

Comparison Of Aerosol Delivery With Three High Flow Nasal

Cannula Types And Sizes.

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Introduction

The effects of flow on the delivery of medication through a high flow nasal cannula (HFNC) circuit has been described in the literature. A direct comparison of different brands and sizes of HFNC prongs and circuits has not been reported. We hypothesize that both cannula brand and size will affect aerosol delivery with HFNC use in adults.

Methods

A vibrating mesh nebulizer (Aerogen Solo) was placed at the inlet (dry side) of the humidifier (Fisher & Paykel). The outlet was attached to a heated wire HFNC circuit with either Intersurgical circuit with Resmed cannula (IS), Fisher and Paykel (F&P) HFNC set of circuit and cannula or Flexicare (Flx) HFNC set of circuit and adult nasal cannula in small, medium and large sizes. The cannulas were seated in a loose-fitting orifice (simulating nares) and attached to an absolute filter positioned at the proximal end of the circuit to collect aerosol and a T-shaped collection trap between the prongs and the absolute filter to collect excess humidity.

Results

Inhaled percent of the medication dose (mean +/- SD) in the figure to the right shows differences between sizes and brands across the different flow rates. The best drug delivery for all systems tested-cannula size and circuit- was at 10 L/min. At both 30 and 50 L/min., the Flexicare large cannula and circuit delivered more drug than both the F&P and IS cannulas (p<0.001).

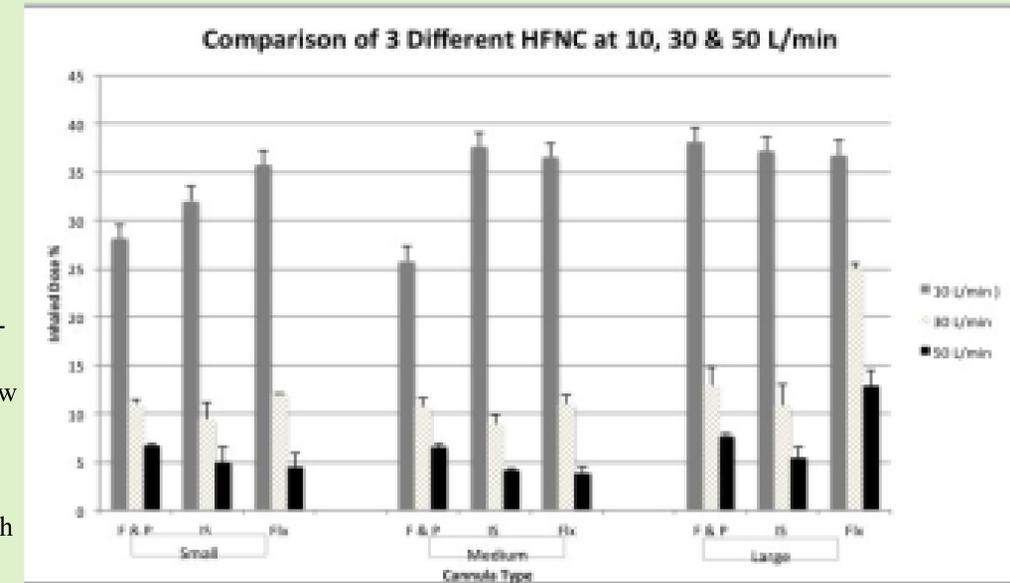


Figure 3. Shows effect of cannula type (listed) and size (in groups).

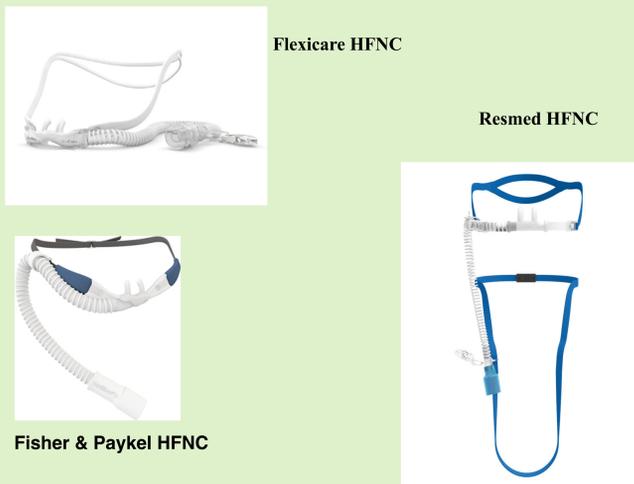
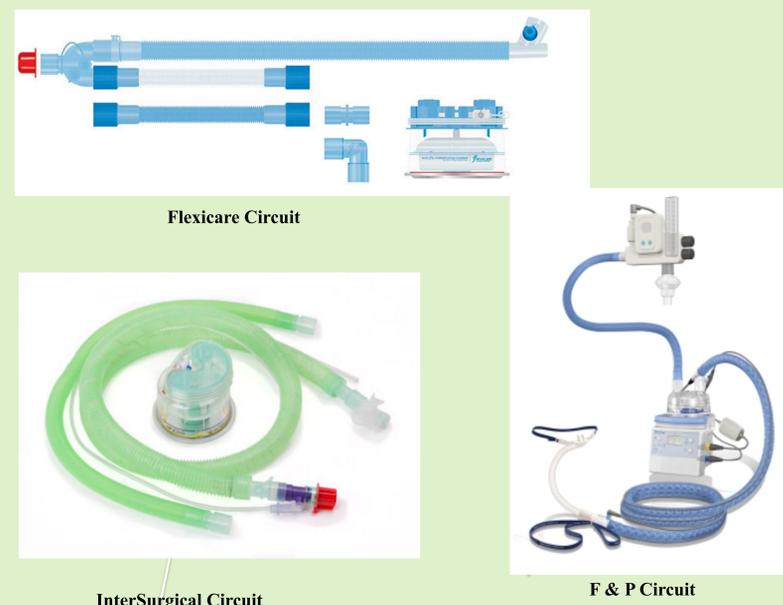


Figure 1. Samples of HFNC interfaces and circuits used for study.



Pseudo "nares"



Figure 4. HFNC prongs attached to simulated nares connected to Harvard Lung machine.

The above apparatus was connected to a breath simulator (Harvard Apparatus, Holliston, MA) with adult settings (Vt: 500mL, Respiratory Rate: 12 breaths/min, I:E Ratio: 1:2). Albuterol sulfate (0.083% 2.5mg/3mL) was administered via the vibrating mesh nebulizer with each nasal cannula size and type and run at 10, 30, 50 L/min flow (n=3). The drug was eluted from the filter and assayed (276 nm). One way ANOVA (P<0.05) was done to obtain results for comparison.

Conclusion

During HFNC use, selection of type and size of adult cannulas can impact aerosol delivery across all of the flow rates tested. Further studies are needed to assess the impact of these aerosol deposition differences on clinical outcomes in adults as well as the pediatric setting.

Disclosures

Tina Thayer works as a KOL for Aerogen, LTD.
Patricia Dailey is currently a Medical Science Liaison for Aerogen, LTD.
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