SOP on Demonstration of Drug Delivery in Asthma

Department of Pharmacology
Faculty of Medicine
UWUSL

STANDARD OPERATING PROCEDURE (SOP) ON DEMONSTRATION OF DRUG DELIVERY IN ASTHMA

Title
Demonstration of Drug delivery in asthma for Undergraduate Pharmacology Teaching

Issued by
Department of Pharmacology
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(1) PURPOSE
To establish a standardized procedure for the safe, correct, and effective administration of drugs in asthma using inhalational and systemic routes, ensuring optimal therapeutic outcomes and minimal adverse effects.

(2) SCOPE
Applicable to:

- Lecturer
- Medical students
- Temporary demonstrators of Pharmacology
- Healthcare professionals involved in asthma management and teaching

(3) RESPONSIBILITIES

(3.1) Lecturer
- Ensure training in inhalation techniques
- Supervise demonstrations
- Ensure adherence to guidelines

(3.2) Healthcare Personnel / Students
- Perform correct drug delivery techniques
- Educate patients
- Monitor response and adverse effects

(4) DEFINITIONS

- **Asthma:** Chronic inflammatory airway disease with reversible bronchoconstriction
- **Bronchodilators:** Drugs that relax bronchial smooth muscle
- **Anti-inflammatory drugs:** Drugs that reduce airway inflammation
- **Metered dose inhaler (MDI):** Pressurized device delivering a metered aerosol dose
- **Dry powder Inhaler (DPI):** Breath-actuated powdered drug device
- **Nebulizer:** Converts liquid drug to aerosol
- **Spacer:** Chamber improving drug delivery and reducing oropharyngeal deposition

(5) CLASSIFICATION OF DRUGS USED IN ASTHMA

(5.1) Combination Therapy

- Long acting β2 agonists (LABA) + corticosteroid combinations (e.g., formoterol + fluticasone)

(5.2) Anti-inflammatory Drugs

- Corticosteroids (beclomethasone, budesonide, prednisolone)
- Sodium cromoglycate
- Monoclonal antibodies (e.g., omalizumab)

(5.3) Bronchodilators

- β2 agonists (e.g., salbutamol, salmeterol, formoterol)
- Antimuscarinics (e.g., ipratropium)
- Methylxanthines (e.g., theophylline)
- Leukotriene receptor antagonists (e.g., montelukast)

(6) RATIONALE FOR INHALATIONAL DRUG DELIVERY

- Direct delivery to lungs
- Rapid onset of action
- Smaller doses required
- Reduced systemic side effects

Example: Inhaled salbutamol produces an effect similar to a higher oral dose

(7) EQUIPMENT / MATERIALS

•MDI

• Mask/ mouthpiece /Spacer device

• Spacer

•DPI

•Nebulizer machine

•Drug Solutions

•Normal saline

•Gloves

(8) GENERAL PRECAUTIONS

- Ensure the five rights: Right patient, Right drug, Right time, Right Route
- Ensure proper technique
- Avoid contamination

Monitor for,
- Tachycardia
- Tremors
- Hypokalemia

(9) PROCEDURE

(9.1) MDI – With Spacer

1. Shake the inhaler well to ensure uniform drug distribution

2. Remove the mouthpiece cap

3. Attach the inhaler securely to the spacer device

4. Hold the inhaler upright to maintain correct aerosol release

5. Sit or stand upright and tilt the head slightly backward

6. Breath out slowly and completely

7. Place the spacer mouthpiece into the mouth and seal lips tightly.

8. Press the inhaler canister once to release medication into the spacer

9. Inhale the medication: slowly and deeply through the mouth OR Take 10 normal tidal breaths.

10. Hold breath for 10-20 seconds
11. Exhale slowly and gently
12. Wait approximately 1 minute before repeating the dose.
13. Shake the inhaler before the second dose
14. Repeat the same steps for additional doses if required.
15. Detach the inhaler and replace the cap after use.

Used in:

- Acute symptom relief in Asthma (eg. Salbutamol, Formoterol and ICS combination)
- Maintenance Therapy (eg. inhaled corticosteroids, Formoterol and ICS combination)

Advantages:

- No coordination needed
- Less oral deposition
- Reduces candidiasis

(9.2) Dry Powder Inhaler (DPI)

1. Load the dose
   - Open the inhaler according to the specific device (e.g., twist, click, or insert capsule depending on the type).
   - Ensure a dose is properly loaded before use.
   - Hold the inhaler in the correct position (usually upright) to avoid losing the powder

2. Exhale away from the device

   - Breathe out gently and fully, but do not exhale into the inhaler**.**
   - Exhaling into the device can introduce moisture, which may cause the powder to clump and reduce effectiveness.

3. Inhale forcefully and deeply

   - Place the mouthpiece between your lips and seal it tightly.
   - Inhale quickly, forcefully, and deeply through the mouth (not through the nose).
   - This strong inhalation is necessary to properly disperse the dry powder and deliver the medication into the lungs.

4. Hold breath for 10 seconds

- Remove the inhaler from your mouth after inhalation.
- Hold your breath for about 10 seconds (or as long as comfortable).
- This allows the medication to settle in the airways and improves drug absorption.
- Then breathe out slowly.

(9.3) Nebulization

1. Add drug + saline
   Measure the prescribed dose of medication (e.g., salbutamol, ipratropium) using a sterile dropper or syringe
   • Dilute the drug with normal saline (0.9%) to achieve a total volume of 2–5 mL (as recommended)
   • Transfer the solution into the nebulizer chamber (medicine cup)

2. Attach mask/mouthpiece
   • Connect the nebulizer chamber to the tubing and compressor machine
   • Attach a face mask (preferred for children/elderly) or mouthpiece (preferred for adults)
   • Ensure proper fitting:
     - Mask should cover nose and mouth tightly.
     - The mouthpiece should be sealed tightly with the lips

- Check all connections to ensure no air leakage

3. Turn on the machine

   - Switch on the compressor to generate aerosol
   - Confirm that a visible mist is being produced from the chamber
   - Ensure the device is functioning properly:
   - Position the patient in an upright sitting position to optimize lung expansion

4. Breathe normally
   - Instruct the patient to breathe slowly and normally through the mouth
   - Avoid rapid or shallow breathing
   - Encourage occasional deep breaths to enhance drug deposition in lower airways
   - In children, allow calm breathing (do not force deep inhalation)
   - Ensure the patient remains relaxed throughout the procedure

5. Continue for 10–15 minutes
- Continue nebulization until:
    - The mist stops OR
    - The solution in the chamber is nearly finished
- Typical duration is 10–15 minutes

Used in:
- Acute severe asthma

(10) INSTRUCTIONS: SPACER USE

- Wash weekly
- Air dry (do NOT wipe)
- Replace every 6–12 months

(11) POST-PROCEDURE CARE

- Rinse mouth after corticosteroid use to prevent candidiasis (important for steroids)
- Assess symptom relief and breathing improvement
- Document:
    - Drug administered
    - Dose and time
    - Patient response

(12) ADVERSE EFFECTS

(12.1) β2 Agonists
- Tremor
- Tachycardia
- Palpitations

(12.2) Steroids
- Oral candidiasis
- Dysphonia

(12.3) Antimuscarinics
- Dry mouth
- Constipation

(12.4) Theophylline
- Narrow therapeutic index and drug interactions
- Arrhythmias, seizures (overdose)

(13). COMPLICATIONS

- Poor technique → treatment failure
- Overuse → toxicity
- Infection risk (improper cleaning)

(14) PATIENT EDUCATION

- Demonstrate inhaler technique step by step
- Regularly reassess and correct technique
- Emphasize medication adherence
- Educate about trigger avoidance
- Explain the difference between;
  Reliever medications (e.g. Salbutamol)
  Preventer medication (e.g. Corticosteroids)

(15) DISPOSAL

- Dispose of single-use items properly
- Clean reusable devices
- Follow infection control protocols

16. REFERENCES

- GINA Guidelines
- WHO Asthma Guidelines
- Standard Pharmacology Textbooks

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