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# A Study To Evaluate The Maximal Dose Administration At Two Different Locations In Two Different VDR4 High Frequency Percussive Ventilator (HPFV) Circuits

Jeff L. Heltborg  
*Legacy Health System*

Bethany S. Kobza  
*Portland State University*

Ace Nilson  
*Legacy Health System*

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# A STUDY TO EVALUATE THE MAXIMAL DOSE ADMINISTRATION AT TWO DIFFERENT LOCATIONS IN TWO DIFFERENT VDR 4 HIGH FREQUENCY PERCUSSIVE VENTILATOR (HFPV) CIRCUITS

**AUTHORS:** Heltborg, Jeff L.<sup>1</sup>; Kobza, Beth S.<sup>1</sup>; Nilson, Ace<sup>1</sup>

**INSTITUTIONS:** 1. Respiratory Therapy, Legacy Health System, Portland, OR, United States

**Background:** The purpose of this study was to determine if the positioning of an Aerogen® Aeroneb solo nebulizer at different locations in two different VDR4 ventilator circuits would result in differing dose administrations. Determining the location with the maximal dose administration could allow clinicians to deliver more medication. We hypothesize that placement near the endotracheal tube will provide greater dose deposition.

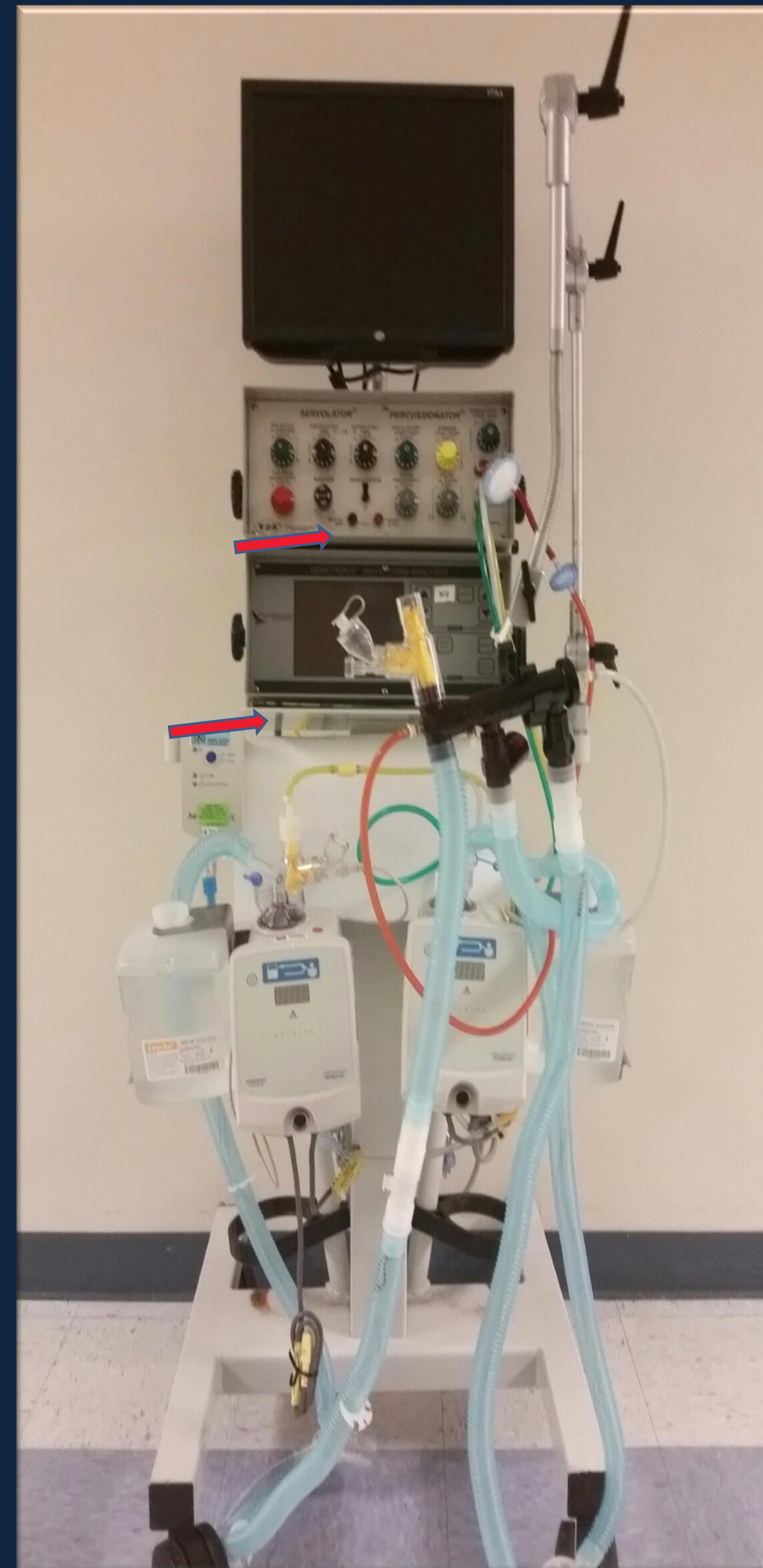
The VDR4 is a high frequency ventilator that combines a convective and percussive high frequency rate. The Aerogen® nebulizer is a low velocity vibrating mesh nebulizer.

**Methods:** The VDR4 ventilator was used with the Hudson RCI Double or Single Limb Circuit connected to an 8.0 ETT tube with a collecting filter attached to a passive lung with these settings: PIP 30, PEEP 12, Convective rate 15, Tinsp 2 seconds, Texp 2 seconds, High frequency rate 500.

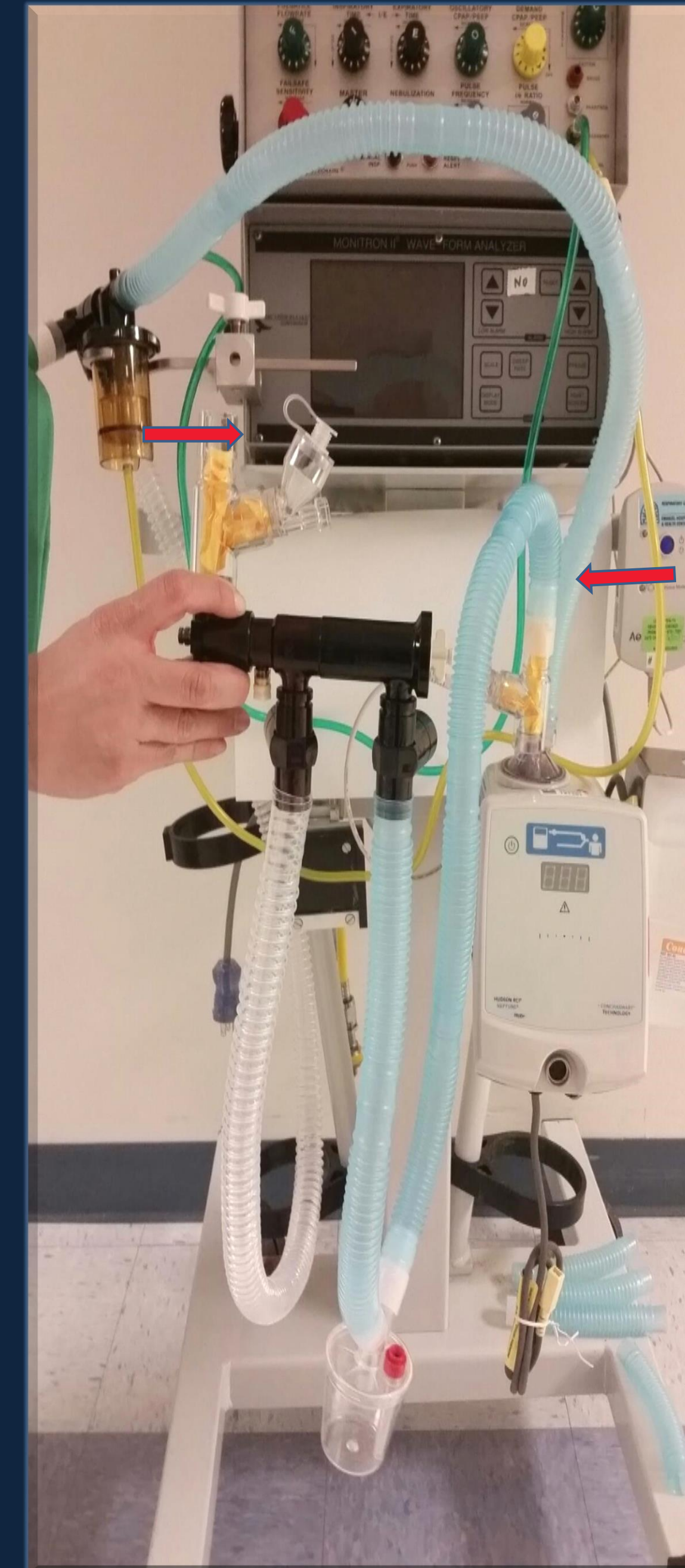
Humidification was provided by the Hudson RCI ConchaTherm Neptune Humidifier. Administration of the dose was done through the Aerogen® nebulizer placed in-line with the ventilator circuit either before the humidifier or between the endotracheal tube and the VDR 4's Phasitron. A unit dose of 0.5 mg / 2.5mL of Albuterol was delivered until complete for the trials. Each trial was performed three times.

After the medication was delivered to the test lung, the filters were sent to a lab where the mass of the drug was eluted from the filters using a UV spectrophotometer at 276nm. Using this data, the percent dose delivered was calculated. Data validation was measured with standard deviation.

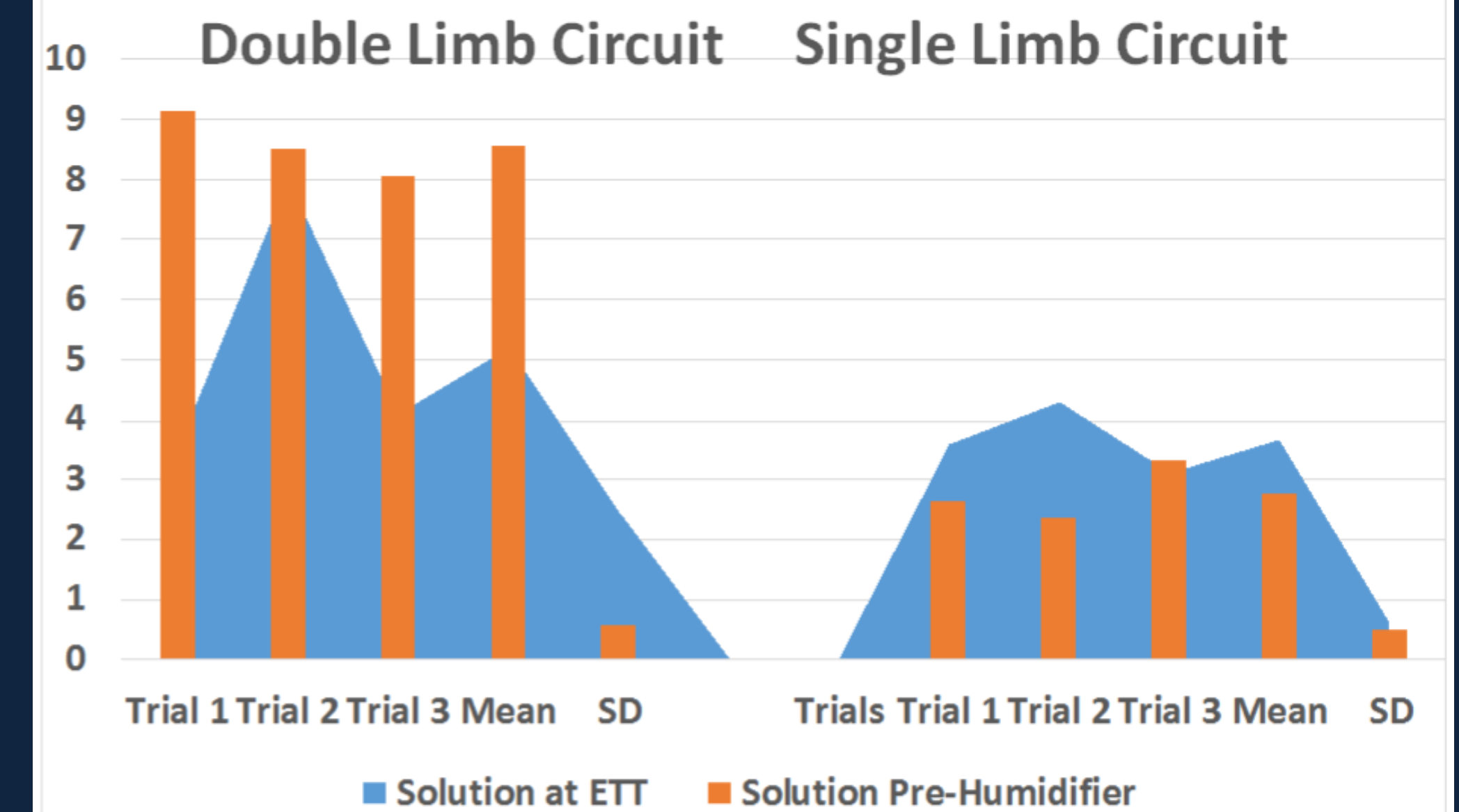
Double limb circuit



Single limb circuit



**Results:** With the double limb circuit, the deposition to the end of the endotracheal tube was greater when the nebulizer was placed before the humidifier (8.6%), rather than near the endotracheal tube (5.2%). The single limb circuit showed contrasting results, with greater deposition when the nebulizer was placed near the endotracheal tube (3.65%), as compared to the placement pre-humidifier (2.62%). Particle size was shown to be at 4.6-4.9 VMD.



**Conclusions:** Maximal dose was achieved between the two circuits when the Aerogen was placed before the humidifier using the double limb circuit. The results were unexpected; we anticipated that the proximity of the medication to the test lung with either VDR 4 circuit would increase medication deposition. We hypothesize now that releasing the medication into the circuit where the air is already saturated with water may possibly decrease the uptake of medication.