

## Is Humidification Always Necessary During Noninvasive Ventilation in the Hospital?

Branson et al are to be congratulated for their paper entitled "Is Humidification Always Necessary During Noninvasive Ventilation in the Hospital."<sup>1</sup> They correctly stated that the data found in the several clinical trials that have examined the various humidification methods in intubated patients cannot be extrapolated to noninvasive ventilation (NIV), and that 30 mg H<sub>2</sub>O/L of absolute humidity is the theoretical minimum level to ensure adequate gas conditioning only during invasive ventilation. Conversely, it is not known if 30 mg H<sub>2</sub>O/L is also adequate for NIV.

From a physiologic point of view the American National Standards Institute suggested, although not directly for NIV, that 10 mg H<sub>2</sub>O/L is the lowest acceptable absolute humidity to minimize mucosal damage in the upper airways.<sup>2</sup> In addition, the last International Consensus Conference on NIV in intensive care stated that inadequate humidification of the medical gas may cause patient distress, especially if the gas is supplied via a pipeline or cylinder.<sup>3</sup>

Unfortunately, Branson et al did not report the helmet as a possible alternative device to deliver NIV.<sup>1</sup> Similar to the carbon-dioxide rebreathing that occurs with the helmet,<sup>4</sup> the high internal gas volume could also serve as a "mixing chamber" between

the heated humidified expired gas and the dry medical gas entering the helmet. This could raise the heat and humidity of the medical gas, thus avoiding the need for a heated humidifier. The final humidity inside the helmet will depend mainly on 2 factors: the amount of humidity in the patient's expired gas, and the flow of fresh medical gas into the helmet. However, the humidifying capability of the respiratory tract could also be influenced by the presence of airway or pulmonary disease.<sup>5-7</sup>

In a previous work we clearly demonstrated that during NIV delivered ventilator CPAP with helmet without a heated humidifier, the use of a helmet—acting as a mixing chamber between the expired gas and the inspired medical gas—significantly increased the absolute humidity, up to 10 mg H<sub>2</sub>O/L.<sup>8</sup> Conversely, the absolute humidity during NIV delivered with a continuous-flow CPAP system with the helmet was lower than that of ambient air, and in this case a heated humidifier is probably indicated. The patients with acute respiratory failure and the healthy individuals exhibited similar abilities to heat and humidify the medical gas. Finally, the application of an active humidifier did not affect the comfort of breathing.

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**Davide Chiumello MD**

Dipartimento di Anestesia  
Rianimazione (Intensiva e Subintensiva)  
e Terapia del Dolore

Fondazione Istituto di Ricovero e Cura a Carattere Scientifico Cà Granda  
Ospedale Maggiore Policlinico  
Milano, Italy

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