Departmental Policy	**Dept.: Intensive Care Services**		**Policy No: 1-2-9451-03-023** **Version No: 02**	
Title: Delivery of Aerosolized Drugs using Small Volume Nebulizer (SVN) and Metered-Dose Inhaler (MDI) to patients on Mechanical Ventilation.			**JCI Code:** COP	
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1. PURPOSE

This Policy and Procedure intended to demonstrate proper medications delivery, preparation of aerosolized agent via Small Volume Nebulizer (SVN) and/ or Metered Dose Inhaler (MDI) to patients on mechanical ventilation.

2. APPLICABILITY

To all staff member of Intensive Care Services (ICS) department.

3. RESPONSIBILITY

It is the responsibility of all staff member of ICS department to implement this departmental Policy and Procedure.

4. POLICY

4.1 Small volume nebulizers will be utilized only if the patient is incapable by virtue of physical or cognitive impairment of administering a MDI, the medication prescribed is not available in the MDI form, the patient has already attempted maximum dosage via MDI, or the patient has clearly demonstrated a reactive hypersensitivity to the MDI.

4.2 The Respiratory Care Practitioner / Nurse will perform an evaluation, identifying any contraindications or hazards, and apply the clinical practice guidelines for the Small Volume Nebulizer Protocol. The RCP / Nurse must be fully aware of the drugs contraindications, hazards, and corrective action.

4.3 If there is no increase in air entry, wheezing persists or there is no improvement in the patient condition, the RCP / nurse should notify the physician for further management.

4.4 In the event the patient suffers any of the side-effects/adverse reactions the RCP / Nurse will:

4.4.1 Discontinue present therapy.

4.4.2 Notify physician.

4.4.3 Chart adverse reaction information in CERNER including patient outcome.

4.5 When one or more aerosolized agents are ordered they will be delivered simultaneously or sequentially as part of a same RCP / Nurse intervention.

4.6 The therapy ordered should include:

4.6.1 Frequency.

4.6.2 Duration.

4.6.3 Medication.

4.6.4 Dose.

4.6.5 Diluents' if needed.

5. DEFINITIONS

5.1 **Small Volume Nebulizer (SVN)** is a device that produces an aerosol suspension of liquid particles in gaseous medium using buffing to control particle size.

5.2 **Metered-dose inhaler (MDI)** is a pressurized cartridge used for administration of exact dosage of aerosolized drugs. A uniform dose of drug is disposed within a fraction of second after actuation, and the dose provided are reproducible throughout the canister life.

5.3 **Spacer and Valve Holding Chambers**: are MDI accessory devices designed to reduce both oropharyngeal deposition and/ or the need for hand-breath coordination. All spacers distance between the MDI and the mouth, reducing the initial forward velocity of the MDI droplets.

5.4 **Mesh nebulizer:** Mesh nebulizer use electricity to vibrate a piezo (at approximately ~128 KHz) element that moves liquid formulations through a fine mesh to generate aerosol. The diameter of the mesh or aperture determines the size of the particle generated, Mesh nebulizers are very efficient and result in minimal residual volume (0.1-0.5 mL).

6. PROCEDURES

6.1 Preliminary Steps

6.1.1 Get physician Order.

6.1.2 Obtain appropriate equipment and supplies.

6.1.3 Inspect medical records for precautions/complications.

6.1.4 Verify physician's order and confirm dose and frequency.

6.1.5 Obtain prescribed medication using approved facility guidelines (electronic medication storage device).

6.1.6 Ensure patient privacy, wash hands and implements standard precautions.

6.2 Patient Interaction and Equipment Preparation

6.2.1 MDI administration:

6.2.1.1 Introduce yourself and identify department.

6.2.1.2 Correctly identify patient using two patient identifiers (wristband and patient's medical recorded number).

6.2.1.3 Explain procedure to patient and provide patient/family.

6.2.1.4 Perform baseline physiologic assessment (pulse, breath sounds, peak-flow, dyspnea rating) **before, during, and after the therapy**.

6.2.1.5 Suction the patient if indicated.

6.2.1.6 Position the spacer within the inspiratory limb of the ventilator circuit.

6.2.1.7 Actuate the MDI at end-exhalation and apply two to three second breath hold, if tolerated by the patient. This is performed by pressing and holding the inspiratory hold button.

6.2.1.8 Use aerosolized devices (Spacer) or Valve Holding Chamber to enhance drug deposition.

6.2.1.9 Perform subsequent actuations at one-minute intervals.

6.2.1.10 Monitor the patient throughout the treatment for tolerance of the therapy.

6.2.1.11 Return the ventilator to pretreatment settings.

6.2.1.12 Reassess the patient for the status of breath sounds, vital signs, and ventilatory mechanics.

6.2.2 **SVN administration:**

6.2.2.1 Prepare the medication and nebulizer as per the manufacturer's recommendation for total solution volume.

6.2.2.2 Keep expiratory filters in place.

6.2.2.3 Position the nebulizer within the circuit in the inspiratory limb approximately 30 cm from the patient airway, and bypass the humidifier (HME). Bypassing the humidification system is necessary to minimize the tendency of water vapor to increase particle size.

6.2.2.4 Adjust the ventilator when necessary to maintain appropriate flow and volume dynamics:

6.2.2.4.1 For patients on pressure-controlled modes, note the exhaled TV, and make adjustments to the PIP as necessary to maintain the exhaled TV at pre-treatment levels.

6.2.2.4.2 When it is necessary to minimize turbulent flow, increase the rise time. This may be especially beneficial when pediatric airways are employed or patients have a significant amount of airway resistance.

6.2.2.4.3 When flows exceeding 4 liters/min are used to power the nebulizer, it may be necessary to increase the sensitivity of the ventilator to account for the increase in bias flow. The flow sensing knob may be placed in the red zone for this purpose.

6.2.2.4.4 If the set PEEP on the ventilator is >10, Clamp must be applied or to use MDI instead.

6.2.2.4.5 If the patient is on advanced ventilator device such as HFOV (high frequency oscillator ventilator) to use MDI instead of SVN.

6.2.3 Monitor the patient throughout the treatment for tolerance of the therapy.

6.2.4 Tap the sides of the nebulizer as the treatment progresses to minimize dead volume. The treatment is complete when there is no longer any aerosol being produced.

6.2.5 Return the ventilator to pretreatment settings.

6.2.6 Reassess the patient for the status of breath sounds, vital signs, and ventilatory mechanics.

6.2.7 Nebulizer in line with the ventilator circuit tends to collect condensate when not in use and should be removed from ventilator circuit between treatments, then cleaned and stored as per small volume nebulizer (SVN) and metered dose inhaler (MDI) handling policy.

6.3 Mesh and ultrasonic Nebulizer:

6.3.1 Correctly assemble the nebulizer as per manufacture's specifications.

6.3.2 If applicable, follow manufacturer's instructions in performing a functionality test prior to the first use of a new nebulizer as well as after each disinfection to verify proper operation.

6.3.3 Pour the solution into the medication reservoir. Do not exceed the volume recommendation by the manufacturer.

6.3.4 Sit in upright position.

6.3.5 Turn on the power.

6.3.6 Hold the nebulizer in the position recommended by the manufacturer.

6.3.7 Follow the instruction of the breathing technique that is recommended by the manufacturer for these uniquely designed mesh and ultrasonic nebulizers.

6.3.8 If the treatment must be interrupted turn off the unit to avoid waste.

6.3.9 At the completion of the treatment, disassemble and clean as recommended by the manufacturer.

6.3.10 When using a mesh nebulizer, do not touch the mesh during cleaning. This will damage the unit.

6.3.11 Once or a twice a week, disinfect the nebulizer following the manufacturer's instructions.

6.4 POST PROCEDURE:

6.4.1 Continue to monitor and assess the effects of therapy in the post treatment period. Beneficial effects may not be noted immediately in all patients, but they may be evident in the period of time shortly after drug administration.

6.5 CHARTING:

6.5.1 Document the outcome and effects of therapy on the "Notes" side of the ventilator flow sheet.

7. REFERENCE

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