Aerosols and Details

To the Editor:

Although I hate to “rain on the parade” of Khorfan and colleagues, 1 it is possible, if not likely, that methodologic nuances of aerosol delivery undermine the validity of their conclusions in their article in CHEST (December 2011), which states that “nebulized albuterol does not cause significant tachycardia or tachyarrhythmias.” 2 In delivery of therapeutic aerosols, the devil is in the details, and the “Materials and Methods” section in the article does not provide any information regarding the aerosol delivery techniques used for study patients. 3 This is especially true in patients who are mechanically ventilated, who composed > 50% of the sample, in which we proved that veritably none of 100 puffs of albuterol was delivered to patients’ airways. 4 Multiple variables, including circuit design, humidification, flow rates, and tidal volumes, impact aerosol delivery to critically ill patients. 5 Poor techniques can lead to the illusion of treatment (ie, doses administered but not delivered to the airways because they rain out in the circuit). Accordingly, this study should be interpreted cautiously, because no evidence (eg, reduced airway resistance) is provided to support that any of the administered doses were delivered.

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References


Response

To the Editor:

We thank Dr Manthous for his interest in our recent article in CHEST 1 and appreciate his comments. Our article concluded that the use of short-acting β-agonist albuterol and a short-acting anticholinergic ipratropium bromide in the recommended commonly used doses and frequency appear not to have a clinically significant detrimental effect on heart rate and rhythm. 6

The study was a real-life bedside clinical study in the ICU. Our work was not to investigate the most effective dose or delivery method of aerosolized bronchodilator in this population. Most patients had airflow obstruction, but some had ARDS and other respiratory failures requiring mechanical ventilation. Metered-dose inhalers (MDIs) were not used in this study. All treatments were previously written by attending physicians to be given by jet nebulizers. The dose of albuterol sulfate was 2.5 mg in a total volume 3 mL (in addition to ipratropium bromide 500 μg), alternating with two different doses of levalbuterol, 0.63 mg and 1.25 mg. These treatments were delivered every 4 to 6 h. The jet nebulizer used was the Micro Mist Nebulizer (Hudson RCI). For patients receiving mechanical ventilation, the Valved Tee Adapter (Thayer Medical Corporation) was used with the Hudson nebulizer. We used the modified protocol of Hess et al as described by Dhand and Tobin 7 to deliver the nebulized bronchodilator treatment.

We do not routinely measure airway resistance by the rapid airway occlusion method. We observed peak airway pressure, resistive airway pressure, and changes in auto-positive end-expiratory pressure. All patients were given the same dose and intervals. This is the most common clinically relevant method used in ICUs currently. Dhand and Tobin 7 noted that both nebulizers and MDIs are effective at delivering aerosols to the lower respiratory tract of patients receiving mechanical ventilation when careful attention is given to technique. Jantz and Collop 8 concluded that in patients receiving mechanical ventilation, four to 10 puffs from an MDI and 2.5 to 5.0 mg of albuterol through a small volume nebulizer every 4 h is the most recommended dose. Sims 9 noted that clinical trial evidence suggests that when used with the proper technique, various devices are equally effective.

Our conclusion agrees with that of Dhand and Tobin 7 that adverse cardiac effects are unlikely to occur with doses recommended in clinical practice. Much higher doses (7.5-15.0 mg albuterol delivered through a small volume nebulizer), as Dr Manthous has demonstrated, could cause sinus tachycardia and premature beats. 3 However, we consider these doses to be experimental rather than clinically recommended.

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