PENTAMIDINE AEROSOL THERAPY

PURPOSE

Pentamidine isethionate is an anti-microbial agent effective in the treatment of *Pneumocystis jirovecii* (formerly *carinii*) pneumonia (PCP). Prophylactic aerosolization of this agent has been shown to be effective in reducing the number of *P. jirovecii* infections in HIV-infected individuals. The Centers for Disease Control and Prevention have recommended that patients with HIV whose CD4+ lymphocyte counts have fallen to 200/mm³ or fewer receive prophylaxis against *P. jirovecii*. Other immunocompromised patient may benefit from prophylaxis, or occasionally, patient with *P. jirovecii* who are intolerant to other antimicrobials may receive aerosolized treatments, although this is not considered first-line treatment.

Pentamidine is administered via the Respiragard II nebulizer which utilizes a series of one-way valves and a filter to minimize the release of aerosol droplets into the air. Aerosolized pentamidine may be potentially toxic necessitating this special nebulization system.

The standard dose is 300 mg of lyophilized pentamidine isethionate dissolved in 3 mL of sterile water and aerosolized until the nebulizer runs dry (20-45 minutes). This therapy is generally given on a monthly basis.

STANDARDS

Pentamidine aerosol therapy requires a prescriber’s order. The order must include dosage, frequency of administration, and indication. The order must also include an order for a bronchodilator as needed (prn).

A Respiratory Therapist will administer pentamidine aerosol therapy.

Pentamidine therapy will be performed in a negative flow or private room to minimize the risk of exposure for others.

A disposable fit-tested N95 respirator mask must be worn by the Respiratory Therapist and any other individuals in the room during treatment and for 30 minutes post treatment.

The risks of pentamidine exposure for pregnant women, their unborn babies, and nursing mothers, and the effects on fertility are unknown. All decisions to administer pentamidine aerosol therapy to pregnant or nursing women must be weighed against these unknown risks. Pregnant health care workers are not permitted to administer aerosolized pentamidine and health care workers attempting to conceive should avoid exposure.

INDICATIONS

- HIV-positive patients whose CD4+ count is at or below 200/mm³ or have a history of *P. carinii* pneumonia
- HIV-positive patients who are intolerant to other anti-*Pneumocystis* chemoprophylaxis or therapeutic agents
- Other immunocompromised patients for whom pentamidine prophylaxis is deemed beneficial (i.e. oncology patients with primary immunodeficiencies or those receiving chemotherapy with secondary immunodeficiencies, bone marrow transplant patients, and patients receiving prolonged administration of high-dose steroids).

CONTRAINDICATIONS

Pentamidine prophylaxis is contraindicated in patients with demonstrated hypersensitivity to inhaled or parenteral pentamidine.

PRECAUTIONS

- Because there is considerable potential for acute side effects from the inhalation of pentamidine, it is imperative that the respiratory therapist be in view of the patient at all times during therapy. Potential side effects include fatigue, metallic taste, pain, pneumothorax, tachycardia, palpitations, syncope, hypertension, gingivitis, dry mouth, confusion, anxiety, seizure, laryngospasm, conjunctivitis, and blurred vision.
Other potential side effects of pentamidine inhalation include bronchospasm and cough. Especially in patients with asthma or reactive airways disease, pre-treating with a bronchodilator may be beneficial. For patients who have documented or suspected airway reactivity to the therapy, a bronchodilator must be administered prior to pentamidine prophylaxis.

Side effects for bystanders and for health care workers administering pentamidine therapy include shortness of breath, headache, burning of the eyes, nose, and throat, nausea, and lightheadedness.

Flow to the nebulizer should be terminated prior to removal of the nebulizer from the patient’s mouth to reduce environmental exposure.

**ADVERSE REACTIONS AND INTERVENTIONS**

- If bronchospasm occurs during or after pentamidine therapy, secure an order from the physician to administer a bronchodilator. Patients with a history of airway reactivity to aerosolized pentamidine should be pre-treated with a bronchodilator.
- Rest periods may be allowed due to fatigue resulting from breathing through the one-way valves and maintaining a tight lip seal on the mouthpiece.
- The patient may complain of a burning sensation in the back of the throat usually occurring in the latter part of therapy. This is usually resolved by temporarily discontinuing therapy and allowing the patient to have a drink of some liquid (avoid orange juice).
- Notify the physician if any of the more serious complications (i.e. chest pain, palpitations, syncope, confusion, seizure, marked desaturation, etc.) occur during therapy and document in the patient’s chart.

**EQUIPMENT**

- Oxygen flowmeter with nipple
- Respirgard II nebulizer system (located in box in the RT staff room)
- Lyophilized pentamidine isethionate (300 mg) (delivered to area)
- One 10 mL vial of sterile water for injection
- 3 mL syringe with large bore blunt needle
- appropriately fit-tested N95 respirator mask(s)
- Small volume nebulizer and bronchodilator or metered dose inhaler as ordered
- Pulse oximeter: required for patients on oxygen
- Facial tissue
- Emesis tray
- Gum (as needed)
- Noseclips (as needed)

**PROCEDURE**

<table>
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<th><strong>Rationale</strong></th>
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<td><strong>PERFORM</strong> hand hygiene.</td>
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2. **PREPARE** aerosol solution and delivery system:
   a. Instill 3 ml of sterile water into 300 mg vial pentamidine and agitate the vial until a homogenous solution results
   b. Assemble the Respirgard II nebulizer and tubing and inject the pentamidine solution into the nebulizer.
   c. Attach flowmeter to wall outlet if not already in place. (Use oxygen outlet if patient on oxygen)
   d. Attach tubing to nipple of flowmeter
### 3. IDENTIFY patient and EXPLAIN procedure.

**Failure to correctly identify patients prior to procedures may result in errors.**  
Reduces child and family’s anxiety. Evaluates and reinforces understanding of previously taught information and confirms consent for medication administration.

### 4. PERFORM pre-treatment assessment:
- heart rate (HR)
- respiratory rate (RR)
- breathing pattern
- breath sounds
- oxygen saturation (SpO₂) if patient on oxygen
- cognitive ability to understand and follow instructions

**Establishes baseline assessment.**

### 5. ADMINISTER a bronchodilator if indicated.

**Potential side effects of pentamidine inhalation include bronchospasm and cough. Especially in patients with asthma or reactive airways disease, pre-treating with a bronchodilator may be beneficial. For patients who have documented or suspected airway reactivity to the therapy, a bronchodilator must be administered prior to pentamidine therapy.**

### 6. PLACE patient in a comfortable position, preferably sitting or with head of bed elevated.

**Nebulizer functions best in an upright position.**

### 7. DON an N95 respirator mask. Parents/guardians and others remaining in the room during therapy must also wear an N95 respirator mask.

**To prevent exposure to aerosolized medication.**

### 8. INSTRUCT patient to place mouthpiece into mouth and form seal around it with lips. Apply nose clip if needed.

**Optimizes drug delivery to the respiratory tract.**

### 9. TURN flowmeter to 6 litres.

### 10. INSTRUCT patient to breathe normally and to inhale and exhale through his/her mouth.

### 11. CONTINUE treatment until all medication is administered (20-45 minutes).

### 12. REASSESS patient intermittently during the treatment and at the conclusion of therapy:
- heart rate
- respiratory rate
- breathing pattern
- breath sounds
- oxygen saturation (SpO₂) if patient on oxygen

**To evaluate effectiveness of treatment and detect any adverse effects of medication.**

### 14. TURN flowmeter off and remove nebulizer mask from patient.

**Turning flowmeter off before removal of mask minimizes aerosolization of particles into room.**

### 15. DISCARD nebulizer and other items in appropriate container.

**Routine infection control practices; reduces transmission of microorganisms.**

### 16. REMIND anyone staying in room to keep the N95 respirator mask on until 30 minutes after treatment.

**To reduce risk of exposure to aerosolized particles of pentamidine that may remain in the room.**

### 17. CONTACT housekeeping to wet clean room after patient leaves and at least 30 minutes after treatment for patients in ambulatory areas.

**A wet clean is used to avoid raising dust.**
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DOCUMENTATION

DOCUMENT in appropriate record(s):
  o date and time
  o pentamidine dose administered and volume of diluent
  o bronchodilator administered if needed
  o individual administering medication(s)
  o assessments of HR, RR, breathing pattern, breath sounds and SpO2
  o patient response to procedure
  o unexpected outcomes and related treatment
  o patient/family education
  o any other pertinent actions or observations

REFERENCES


Lexi-Comp, Inc. Pentamidine Pediatric Drug Information. Retrieved from Up to Date.

