RESPIRATORY MEDICATIONS AND DEVICES

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CONFLICT OF INTEREST

• Dewey Hahlbohm is a member of the speakers bureau of the Association of Asthma Educators
OBJECTIVES

- Review mechanism of action for asthma pharmacologic agents
- Describe key patient educational points for each
- Compare and contrast various aerosol delivery devices including proper technique and limitations of device

MECHANISMS OF ACTION

- Albuterol (ProAir Respliclick®)
- Fluticasone Furoate (Arnuity Ellipta®)
- Fluticasone Furoate/Vilanterol (Breo Ellipta®)
- Montelukast (Singulair®)
- Albuterol/ Ipatropium (DuoNeb®)

A. LABA
B. SABA
C. ICS
D. LTRA
E. SAMA
F. LAMA
QUICK RELIEF MEDICINES
RESCUE MEDS

- Short acting B2 agonists
- Anticholinergics
- Systemic corticosteroids, oral or IV

- These medications quickly reverse bronchoconstriction and symptoms of cough, chest tightness, and wheeze

SHORT ACTING B2 AGONISTS

- Relax smooth muscle
- Rapid onset of action, 10-15 minutes
- 4-6 hour duration of action
- Use up to q 4 hours PRN
- Take 2 puffs 15-30 minutes before exercise to prevent symptoms
- Should always be available to patient
ANTICHOLINERGICS

- Recently approved for asthma as long acting bronchodilator
- Has had a limited asthma role, primarily in the ED for acute exacerbations
- First line drug for COPD  
  
  **Mode of action:** Inhibits muscarinic cholinergic receptors
- Bronchodilation, reduces intrinsic vagal tone, may reduce mucous gland secretions
- Adverse Effects: Dry mouth
- Does not block Exercise Induced Asthma??

LONG-TERM CONTROL MEDICATIONS

- EPR-3 recommends long-term control medications be taken on a daily basis for treatment of persistent asthma
- Inhaled corticosteroids (ICS)
- Inhaled long-acting bronchodilators (LABA)
- Leukotriene modifiers (Singulair)
- Tiotropium (LAMA)
- Theophylline
- Immunomodulators
LONG ACTING B2 AGONISTS

• Should not be initiated in patients with significantly worsening or acutely deteriorating asthma, which may be a life-threatening condition.

• Should only be used long-term in patients with asthma not adequately controlled with inhaled steroids or other controller medications.

• Should be used for the shortest time possible to achieve symptom control. Once patients are no longer experiencing symptoms, LABAs should be discontinued if possible with patients maintained on single controller medications alone.

• Children and adolescents needing a LABA should use a combination product that also contains an inhaled steroid to ensure compliance with both medications.

LONG ACTING B2 AGONISTS

• MOA: relax bronchial smooth muscle by stimulating B2 receptors
  • B2 receptors found throughout respiratory tract
  • Duration of action: 12 hours—not to be used more than twice daily
LEUKOTRIENE MODIFIERS

• Work on arachadonic acid cascade
  Block leukotriene D4 (potent vasoconstrictor)
  • D4 at least 1000 times more potent than histamine
  • Leukotrienes are inflammatory mediators that mediate airway obstruction, hyperresponsiveness, and inflammation

INHALED CORTICOSTEROIDS (ICS)

• Most potent and consistently effective long-term control medication for treatment of asthma
  • Work on airway inflammation through a variety of mechanisms
  • Effects: Decrease severity of symptoms, improve control and QOL, improve peak flow and spirometry, prevent exacerbations and decrease systemic corticosteroid use, ED visits, hospitalization and death
INHALED CORTICOSTEROIDS (ICS)

- Increase number of β2-adrenergic receptors and may improve the receptor responsiveness to β2-adrenergic stimulation
- Reduce mucous production and hypersecretion
- Reduce bronchial hyperresponsiveness
- Reduce airway edema and exudate

ALBUTEROL (PROAIR RESPICLICK®)

- Breath actuated dry powder SABA
- Indicated: >12 years for bronchospasm and prevention of exercise-induced bronchospasm

  In a study that investigated the peak inspiratory flow rate (PIFR), mean PIFR achieved by subjects was >60 L/min (range = 31 to 110 L/min.), indicating that patients would be able to achieve the required inspiratory flow to operate the MDPI device correctly.

- Cleaning: Wipe with dry cloth
- Discard: 13 months after removing from foil pouch

http://medlibrary.org/lib/rx/meds/proair-respiclick

http://www.clinicaladvisor.com/proair-respiclick/drug/34393/
• Indication: > 12 years

• Dosing: 1 inhalation daily

• Delivery 90 and 182 mcg, respectively, of fluticasone furoate per blister when tested at a flow rate of 60 L/min for 4 seconds.

• Cleaning: Dry tissue if needed

• Discard: 6 weeks after removal from foil tray
• Indication: ≥18 years and older

• Dosing: 1 inhalation daily

• Delivery: delivers 92 and 184 mcg of fluticasone furoate and 22 mcg of vilanterol per blister when tested at a flow rate of 60 L/min for 4 seconds.

• Cleaning: Dry tissue if needed

• Discard: 6 weeks after removal from foil tray

http://medlibrary.org/lib/rx/meds/breo-ellipta
RESPIMAT

- Hold the Respimat upright.
- Turn the clear base in the direction of the white arrows for a half turn until it clicks.
- Flip the orange cap until it snaps fully open.
- Hold the Respimat away from your mouth and gently breathe out.
- Seal your lips around the end of the mouthpiece without covering the air vents.
- Point the Respimat inhaler to the back of your throat.

RESPIMAT

- While inhaling slowly and deeply through your mouth press the dose release button. Continue to breathe in slowly and deeply.
- Hold your breath for up to ten seconds. This allows the medication time to deposit in the airways.
- Resume normal breathing.
- Close the orange cap until you use the inhaler again.
- Respimat is being marketed as a Slow Mist Inhaler, SMI. Another new term to remember about inhalers
Advantages and Disadvantages of Metered-Dose Inhalers

ADVANTAGES
Size and portability
Short treatment time
Consistent dose delivered

DISADVANTAGES
Hand-breathing coordination needed
Correct technique is required
If no dose counter, it is difficult to know the amount of medication left in the canister
Fixed drug concentration
Possible adverse propellant reaction or foreign body aspiration
Limited range of drugs

COMMON MDI USE PITFALLS

Failure to coordinate MDI actuation on inhalation
Too short of a breath hold after inhalation
Too rapid an inspiratory flow rate
Inadequate shaking before use
Premature discontinuation of inspiration as aerosol hits throat
Delayed actuation of MDI
Air entrainment through the nose
Exhaling during actuation
Improper canister position
Use of MDI beyond rated capacity
Cognitive impairment of user
Inadequate hand strength or flexibility to activate MDI
Advantages and Disadvantages of Dry Powder Inhalers

**ADVANTAGES**
Small and portable  
Dose counter  
Breath actuated and propellant free  
Quick setup and administration time

**DISADVANTAGES**
Dependent on patient inspiratory flow rate  
Less recognition of dose delivered  
High oropharyngeal impaction can occur  
Limited range of drugs  
Humidity can affect the medication

**COMMON DPI USE PITFALLS**

Not holding device in the correct position while loading dose  
Exhaling into the mouthpiece at the beginning or end of inhalation  
Not exhaling to residual volume before inhaling  
Not inhaling forcefully  
Inadequate or no breath hold  
Using a multi-dose device in high humidity
Advantages and Disadvantages of Valved Holding Chambers

**Advantages**
- Reduced oropharyngeal drug impaction and loss
- Simplifies coordination of MDI actuation and inhalation
- Allows use of MDI during acute asthma exacerbation

**Disadvantages**
- Size inconvenience
- Extra expense to the patient
- Patient errors such as firing multiple puffs into the device
- Need to clean and potential for contamination
- Part replacement or reassembling error

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**WHAT ARE THE BEST TOOLS TO USE TO EDUCATE PATIENTS ABOUT MEDICATION USE?**


http://www.monaghanmed.com/truzone-pfm-0
Devices to Improve Aerosol Delivery Results

**Optimum Inspiratory Flow**
- Delivery of medication to the lungs is dependent on inspiratory airflow and medication device resistance
- Resistance to airflow differs between devices, therefore inspiratory flow requirements vary
- One device example used to measure inspiratory airflow is the In-Check DIAL®

The In-Check DIAL is a hand held low range inspiratory flow measurement device with a dial top. The dial can be adjusted to accurately simulate the resistance of popular inhaler devices. The In Check DIAL enables clinicians to train patients to the proper inspiratory technique considering force and flow rate to achieve optimal deposition of the medication being inhaled into the lungs. (Jarisch. Retrieved from Alliance Tech Medical, Inc.: http://www.alliancetechmedical.com)

<table>
<thead>
<tr>
<th>Device</th>
<th>Optimum Inspiratory Flow</th>
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</thead>
<tbody>
<tr>
<td>Diskus</td>
<td>30 to 90 L/min</td>
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<tr>
<td>Flexhaler</td>
<td>60 to 90 L/min</td>
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<tr>
<td>Common MDI</td>
<td>25 to 60 L/min</td>
</tr>
<tr>
<td>Aerolizer</td>
<td>25 to 90 L/min</td>
</tr>
<tr>
<td>Twisthaler</td>
<td>30 to 60 L/min</td>
</tr>
<tr>
<td>Handihaler</td>
<td>20 to 90 L/min</td>
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ADDITIONAL DEVICES TO REVIEW

• MDI with Holding Chamber
• Twisthaler
• Flexhaler
• Etc...

PIPELINE

• Longer acting controller medications asthma/COPD overlap syndrome

• Biologics
  • Interleukin (IL-5)- Monoclonal antibodies (Mepolizumab (Nucala®)) and Monoclonal antibody targeted at the IL-5 receptor (Benralizumab). Indicated for Severe Eosinophilic Asthma
  • Interleukin (IL-13)- Lebrikizumab

GSK Product development pipeline, March 2015.

http://www.waojournal.org/content/7/1/32. doi:10.1186/1938-4551-7-32
QUESTIONS