressure (CPAP), have come under intense investigation in recent years because these techniques avoid infectious complications associated with endotracheal intubation. Consistent with other published trials (1), Hilbert and colleagues found favorable outcomes for NIV in immunocompromised patients. Given the increased susceptibility of these patients to infection, the results have potential clinical importance.

The trial shares a methodologic problem with similar trials: the impossibility of blinding caregivers and trialists. Although the authors attempted to control for bias by assigning the same caregivers to both groups of patients, the degree of control is limited and unknown. CPAP seems to produce the same results with less expensive equipment and a nasal mask, which increases patient comfort (2). Patients with PaCO<sub>2</sub> > 55 mm Hg were excluded.

Because NIV increases alveolar ventilation, one might question this exclusion.

Noninvasive ventilatory techniques gain empirical support from the results of the study. Multicenter trials are warranted to compare cost-effectiveness among NIV support techniques.

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## References

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2. Putensen C, Hormann C, Baum M, Lingnau W. Comparison of mask and nasal continuous positive airway pressure after extubation and mechanical ventilation. *Crit Care Med*. 1993;21:357-62.