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 (Amunity 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 activated dry powder SABA
- Indicated: > 12 years for bronchospasm and prevention of exercise-induced bronchospasm
- In a study that investigated the peak inspiratory flow rate (PIM), mean PIM achieved by subjects was >40 L/min (range = 31 to 115 L/min), indicating that patients would be able to achieve the required inspiratory flow to operate the MDI device correctly.
- Cleaning: Wipe with dry cloth
- Discard: 13 months after removing from foil pouch

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

http://myproair.com/pdf/Full_Prescribing_And_Patient_Information.pdf
FLUTICASONE FUROATE (ARNUITY ELLIPTA®)

- **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

http://medlibrary.org/lib/nm/data/arnuity-ellipta

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FLUTICASONE FUROATE/VILANTEROL (BREO ELLIPTA®)

- **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/nm/data/breo-ellipta

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

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

Device 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 airflow requirements vary
- One device example used to measure inspiratory airflow is the InCheck DM/ID.

InCheck DM/ID is a handheld, low-range inspiratory flow measurement device with a dial. The dial can be adjusted to accurately simulate the resistance of popular inhaler devices. The InCheck DM/ID enables clinicians to train patients to the proper inspiratory technique considering force and flow rate to achieve optimal deposition of the medication inhaled into the lungs. [InCheck. Retrieved from Alliance Tech Medical, Inc. http://www.alliancetechmedical.com]
<table>
<thead>
<tr>
<th>Device</th>
<th>Optimum Inspiratory Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diskus</td>
<td>30 to 90 L/min</td>
</tr>
<tr>
<td>Flexhale</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>Twisthale</td>
<td>30 to 60 L/min</td>
</tr>
<tr>
<td>Handihale</td>
<td>20 to 90 L/min</td>
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</tbody>
</table>

DEVICE TRAINING

http://use-inhalers.com
Ipratropium bromide is not a recommended rescue inhaler outside of use in the emergency room or urgent care but may, on occasion, be prescribed to supplement short-acting β2-agonists.
ADDITIONAL DEVICES TO REVIEW
- MDI with Holding Chamber
- Twisthaler
- Flexhaler
- RediHaler
- Etc

IMMUNOMODULATORS
- Xolair (Omalizumab) is an Anti-IgE agent.
- Mepolizumab (Nucala®) Interleukin (IL-5) Monoclonal antibody targeted at the IL-5 receptor
- Benralizumab (Fasenra®) SQ injection Anti-Eosinophilic
- Reslizumab (Cirqirin)
PIPELINE

- Longer acting controller medications asthma/COPD overlap syndrome ACO
- Biologics
  - Lebrikizumab (Interleukin IL-13)
  - Dupilumab (IL-4, IL-13 Receptor)


QUESTIONS

Thanks for your attention, and enjoy the conference

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