1. PURPOSE
To provide guidelines for the use of wet nebulization to invasively and non-invasively ventilated patients, and HHFNC in the Critical Care Units.

To standardize the Aeroneb system set-up with heliox via a face mask.

To standardize the set up, the administration and the technical care of the Aeroneb Solo System - Micropump Nebulizer and Pro X

HOW IT WORKS, and BENEFITS
The micropump nebulizer is designed to aerosolize inhalation medications for any patient. The nebulizer is an electronic micropump that creates a vibration, which sends the medication through holes in a domed aperture plate to create the aerosol.

The Aeroneb Pro allows the ventilator to maintain the chosen settings, reducing the risk of harm to patients receiving aerosolized medications.

The Aeroneb Pro is the first nebulizer of choice for invasively and non-invasively ventilated patient requiring wet nebulization in the critical care areas.

The Aeroneb can be used with heliox since the liquid medication is pumped through the narrow end of the aperture at about 3 micron, creating very small, consistent particles. These apertures are so narrow that the heliox does not leak out, and the liquid placed in the reservoir does not leak through the holes.

NOT INDICATED:
There is no indication to use wet nebulization in line with the jet ventilator. The reason is the double-helical, bidirectional flow that occurs during HFJV. The aerosolized medication quickly gets caught up in the sweeping exhalation and makes its way out into the expiratory limb of the conventional circuit.

2. PROFESSIONALS AND PATIENT POPULATION
Any neonatal or pediatric patient requiring aerosolized medication treatments via a mechanical ventilator, HFOV, BiPAP machine, HHFNC, or Heliox, or manual resuscitator, once ordered by a physician.
3. ELEMENTS OF CLINICAL ACTIVITY

Respiratory Therapists are responsible to know the limits and extent of their practice as related to the particular protocol.

Medication to nebulize:

Medication that can be nebulized include (but are not exclusive to)

- Salbutamol
- Ipratropium bromide (ex. Atrovent)
- Inhaled corticosteroids (ex. Beclovent, Budesonide)
- Aerosolized anesthetic (ex. Lidocaine)
- Dornase alfa (Pulmozyme)
- Anticholinergics drug (ex. Atropine)
- Antibiotic for aerosol (ex. Pentamidine, Tobi etc.)
- Hypertonic saline
- Acetylcysteine (ex. Mucomyst)

NB. Only need 1 nebulizer for all medications.

**Equipment needed via mechanical ventilation/HFOV:**

Aeroneb Pro control module with cable
Aeroneb solo nebulizer (disposable)
Aeroneb T-piece
5 cc syringes (for medication and Normal Saline)
Labels
Filters (for ventilator expiratory line, and for NO delivery device sampling line)
Omni flex extension (if using 3100 a/b oscillator or manual bagging system)
22M-22F connector (if using HHFNC)

**Procedure**

Please refer to Aeroneb Pro manual for more specific details.

1. Get medical order

The medical order must be clearly documented in the patient's chart (medical order section) with the following information;

- Date the medication is ordered
- Name of medication
- Frequency of delivery (e.g.: Q2h)
- Route of administration (i.e.: aerosol)
- Dosage
- Physician's name and signature

2. Prepare the Aeroneb and connectors (see Annexe A)

- Assure the functional test is done (see below –under “cleaning”).
- Connect the nebulizer unit to the ventilator circuit assuring optimal orientation of the medication cup as recommended below (see Annexe A).
- Connect the control module and the nebulizer unit together using the control module cable.
- Plug adaptor in AC power source (does power on battery- 45 minutes if fully charged)
• Remove flowsensor, if there is one.
• Add filter on expiratory line of the ventilator circuit.
• If patient is on nitric oxide, add the disc filter between sampling T and sampling line of the NO delivery device (proximal to patient).
• It is recommended to have a minimum bias flow of 2lpm for non-continuous flow ventilators.

3. Prepare the medication:
   • Label syringe used with name of medication, dosage, date and time of utilization.
   • Withdraw prescribed medication and saline (if needed), in appropriate syringe, using clean technique.

4. Auscultate patient and document observations.

5. Add medication:
   • Open filter cap tab on the nebulizer unit.
   • Add medication into filler port of the nebulizer. Assure it does not surpass max. fill line.
   • Close filler cap.
   **CAUTION:** To avoid damage to the nebulizer unit, do not use a syringe with needle.

   **Note:**
   • Medication can be added during nebulization, as it does not interrupt nebulization or ventilation.
   • Medication gets fully dissolved, therefore no need to change cup in between medications.
   • The average nebulization rate of the Aerogen seem to be about 0.4 ml/min. This means that the 0.25 ml of ventolin would nebulize for about 30-40 seconds. If you add NS, given a consistent patient RR and I:E, diluting will not change the dose delivered to the patient because there is no residual volume. All you are doing is lengthening the time for the patient to receive the dose, as each breath will have a decreased concentration.

**MAXIMUM FILLING CAPACITY AERINEB SOLO:** 6ml

6. Nebulization:
   For doses less than or equal to 3ml:
   A 15 minute cycle is recommended. Press and release the blue on/off power button. The green 15 MIN. indicator lights to indicate that the 15 minutes nebulization cycle is in progress.

   For doses greater than 3ml:
   A 30 minute cycle is recommended. Add the medication and press and hold the blue on/off power button for at least 3 seconds. The green 30 Min. indicator lights to indicate that the 30 minute nebulization cycle is in progress.

   To stop the nebulizer at any time, press the on/off power button.

   Continuous nebulization is possible with the Aerogen Pro-X. See instructions below.

7. Charting
   All aerosol treatments administered to a patient must be clearly signed by the respiratory therapist in the chart with the following information:
• Date and time of administration
• Name of medication
• Dose
• Method of administration (aerosol)
• RT’s signature
• RT’s observation, including side effects, should be documented on vtr flowsheet

Residues of viscous drugs or crystallization with use of hypertonic saline can be removed by nebulizing a few drops of normal saline.

9. Cleaning:
   • Wipe down Aeroneb module and cable with an antiseptic wipe.
   • Discard all disposable items

Set-up Guide:
Refer to Annexe A (Set-up guide Aerogen solo –www.aerogen.com) for pictures and more specific details or go to website www.aerogen.com
FAQ:
1. For ventilators and HHFNC
   1. Place the Aerogen Solo on dry side of the humidifier.*
   2. Assure the angle of the T-piece is facing up.
   3. Assure the medication cup is higher than the cable connection (last page of Annexe A).

EXCEPTIONS: If using hypertonic saline for an extended period of time, or antibiotics, please the Aerogen solo AFTER the humidifier. Between the humidifier and the inspiratory line.(refer to article reference #1). This is to prevent calcification on temperature probe, and discoloration
   • In neonates it is optimal to place Aerogen solo at wye. Placement at humidifier is acceptable if concerned with added weight or rainout with placement at wye.
   • For the pediatric population, if there is bias flow, placing the aerogen at the before the humidifier gives optimal deposition. If there is no bias flow then it is best at the wye.
2. For 3100 A/B

1. Place the Aerogen Solo between the ETT and the circuit.

Insert pediatric T-adaptor between patient wye and pediatric omni-flex extension. Please note this picture is showing a non-disposable nebulizer, but the transparent, disposable nebulizer can be used.

3. For manual resuscitator:

- Aeroneb Pro control module with cable
- Aeroneb solo nebulizer
- Disposable pediatric T-adaptor
- 5 cc syringes (for medication and Normal Saline)
- Labels
- Manual resuscitator
- Swivel
- Pediatric omni flex extension

4. For BiPAP/CPAP/ trach’d patient on single limb circuits
1. Place the aerogen solo on the patient side of the leak valve.

2. Respironics masks do have the option of changing the elbow for the NIVO that incorporates the Aerogen solo in it. (in process of getting it)

3. If Masks has leak incorporated in it (try to block the leaks and add a fixed leak valve temporarily for the treatment only, under direct supervision.

5. For face mask and Heliox

Please refer to the Heliox protocol for high humidity equipment set up
Aeroneb Pro control module with cable
Aeroneb solo nebulizer
Disposable adult T-adaptor
5 cc syringes (for medication and Normal Saline)
Labels

Insert the Adult T-adaptor between mask and corrugated tubing.

5. CONTINUOUS NEBULIZATION (refer to page 5 of annex A)

Supplies Needed (in addition to above)
1. Aerogen Syringe.
2. Aerogen tubing
3. Syringe pump (supplied by nursing)

Set-up:

1. Assemble the continuous nebulization set as per Annex A and insert the T-piece at the wye or dry side of the humidifier.
2. Prime the tubing until the medication reaches the nebulization chamber (Approximately 3.5 mL)
3. Insert the medication syringe and set appropriate pump infusion rate.

Note: The Aerogen Solo nebulizes at a rate of 0.2 mL per minute or a maximum infusion rate of 12 mL per hour. The medication level in the nebulizer should be periodically checked to ensure the fill rate does not exceed the output rate of the nebulizer.

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4. APPROVAL PROCESS

Institutional and professional approval
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5. REVIEW DATE
To be updated in 2023, or sooner if presence of new evidence or need for practice change.

6. REFERENCES
Berlinski Ariel, Willis Randy, Albuterol Delivery by 4 Different Nebulizers Placed in 4 Different Positions in a Pediatric Ventilator In Vitro Model, Respiratory Care July 2013:58 (7): p1124-1133.
Berlinski Ariel, Willis Randy, Effect of Tidal Volume and Nebulizer Type and Position on Albuterol Delivery in a Pediatric Model of mechanical Ventilation. Respiratory Care May 2015.


Aeronep Pro Micropump Instruction manual.

Aeroneb Pro X Micropump instruction manual.


Aerogen Solo Set-Up Guide

Aerogen Redefining Continuous Aerosol Drug delivery PM223

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