

Inhalation Therapy

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I have no disclosures

Strategies to improve adherence in asthma

- Only a few interventions have been studied closely in asthma and found to be effective for improving adherence
 - Shared decision-making
 - Simplifying the medication regimen (once vs twice-daily)
 - Comprehensive asthma education with nurse home visits
 - Reviewing patients' detailed dispensing records

Need for Asthma Education

- Several studies indicate that education can decrease hospitalizations, ER visits and asthma care costs.
- Asthma surveys demonstrate that 71% of people with asthma recognize there is a strong need for more education.
- Poor understanding of causes of asthma symptoms and treatment options.
- Instruction on optimal use of medications and delivery devices is lacking

History of medication inhalation therapy

- Inhalation for medical purposes dates back 4000 years in the South-Asian Indians who smoked herbal preparations with anticholinergic properties.
- 1833 inhalation of atropine was described.
- 16th century Egyptians inhaled vapors of the deadly nightshade family, which had anticholinergic properties.
- 1778 English physician, Dr. John Mudge developed the term inhaler for the inhalation of opium vapor to treat cough.

History of Inhalers

- 19th Century devices were used for inhalation of vapors or medicated steam, including Dr. Nelson's inhaler.
- Dr. Nelson's inhaler was a ceramic flask into which aromatic herbs and hot water were placed.
- A vapor was emitted which the patient inhaled.



Nebulizers

- Mid to late 19th Century in France the atomizer similar to a modern nebulizer was introduced.
- It was a product from the French atomizer used in the perfume industry. It was operated by a hand pump.



Steam Powered inhalers

- Steam powered inhalers consisting of a small boiler that created steam were used. The patient would inhale the steam/medication through a glass tube adjacent to the tip of the capillary tube.



Epinephrine Aerosol



- The epinephrine aerosol was first developed in 1910 .
- Plastic bulb nebulizers appeared in the 1930s and 1940s for the administration of epinephrine.
- The inhaler required the patient to add epinephrine solution and squeeze a bulb to aerosolize the epinephrine on a breath-to breath basis.

Dry Powdered Inhalers

- Combustible powders and cigarettes containing powders for the treatment of asthma became popular in the early 20th century. These evolved into the early dry powder inhalers.

- 1940s Penicillin was inhaled via a DPI .
- 1950 norisodrine DPI was developed for asthma.



- 1977 the Albuterol rotohaler was introduced

Metered Dose Inhalers

- The MDI evolved over a period of two years, 1955-1957
- Epinephrine and isoproterenol MDIs were the first ones.
- Now breath-actuated inhalers, HFA propellant, spacers and holding chambers and wide variety of delivery devices are available.
- The challenge is now how to choose and learn the different inhalation techniques.

Principles of medication Inhalation Therapy

- Advantages of inhaled medication therapy
- Factors associated with successful inhaled medication therapy
- Mechanisms of medication deposition

Metered Dose Inhaler Therapy and Accessory Devices

- MDIs are compact and portable.
- Inherent problems with MDIs include inadequate technique.
- Hand-breath coordination problems
 - Too brief of breath hold
 - Too rapid of inspiratory flow rate

Advantages of Inhaled Therapy

- Smaller doses of medication can be used.
- Rapid onset of action.
- Low incidence of systemic side effects.

Physical Mechanisms of Particle Deposition in the Respiratory Tract

Three mechanisms of aerosol kinetics govern the majority of particle deposition within the respiratory tract.

- Inertial Impaction
- Sedimentation
- Diffusion

Inhalation Technique

- The most important features of inhalation technique are:
 1. Inhaled Volume
 2. Flow Rate
 3. Breath-holding pause at the end of inspiration

Inhalation Mode

- Slow steady inhalation facilitates laminar flow and larger deposition in the peripheral airways
- The larger the volume of air inhaled, the greater the deposition in the peripheral airways.

Inspiratory Flow Influences Drug Deposition

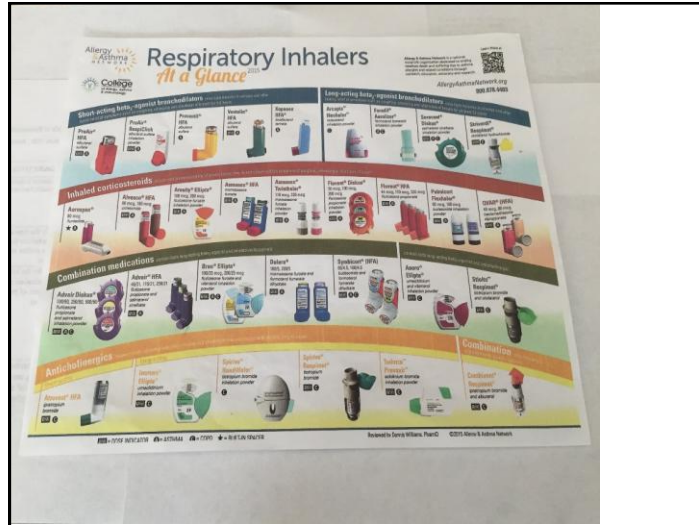
- | • Inspiratory Flow: | • Drug Deposition: |
|---------------------|--------------------|
| • Too Slow | • Mouth |
| • Too Fast | • Throat |
| • Correct Speed | • Lungs |

Nebulizer Therapy Advantages

- Some patients (young children, elderly adults) cannot master MDI technique or they don't cooperate.
- A breath hold is not essential.
- Some literature suggests patients prefer nebulizers over MDIs.
- Moisture has some benefit in increasing mucociliary activity

Nebulizer Disadvantages:

- Increased expense
- Less portable and cumbersome
- Longer treatment times
- Need for external power source; there are portable hand-held compressor/nebulizers



MDI Therapy



- 1. Remove MDI cap.
- 2. Shake inhaler
- 3. Tilt head back slightly and breathe out to empty the lungs.
- 4. Position the inhaler
 - A. in mouth between teeth with lips sealed around mouth piece OR
 - B. About 2 inches in front of open mouth.
- 5. Actuate the MDI as slow inhalation begins. Continue to breath in slowly over 3-5 seconds.
- 6. Hold breath for 10 seconds to allow the medication to settle into lungs.
- 7. Repeat steps 2-6 for each puff of medication ordered.



Spacers/Valved Holding Chambers

- Reduce difficulties associated with MDIs.
- With spacers, aerosol particles decelerate allowing the propellant to evaporate, increasing the respirable dose.
- Systemic absorption is minimized due to the decrease in medication that is deposited in the oropharyngeal cavity.
- Local side effects: dysphonia, oral candidiasis and bad taste are reduced.
- Studies have shown that MDIs plus valved holding chambers are as effective as nebulizers with short acting beta agonists in the ER for mild to moderate asthma exacerbations.
- Mask spacers has enhanced delivery to infants, small children and neurologically impaired.
- Many spacers employ a flow signal, which is activated when the patient inhales too quickly.

Spacer with mouthpiece



- **Instructions for Using Your Inhaler with a Spacer**
- 1. Shake the inhaler well.
- 2. Attach the inhaler to the back end of the spacer.
- 3. Put the mouthpiece of the spacer in your mouth.
- 4. Push down on the medicine once.
- 5. Close your lips tightly around the mouthpiece. Breathe in slowly and deeply.
- 6. Hold your breath and count to 10 in your head.
- 7. Breathe out slowly, then breathe normally.

Spacer with Mask

- 1. Put the Spacer with mask to the child's face so that both the nose and mouth are covered. The mask must be pressed to the child's face to assure that the medication gets to the child's lungs
- 2. Press the MDI down once to release a spray of medicine. The medicine will be trapped in the spacer.
- 3. While the mask is on, ask your child to breathe in slowly and deeply for six breaths with the chamber mask in place.
- 4. Take off the mask and have the child breath normally.
- 5. Repeat steps 1 through 3 if additional puffs are required.



Dry Powder Inhaler Therapy

- DPIs do not require hand- breath coordination.
- Diskus, Flexhaler, Aerolizer, Twisthaler

Diskus

- Using a Diskus requires 3 simple steps. **Open, Click, Inhale**
- **Open**
 1. Hold the Diskus in one hand.
 2. Place thumb of the other hand on thumb grip and push away, until the mouthpiece appears and snaps into position.
- **Click**
 1. Hold the Diskus in a level, horizontal position with the mouthpiece towards you.
 2. Slide the lever away from you as far as it will go until it clicks.
 3. The Diskus is now ready to use.
- **Inhale**
 1. Turn head away from the device and exhale.
 2. Place mouthpiece to lips.
 3. Breathe in quickly and deeply through the Diskus, not through you
 4. Remove Diskus from mouth and hold breathe for up to 10 seconds.
 5. To close the Diskus put your thumb on the thumb grip and slide the Diskus will click shut.



Twisthaler

- Open inhaler, hold straight up position, hold the colored (pink or grey) base twist the cap in a counterclockwise direction to remove cap
- By removing the cap it automatically loads the correct dose. Do not shake the twisthaler.
- Breathe out fully, then bring twisthaler mouthpiece into your mouth by holding inhaler horizontally, firmly close your lips, and take a deep breath. Do not breathe into the twisthaler.
- Since medicine is a fine powder, you may not be able to taste or feel it in your lungs. Do not cover the ventilation ports while inhaling dose.
- Remove twisthaler from mouth after deep inspiration, hold your breath up 5- 10 seconds.
- Repeat steps above if extra doses are needed.
- Replace cap of twisthaler right away and turn clockwise, you will hear a click to let you know the cap is fully closed, this is the only way to be sure that your next dose is ready and loaded the right way.
- DO NOT STORE MEDICATION IN A HUMID PLACE OR BATHROOM.



Flexhaler Instructions

Prime: Before you use your Flexhaler for the first time prime it. Take the cover off and twist the brown grip back and forth two times. It is not necessary to do this again.

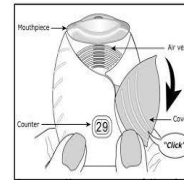
How to Use:

- Hold the Flexhaler by the brown grip and twist the cover off.
- Keep the Flexhaler upright with the mouthpiece facing up.
- Twist the brown grip fully in one direction and then the other. You will know you have done this correctly if you hear it click.
- Take a breath in and then out.
- Turn the Flexhaler sideways and place the mouthpiece in your mouth.
- Take a fast, deep forceful breath in.
- Hold your breath for 10 seconds.
- Rinse your mouth out after taking this medication.
- Repeat the steps if more than one puff has been prescribed.
- Place the cover back on and twist in place.



Ellipta Inhaler

- An Ellipta Inhaler comes in a tray and contains a desiccant to reduce moisture. Throw out tray after it's opened. The inhaler contains 30 doses.
- Each time you open the cover of the inhaler you will hear a clicking sound and a dose is ready to be inhaled.



Do not open the cover of the inhaler until you are ready to use it.

- Breathe out, while holding the inhaler away from your mouth.
- Inhale your medicine. Put the mouthpiece between your lips and close your lips firmly around it.



Take one long, steady, deep breath in through your mouth. Do not breathe through your nose. Do not block the air vent with your fingers. Remove the inhaler from your mouth and hold your breath for about 3-4 seconds. Close the inhaler.

Dry Powder Inhaler Aerolizer

- Hold the Aerolizer and twist the mouthpiece open by following the arrow on the mouthpiece.
- Place one capsule in the bottom of the Aerolizer.
- Twist the mouthpiece back in place to close the Aerolizer.
- Hold the Aerolizer upright and squeeze the blue buttons on the sides one time to pierce the capsule. You should hear a click. Then release the buttons.



- Take one breath in and then breathe out.
- Turn the Aerolizer sideways and place the mouthpiece in your mouth.
- Take a fast, deep forceful breath in. (you should hear the capsule spinning in the Aerolizer as you inhale)
- Hold your breath for 10 seconds.
- Open the Aerolizer to check that all the powder is gone. Dispose of the empty capsule.
- Place the cover back on over the mouthpiece.

RespiClick

- Make sure the cap is closed before use.



- Check the dose counter window. The dose counter only displays even numbers.
- Hold the inhaler upright as you open the cap fully. You should hear a click. The inhaler is now ready to be used.
- Exhale before you put the mouthpiece in your mouth.
- Put the mouthpiece in your mouth and close your lips around it and breathe in deeply.
- Hold your breath for 10 seconds.
- Always close the cap after each inhalation so your inhaler will be ready for your next dose.



Respimat



Respimat: Prepare for First-Time Use

1. With the cap closed, press the safety catch while pulling off the clear base. Be careful not to touch the piercing element located inside the bottom of the clear base.
2. Write the discard by date on the label of the RESPIMAT inhaler. The discard by date is 3 months from the date the cartridge is inserted into the inhaler.
3. Take the RESPIMAT cartridge out of the box. Push the narrow end of the cartridge into the inhaler. The base of the cartridge will not sit flush with the inhaler. About 1/8 of an inch will remain visible when the cartridge is correctly inserted. The cartridge can be pushed against a firm surface to ensure that it is correctly inserted. Do not remove the cartridge once it has been inserted into the inhaler.
4. Put the clear base back into place. Do not remove the clear base again. The RESPIMAT inhaler should not be taken apart after the cartridge has been inserted and the clear base has been replaced.



Priming Respimat

- The following steps are needed to fill the dosing system the first time it is used and will not affect the number of puffs available. After preparation and initial priming, the RESPIMAT inhaler will be able to deliver your medicine. Proper priming of the inhaler is important to make sure the correct amount of medicine is delivered.
- Hold the inhaler upright, with the cap closed, to avoid accidental release of dose.
- Turn the clear base in the direction of the black arrows on the label until it clicks (half a turn).
- Flip the cap until it snaps fully open.
- Point the RESPIMAT inhaler toward the ground (away from your face). Press the dose-release button. Close the cap.




Daily Dosing Respimat

- A. Hold the RESPIMAT inhaler upright, with the cap closed, to avoid accidental release of dose. TURN the clear base in the direction of the black arrows on the label until it clicks (half a turn).
 - B. Flip the cap until it snaps fully OPEN. Breathe out slowly and fully, and then close your lips around the end of the mouthpiece without covering the air vents.
- Point the RESPIMAT inhaler to the back of your throat. While taking in a slow, deep breath through your mouth, PRESS the dose-release button and continue to breathe in slowly for as long as you can. Hold your breath for 10 seconds or for as long as comfortable



Provide hands-on inhaler skills training



- Choose
- Check
- Correct
- Confirm

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