Clinical Outcomes Following Bronchodilator Delivery Via the Aerogen® Ultra *Versus* a Jet Nebuliser in Children Presenting to the Emergency Department With Acute Moderate-to-severe Asthma

Original article: Moody GB, Luckett PM, Shockley CM, et al. Clinical efficacy of vibrating mesh and jet nebulizers with different interfaces in pediatric subjects with asthma. Respir Care. 2020;65(10):1451-1463.

Background

Children presenting to the emergency department with an asthma exacerbation are frequently treated with aerosolised bronchodilators; however, there are currently no RCTs examining drug delivery via vibrating mesh nebulisers versus jet nebulisers in this setting

Objective

The aim of this study was to compare clinical outcomes following bronchodilator therapy delivered using the Aerogen Ultra versus a jet nebuliser in children presenting to the emergency department with acute moderate to severe asthma exacerbations**

Materials and Methods

Design: Randomised, single-blind study

Asthmatic children aged 2–18 years presenting to the emergency department with a moderate-to-severe exacerbation

N=217

Presentation to the emergency department → **Treatment with an oral/IV corticosteroid*** → **Randomisation** Up to 6 intermittent treatments with albuterol/ipratropium†‡

- **Jet nebuliser§** (n=109)
  - **Aerosol mask** (n=87)
  - **Mouthpiece** (n=22)
- **Aerogen Ultra¶** (n=108)
  - **Valved facemask** (n=84)
  - **Valved mouthpiece** (n=24)

Selection of the interface was at the discretion of the treating respiratory therapist, based on patient age, size, ability to follow instructions and/or comply with mouthpiece use

Primary endpoint: Hospitalisation rate (admission to the general paediatric unit or ICU)

Secondary endpoints: Number of treatments and time to a mild asthma score (ie 1–4**)

*Prednisone or prednisolone 1–2 mg/kg (maximum 60 mg) OR oral dexamethasone 0.3–0.6 mg/kg (maximum 16 mg) OR IV methylprednisolone 1–2 mg/kg (maximum 60 mg); †Albuterol 2.5 mg/ipratropium 250 µg in children weighing <10 kg OR albuterol 5 mg/ipratropium 500 µg in children weighing ≥10 kg; ‡Patients were assessed 20 mins after each administration and were re-treated if they had an asthma score of moderate (5–8) or severe (9–12) → Patients were admitted if they had an asthma score of 5–12 after 2 hours (ie 6 treatments); §Operated at a flow rate of 7 L/min; ¶Operated at a flow rate rate of 2 L/min with a valved facemask or without supplemental flow with the valved mouthpiece (unless oxygen was indicated). ICU, intensive care unit; IV, intravenous; RCT, randomised controlled trial. **Severity of exacerbation based on breathing frequency, oxygen requirement, retractions, and findings on auscultation (mild: 1–4; moderate: 5–8; severe: 9–12).

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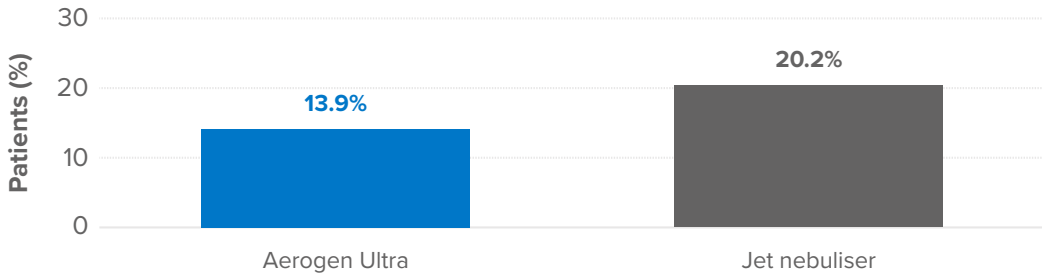
Clinical outcomes in children presenting to the emergency department with an acute asthma exacerbation were better in those treated with bronchodilator therapy delivered via the Aerogen Ultra *versus* a jet nebuliser

Rate of hospital admission (primary endpoint)

31% lower admission rates
with the Aerogen Ultra *versus* a jet nebuliser (*P*=0.22)



Following adjustment for differences in baseline asthma score:*

- Patients in the Aerogen Ultra versus the jet nebuliser group had a reduced probability of admission overall (*P*=0.062)
- Use of the Aerogen Ultra with valved facemask *versus* a jet nebuliser with aerosol mask was associated with a significantly reduced probability of admission (*P*=0.032)

Median time to achieve a mild asthma score

58min Aerogen Ultra

81min Jet Nebuliser

P=0.004

Median number of intermittent treatments needed to achieve a mild asthma score

2 Aerogen Ultra **vs** **3** Jet Nebuliser

P<0.001

*Overall, 57.4% of children in the Aerogen Ultra group versus 42.2% of children in the jet nebuliser group had severe asthma at baseline (P=0.03).

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