

Choosing the Right Nebulizer

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Small Volume Aerosol therapy for the administration of medication has long been a primary component in the care plan of patients with pulmonary disease. The use of the nebulizer to deliver drug therapy dates back to 1849, when Euget-les-Bains invented the atomizer. Many have studied this delivery system and deemed it an effective vehicle to deliver medication to the lungs. In the infant and pediatric patient population, this has proven challenging primarily due to the anatomical and physical characteristics of the airway.

In our Neonatal Intensive Care Unit, we were challenged with providing inhalation drug therapy to infants who also required Continuous Positive Airway Pressure (CPAP). Following extubation from mechanical ventilation, these premature infants received continuous positive pressure via High Flow Nasal Cannula humidified with the Vapotherm Humidification System. This constant pressure was needed to stent the airway and increase residual lung volume with the ultimate goal of decreasing work of breathing.

These patients were on a regime of inhaled bronchodilator therapy pre-extubation with post treatment response of improved exhaled tidal volume and increased inspiratory and expiratory flow rates as measured on the Dräger Evita Ventilator. Once extubated we were obligated to continue the therapy.

The following factors were considered in choosing the appropriate device to deliver inhalation aerosol therapy in conjunction with the Vapotherm High Flow Nasal Cannula:

- The power source of the device
- Aerosol particle size
- Interface with patient/Vapotherm High Flow Nasal Cannula system

These considerations were necessary as we needed to provide aerosol therapy without interrupting the continuous airway pressure of the Vapotherm High Flow Nasal Cannula system. This system is theorized to provide continuous positive airway pressure. However, there is no way to measure how much pressure is generated at any given flow. For this reason we did not want to add any additional flow to the system.

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Removing the nasal cannula during aerosol therapy, resulting in loss of CPAP, was not an option since patients quickly become distressed as evidenced by increased respiratory rate, increased heart rate, increased use of accessory muscles, and decrease in oxygen saturation. Irritability alone decreases drug deposition to the lung. Add to this the loss in volume associated with discontinuing CPAP and aerosol therapy becomes an exercise in futility.

Using the American Association for Respiratory Care guidelines and individual patient needs, we chose the Aeronex Professional Nebulizer System (Aerogen, Inc.). This nebulizer:

- Delivers an aerosol in the range of 1.9 to 2.5 μm Mass Median Aerodynamic Diameter (MMAD) (optimal lung particle size)
- Can be placed inline with the CPAP system
- Does not require additional flow to generate the aerosol
- Delivers a higher volume of medication increasing the probability of delivering the prescribed dose
- Delivers the drug faster than the traditional Jet nebulizer (decreasing treatment time)

The Aeronex Pro nebulizer is placed inline between the modified nasal cannula tubing and the delivery tubing of the Vapotherm nasal cannula. Once in place, there is no need to remove the nebulizer. You simply open the medication filler cap and place the prescribed drug into the nebulizer without cessation to constant airway pressure. The electronic micropump creates a vibration, which sends the medication through holes in a domed aperture plate to create the aerosol without the addition of flow. The drug is delivered quickly; a volume of 3 mLs is delivered in approximately 5 minutes with virtually no residual volume.

Though this is anecdotal, we have found the Aeronex Pro an effective, efficient, and optimal inhalation delivery system when providing aerosolized drug therapy to patients requiring High Flow Nasal Cannula. It does not alter flow to the system, nor cause the baby stress. Although we have no clinical data to support its use in this application, pre and post assessment suggests a positive patient response.

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