

Nasal High-Flow Nebulization for Lung Drug Delivery: Theoretical, Experimental, and Clinical Application

Jonathan Dugernier, Grégory Reyckler, Laurent Vecellio, and Stephan Ehrmann 

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Abstract

The use of nasal high-flow (NHF) therapy is rapidly spreading across acute care facilities. This raises the question of optimal delivery of inhaled medication to patients undergoing this noninvasive ventilatory support consisting in delivering heated and humidified high gas flow rates through nasal cannulas. In this article, we review experimental and clinical work evaluating the delivery of inhaled medication within the NHF circuit to target the lung without interrupting the ventilatory support. Using vibrating mesh nebulizers placed immediately upstream or downstream of the humidification chamber, with flow rates of 30–45 L/min in adults and 2–6 L/min in children and infants, about 1%–10% of the drug charged in the nebulizer may be delivered to the lungs. Compared with conventional facemask aerosol interfaces, this amount is significantly lower than amounts delivered to adults (i.e., up to 25% of the nominal dose), but similar to amounts delivered to children and infants, the latter having a predominantly nasal breathing. However, significant clinical effects have been shown in both populations when delivering bronchodilators through NHF. This interface is particularly well tolerated and may be useful to improve aerosol therapy tolerance in the pediatric setting. Thus, among patients undergoing NHF therapy, bronchodilators may be delivered through this route. Whereas other drugs may be delivered this way or if there is a patient-centered benefit to specifically use NHF for aerosol therapy among patients without ongoing ventilatory support, requires further evaluation and technological development.

