

**OLIVE VIEW-UCLA MEDICAL CENTER
RESPIRATORY CARE SERVICES – NICU
POLICY & PROCEDURE**

**NUMBER: 1956
VERSION: 1**

SUBJECT/TITLE: AEROSOLIZED MEDICATION THERAPY

POLICY: Delivery of any aerosolized therapy is the responsibility of the respiratory therapist. A physician's order dictates the mode and type of aerosol delivery system.

PURPOSE: To deliver medications, promote cough, relieve bronchospasm and thin secretions (mucolytic agents).

DEPARTMENTS: RESPIRATORY CARE SERVICES

DEFINITIONS:

Aerosol therapy is the delivery of normal saline, hypertonic saline or medication to the upper and lower airways utilizing MDI (metered dose inhalers) or HHN (hand held nebulizers). The delivery of an aerosol must be ordered by a physician from one of the following drug classifications:

- Beta adrenergic agents.
- Anticholinergic agents
- Anti-inflammatory agents (i.e., corticosteroids)
- Mediator-modifying compounds (i.e. cromolyn sodium)
- Mucolytics
- Wetting agents (i.e. sodium chloride)

PROCEDURE:

Indications:

1. Bronchospasm
2. Upper airway inflammation (i.e. relief of inflammation due to edema and vascular congestion)
3. Mobilize and hydrate dried secretions
4. Restore and maintain the mucociliary blanket
5. Encourage cough

Contraindications:

Consult the package insert for product-specific contraindications and known hypersensitivity to the substance being delivered.

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Precautions / Complications

Administration of medications may result in:

- Inhibition of gag reflex
- Choking
- Dehydration of epithelium
- Allergic reactions
- Bronchospasm
- Nosocomial infection from contaminated delivery device or medication

NOTE: See the package insert for specific potential complications.

Metered Dose Inhaler (MDI)

A metered-dose inhaler consists of three major components; the canister which is produced in aluminum or stainless steel by means of deep drawing, where the formulation resides; the metering valve, which allows a metered quantity of the formulation to be dispensed with each actuation; and an actuator (or mouthpiece) which allows the patient to operate the device and directs the aerosol into the patient's lungs. The formulation itself is made up of the drug, a liquefied gas propellant and, in many cases, stabilizing excipients. The actuator contains the mating discharge nozzle and generally includes a dust cap to prevent contamination.

To use the inhaler, press down on the top of the canister to dispense the medication. Actuation of the device releases a single metered dose of the formulation which contains the medication either dissolved or suspended in the propellant. Breakup of the volatile propellant into droplets, followed by rapid evaporation of these droplets, results in the generation of an aerosol consisting of micrometer-sized medication particles that are then inhaled. Use chlorofluorocarbon free preparation when administering to neonates.

*The dosage delivered depends on the drug being given and the ability of the patient to coordinate the breath to actuation treatment effectively.

Metered Dose Inhaler Spacer, see above

A spacer device may be added to an MDI to aid in optimum delivery of the medication. A spacer with facemask (size 0) should be used for infants.

(Hand Held) Nebulizer (HHN)

HHN is a device that allows the nebulization of liquid medication. The medications are nebulized by either oxygen or compressed air. Infant patients will require the use of a facemask or blow-by therapy for effective utilization of this device.

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Limitations of Specific Devices

Metered Dose Inhaler

- Adequate/Inadequate technique
- Inadequate instruction to parents upon discharge
- The MDI canister is under pressure.
- Do not puncture.
- Do not use or store near open heat or flame. Exposure to temperatures above 120 degrees F may cause the canister to rupture. The MDI canister should be stored at temperatures between 50 and 86 degrees F.
- The MDI canister must be shaken well before each actuation.
- The MDI Accessory Device (spacer) is more bulky than MDI alone

Hand held Nebulizer

- Time and labor intensive*
- Less portable*
- Requires compressed-gas source or electricity*
- Vulnerable to contamination*
- Lack of convenience may affect parent/patient compliance*
- Nasal breathing reduces particle deposition
- Requires close monitoring*
- Vulnerable to contamination*
- Re-concentration of solution may occur over long period of time

*Applies to NICU graduates who require home aerosolized HHN/ MDI therapy.

Aerosolized Medications

1. Albuterol (Proventil, Ventolin)

Method of Action: stimulates beta-2 adrenergic receptors, relaxing airway smooth muscle (selective beta agonist)

- bronchodilator

Dosage, Frequency and Duration:

- MDI: 1 actuation/dose Q2-6 hours
- HHN: 0.1 to 0.5 mg/kg per dose Q2-6 hours with nebulizer

Indications: bronchospasm.

Hazards: Tachycardia, arrhythmias, tremor, hypokalemia, and irritable behavior

2. Racemic Epinephrine (Vaponefrin, Micronefrin). Alpha and beta stimulant

Method of Action: Alpha-receptor stimulation: causes vasoconstriction, which results in reduction of mucosal and submucosal edema

Beta-receptor stimulation: bronchodilation, reduction in airway smooth muscle

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spasm

Adverse Effects: Tachycardia, hypertension, precipitation or exacerbation of narrow-angle glaucoma

Dosage, Frequency and Duration:

- HHN: 0.25ml of 2.25% solution diluted with 0.9% NaCl to a total volume of 3 ml via nebulization Q30min-Q8

Indications: Post-extubation stridor, upper airway obstruction

Hazards: Tachycardia, Palpitation, Increased blood pressure, Headache, Tremors

3. Acetylcysteine (Mucomyst, Mucosol) Mucolytic

- **Method of Action:** Breaks mucus chains by replacing the disulfide bond in mucus with its own sulfahydril groups. Lowers viscosity of mucus.

Dosage, Frequency and Duration:

- HHN: 2 ml of 10% or 4 ml of 20% solution administered TID, QID, BID, Q4, Q6, Q8
- May be directly instilled in tracheostomy or endotracheal tube after aerosolization of a bronchodilator.

Indications: Thick, viscous secretions

Hazards: May cause bronchospasm. This drug should be used in conjunction with a bronchodilator.

5. Pulmicort (budesonide)

Method of Action: An anti-inflammatory corticosteroid that inhibits mast cell degranulation by blocking calcium ions from entering the mast cell, thereby preventing mediator release. Budesonide must be administered on a regularly to achieve full benefit.

Dosage, Frequency and Duration:

- MDI: Not recommended
- HHN: 0.25-0.5 mg in normal saline for a total amount of 3 ml Q12

Indications: Prophylactic management of bronchial asthma.

Hazards, Adverse Reactions and Interventions: cough, bronchospasm, throat irritation and dryness, bad taste, wheezes, nasal congestion, dizziness, joint swelling and pain, headache, rash, swollen parotid glands, nausea. If wheezing is noted during or after the therapy is administered, stop the treatment and notify the physician.

EQUIPMENT

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MDI

- MDI canister with housing
- Spacer device with face mask
- Patient set-up bag to hold the equipment at the bedside. Suction as needed.

HHN

- Flow meter connected to an oxygen blender
- Micro mist nebulizer kit (tubing, cap and jar, tee, and reservoir)
- Inline Neonatal nebulizer kit (tee, tee adapter, 12-inch corrugated tubing, nebulizer adapter, cap, jet, jar, and 7-foot Oxygen Supply tubing)
- 15mm adaptor
- Size 0 resuscitation mask
- Medications as ordered by physician
- Patient set-up bag to store the equipment.

Procedure

MDI

- Verify a written physician order for therapy in the chart.
- Collect the appropriate equipment.
- Wash hands.
- Don universal precautions attire.
- Assess breathing, auscultate, suction as needed and check vital signs before, during and after the treatment
- Place the patient in a comfortable semi-Fowler's position. Diaphragmatic excursion is greater in this position.
- Shake the MDI canister well immediately before each actuation.
- Remove the cap from the mouthpiece.
- Insert the MDI canister into the spacer.
- Make sure the canister is fully and firmly inserted in the actuator.
- With one hand behind the patient head and back for support, place spacer mask to the patient chin, seal mask to face before pressing the top of the mask to the nose.
- Wait for a breath and depress the canister to release the medication.
- Hold mask to patient face for approximately four breaths.
- Administer subsequent dose(s) after one minute.
- Watch for patient cough.

Assess the patient's therapy including:

- Patient response to or compliance with the procedure.
- Work of breathing

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- Reduction or elimination of symptoms (i.e. stridor, wheezing, congestion).
- Return patient to pre-treatment position.

HHN

1. Verify a written physician order for therapy is in the chart.
2. Collect the appropriate equipment.
3. Wash hands.
4. Don universal precautions attire.
5. Assess breathing, auscultate, and check vital signs before, during and after the treatment for patients receiving bronchodilator drugs.
6. Connect the HHN unit together with the resuscitation mask.
7. Add the prescribed medications to the jar.
8. Connect the tubing to the flow meter/ blender and set the flow at 6 to 8 liters per minute.
9. Place the patient in a comfortable semi-Fowler's position. With one hand behind the patient's head and back for support, place the mask to the patient chin and loosely to the nose at the top of the mask. Don't seal the mask to the face.
10. After the medication is finished, be sure the patient has sufficiently cleared the upper airway by auscultation. Assure that suctioning is not indicated.
11. Assess patient for response to therapy.
12. Return the patient to pre-treatment position.
13. To administer therapy as a blow by treatment, omit the mask.

For HHN via PPV therapy (Orally intubated patients):

- Follow steps 1-5 as noted in HHN.
- Connect a 15-mm adapter to the distal end of the corrugated tubing on the nebulizer and a positive pressure bag with manometer to the proximal end.
- Set the flow meter to 6-8 LPM (adjust as needed to obtain sufficient pressure for adequate chest rise) and attach the O2 tubing.
- Disconnect patient from the ventilator and connect the nebulizer set-up to the endotracheal tube.
- Closely monitor chest rise as you initiate breaths with the positive pressure bag (adjust respiratory rate, FIO2 and pressures as needed)
- Monitor vitals closely.
- Once the medication has been nebulized, disconnect the nebulizer and return the patient to the ventilator.
- Assess vital signs including breath sounds.

For inline aerosol therapy (intubated patients):

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- Follow steps 1-5 as noted in HHN.
- Place medication into the nebulizer jar. Attach the cap to the jar with a clockwise rotation.
- Attach the wide end of the nebulizer adapter to the top of the nebulizer cap
- Connect the tee adapter to the central port of the tee. The corrugated tube may be cut at a cuff if a shorter length is needed.
- Connect one end of the supply tubing to the bottom of the nebulizer and the remaining end directly to a gas flow meter outlet or to a nipple and nut connector.
- Adjust the gas source to 5-9 LPM. Check for gas and aerosol flow through the device.
- Place the tee in-line on the inspiratory limb of the ventilator circuit proximal to the patient.
- Closely monitor patient before, during and after treatment
- Once the treatment is complete, remove the tee from the Inspiratory limb and reconnect the ventilatory tubing.
- Assess vital signs including breath sounds.

Post procedure

MDI and Accessory Devices

- Remove the MDI canister and cleanse the plastic housing and cap by rinsing thoroughly in sterile water at least once a day. After thoroughly drying the plastic housing and cap, replace the canister into the plastic housing with a twisting motion and replace the cap. These products are for single patient use only.
- Place canister and spacer in a patient set up bag placed at patient bedside.

HHN

- Disassemble and clean the HHN unit after each use with sterile water. After thorough drying, place the device in a clean plastic set up bag at the patient's bedside. This equipment should be changed every 48 hours.

Documentation

All documentation will be done in the hospital EHR, ORCHID. The Medication Nebulizer documentation is in the RT Therapy and Treatment section, under Medication Nebulizer. Documentation can also be done by clicking on the Medication Nebulizer task in the Multi-patient Task List (MPTL).

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References: References: 1, 2, & 3.) AARC Clinical Practice Guideline "Selection of Aerosol Delivery Device." "Delivery of Aerosols to the Upper Airway.", "Selection of an Aerosol Delivery Device for Neonatal and Pediatric Patients." <i>Pharmaceutical Inhalation Aerosol Technology</i> , ed. A. J. Hickey, 2nd edition, Marcel Dekker Inc., NY, 2004., Swarbrick, James (2007). <i>Encyclopedia of Pharmaceutical Technology</i> (3rd Illustrated ed.). Informa Health Care. pp. 1170. ISBN 0849393949. , Finlay, W. H., <i>The Mechanics of Inhaled Pharmaceutical Aerosols: An Introduction</i> , Academic Press	
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