Catching Your Breath:

A Review of Inhaler Products

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Disclosures

- I have no financial obligations to disclose.
Objectives

- To identify common inhaler products
- To describe available combination products
- To reproduce appropriate inhaler techniques
- To name important counseling points regarding inhaler therapy
Presentation Outline

- Part One: Categories of inhaler products
  - Common inhaler products
  - Side effects
  - Dosing
  - Counseling points

- Part Two: Inhaler administration & techniques
  - Signs of improper technique
  - Inhalers by delivery system
    - Administration technique
Part One: Categories of Inhaler Products
Categories of Inhaler Products

- Short Acting $\beta_2$ Agonists (SA$\beta_2$A)
- Long Acting $\beta_2$ Agonists (LA$\beta_2$A)
- Anticholinergics (ICA)
- Inhaled Corticosteroids (ICS)
- Combination
  - ICS + LA$\beta_2$A
  - ICA + SA$\beta_2$A

Short Acting $\beta_2$ Agonists

Albuterol HFA  
Albuterol Inhalation Solution

Levalbuterol HFA  
Levalbuterol Inhalation Solution

Albuterol vs. Levalbuterol

- **Albuterol**
  - 50:50 racemic mixture of R-albuterol (levalbuterol) and S-albuterol

- **Levalbuterol** developed based on rationale that levalbuterol would have:
  - Less tachycardia
  - Better tolerability
  - Similar or greater efficacy

- **Levalbuterol** is associated with lower mean heart rate
  - Little difference vs. albuterol

- Levalbuterol associated with higher cost

SAβ₂A Side Effects

- Anxiety
- Racing Heart/Palpitations
- Headache
- Restlessness
- Insomnia
- Nervousness & Tremors
- Chest Pain
- Throat irritation
- Rhinitis

# SAβ₂A Dosing Guidelines

<table>
<thead>
<tr>
<th>Brand</th>
<th>Generic</th>
<th>Indication</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proair HFA, Proventil HFA, Ventolin HFA</strong></td>
<td>albuterol sulfate</td>
<td>Asthma; EIA PPx</td>
<td><strong>Acute Exacerbation</strong>&lt;br&gt;• 4-8 inh q 20 mins up to 4 hours, then q1-4h PRN&lt;br&gt;<strong>Bronchospasm</strong>&lt;br&gt;• 2 inh q4-6 (or 1 inh q4 PRN)&lt;br&gt;<strong>EIA</strong>&lt;br&gt;• 2 inh 15 to 30 mins prior to exercise</td>
</tr>
<tr>
<td><strong>Xopenex HFA</strong></td>
<td>levalbuterol tartrate</td>
<td>Asthma</td>
<td><strong>Acute Exacerbation</strong>&lt;br&gt;• 4-8 inh every 20 min up to 4 hours, then every 1 to 4 hr prn&lt;br&gt;<strong>Bronchospasm</strong>&lt;br&gt;• 2 inh q4-6 PRN (may only need 1 q4 PRN)</td>
</tr>
</tbody>
</table>

## SAβ₂A Counseling Points

<table>
<thead>
<tr>
<th>“Rescue Inhaler” – use for ACUTE attacks</th>
<th>Instruct patient to prime inhaler when:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• First time</td>
</tr>
<tr>
<td></td>
<td>• Inhaler has not been used for ≥ 3 days</td>
</tr>
<tr>
<td>Instruct patient to report increased use</td>
<td><strong>Wash &amp; dry</strong> mouthpiece once a week</td>
</tr>
<tr>
<td>Concomitant caffeine/stimulants may increase SEs</td>
<td>ALL asthma/COPD patients should have a SAβ₂A</td>
</tr>
</tbody>
</table>

Long Acting $\beta_2$ Agonists

Serevent Diskus

Foradil Aerolizer

LAβ₂A Side Effects

- Increased HR
- Nervousness
- Headache
- Sleeplessness
- Palpitations
- Tremor, shaking feeling
- Nausea & Vomiting
- Hoarseness
- Coughing
LA$\beta_2$A Dosing Guidelines

<table>
<thead>
<tr>
<th>Brand</th>
<th>Generic</th>
<th>Indication</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serevent Diskus</td>
<td>salmeterol xinafoate</td>
<td>Asthma; EIA PPx; COPD</td>
<td>One inhalation (50mcg) by mouth twice daily</td>
</tr>
<tr>
<td>Foradil Aerolizer</td>
<td>formoterol fumarate</td>
<td>Asthma; COPD; EIA PPx</td>
<td>One capsule every 12 hours via oral inhalation</td>
</tr>
</tbody>
</table>

# LAβ₂A Counseling Points

<table>
<thead>
<tr>
<th>NOT for acute attacks</th>
<th>Avoid other LAβ₂A</th>
</tr>
</thead>
</table>
| **Instruct patient to report** increased asthma exacerbations | **Formoterol only:**  
  • Warn patient that the drug capsules must not be swallowed |
| Patient should **not exceed** recommended dose |
Inhaled Corticosteroids

Flovent HFA

Pulmicort Flexhaler

Pulmicort Respules

Asmanex Twisthaler

Inhaled Corticosteroid Side Effects

- **Common:**
  - Cough
  - Nose Bleeds
  - Hoarseness
  - Throat Irritation
  - Headache
  - Dry Mouth

- **Severe:**
  - Creamy white patches in mouth
  - Fast/pounding heartbeat
  - Puffy Face
  - Skin Rash
  - Wheezing
  - Other Systemic Effects
    - Weight gain, fatigue, muscle weakness
  - Cataracts
  - Reduced bone mineral density

# ICS Dosing Guidelines

<table>
<thead>
<tr>
<th>Brand</th>
<th>Generic</th>
<th>Indication</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flovent HFA (44/110/220 mcg)</td>
<td>fluticasone propionate</td>
<td>Asthma</td>
<td>Starting dose dependent on prior therapy with: bronchodilators, ICS, oral CS</td>
</tr>
<tr>
<td>Pulmicort Flexhaler</td>
<td>budesonide</td>
<td>Asthma</td>
<td>2 inhalations BID</td>
</tr>
<tr>
<td>Asmanex (30/60/120 doses/unit)</td>
<td>mometasone furoate</td>
<td>Asthma; Allergic rhinitis</td>
<td>Starting dose dependent on prior therapy with: bronchodilators, ICS, oral CS</td>
</tr>
<tr>
<td>Qvar</td>
<td>beclomethasone dipropionate</td>
<td>Asthma; Rhinitis</td>
<td>40 to 160 mcg BID</td>
</tr>
</tbody>
</table>

# ICS Counseling Points

<table>
<thead>
<tr>
<th>NOT for acute attacks</th>
<th><strong>Diabetic</strong> patients should report any difficulties with glycemic control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid exposure to chickenpox &amp; measles</td>
<td><strong>Do NOT discontinue</strong> without speaking with healthcare professional</td>
</tr>
<tr>
<td>Report any signs of infection</td>
<td></td>
</tr>
</tbody>
</table>
Anticholinergics

Ipratropium

Spiriva Handihaler

Anticholinergics Side Effects

- May increase wheezing for some patients
- Hypersensitivity reactions
- Dry mouth
- Blurred vision
- Sinusitis
# Anticholinergics Dosing Guidelines

<table>
<thead>
<tr>
<th>Brand</th>
<th>Generic</th>
<th>Indication</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atrovent HFA</strong></td>
<td>ipratropium bromide</td>
<td>COPD</td>
<td>2 inhalations QID</td>
</tr>
<tr>
<td><strong>Spiriva Handihaler</strong></td>
<td>tiotropium bromide</td>
<td>COPD</td>
<td>1 capsule (18 mcg) via 2 oral inhalations once daily</td>
</tr>
</tbody>
</table>

## Anticholinergics Counseling Points

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOT for acute attacks</strong></td>
<td><strong>Increase water intake</strong></td>
</tr>
<tr>
<td><strong>Avoid activities requiring</strong></td>
<td><strong>If paradoxical</strong></td>
</tr>
<tr>
<td><strong>balance/visual acuity</strong></td>
<td><strong>bronchospasm occurs,</strong></td>
</tr>
<tr>
<td><strong>until drug effects are</strong></td>
<td><strong>stop drug &amp; contact</strong></td>
</tr>
<tr>
<td><strong>realized</strong></td>
<td><strong>healthcare professional</strong></td>
</tr>
<tr>
<td><strong>Use saline eye lubricants</strong></td>
<td></td>
</tr>
<tr>
<td><strong>as needed</strong></td>
<td></td>
</tr>
</tbody>
</table>

## Combination Inhalers

<table>
<thead>
<tr>
<th>Combination Medications</th>
<th>Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ICS + LABA</strong></td>
<td></td>
</tr>
<tr>
<td>Advair Diskus</td>
<td>fluticasone propionate/salmeterol xinafoate</td>
</tr>
<tr>
<td>Symbicort</td>
<td>budesonide/formoterol fumarate</td>
</tr>
<tr>
<td>Dulera</td>
<td>mometasone furoate/formoterol fumarate</td>
</tr>
<tr>
<td><strong>Anticholinergic + SABA</strong></td>
<td></td>
</tr>
<tr>
<td>Combivent Respinmat</td>
<td>ipratropium bromide/albuterol sulfate</td>
</tr>
<tr>
<td>Duonebs</td>
<td>ipratropium bromide/albuterol sulfate</td>
</tr>
</tbody>
</table>

Part Two: Inhaler Administration & Techniques
Signs of Improper Technique

- **Increased use/refills of rescue inhalers**
  - +/- use of daily long term controller

- Lack of symptom improvement

- **Increased frequency** of attacks/exacerbations

- Possible **language/literacy** barriers
  - Different patient definitions of “long term controller” vs. “rescue medication”

- **Improper technique** demonstrated by patient

Barriers to Proper Inhaler Technique

- Language/Literacy Barriers
- Age
- Dexterity
- Inspiratory capacity/rate
- Hand-Lung Coordination

Inhalers by Delivery System

- Metered Dose Inhalers (MDIs)
- Dry Powder Inhalers (DPIs)
  - Twisthaler
  - Flexhaler
  - Handihaler
  - Diskus Inhalers
- Respimat Soft Mist Inhaler
- Nebules
Metered Dose Inhalers
Metered Dose Inhalers

- Pressurized canister that fits into mouthpiece
- Medication is usually released by pushing down canister
- Some, but not all, count down the number of puffs, so patient knows when empty
- Can be used with a spacer – makes it easier for patient to inhale
Administration Technique: MDI

Step 1
Remove the cap

Step 2
Shake the inhaler

Administration Technique: MDI

Step 3
Hold the inhaler

Step 4
Sit straight

Administration Technique: MDI

Step 5
Tilt your head

Step 6
Breathe out

Administration Technique: MDI

Step 7
Inhale medicine

Step 8
Hold your breath

Spacers
Spacers

Benefits:
• Hollow tube that attaches to inhaler
• Slows delivery of medication
• Less medication deposited in mouth/throat
• More medication reaches the lungs
• Easier to coordinate breathing in and activating the MDI

Cleaning Your Spacer
• Take the spacer apart.
• Move parts in warm water using a mild soap.
  • Do not use high-pressure or boiling hot water, rubbing alcohol or disinfectant.
• Rinse the parts well in clean water.
• Do not dry inside of the spacer with a towel.
• Instead, let the parts air dry.
• Put the spacer back together.

Spacers

- Important points to remember:
  - Only use spacer with MDI NOT with DPIs
  - Breathe in as soon as the patient sprays a puff into spacer
  - RX is required for spacer
  - Keep the spacer away from heat
  - If there is any damage to spacer – do NOT use
  - Whistling sound = too fast
  - Only use 1 puff at a time

Administration Technique: MDI with Spacer

Step 1
Remove the cap

Step 2
Remove the cap

Administration Technique: MDI with Spacer

Step 3
Shake the inhaler

Step 4
Insert inhaler

Administration Technique: MDI with Spacer

**Step 5**
Sit straight

**Step 6**
Tilt your head

Administration Technique: MDI with Spacer

Step 7
Breathe out

Step 8
Inhale medicine

Administration Technique: MDI with Spacer

Step 9

Hold your breath
Dry Powder Inhalers
Dry Powder Inhalers

- Important to Remember:
  - Requires patients to actively breathe in the medication, rather than canister propulsion
Administration Techniques:
Spiriva Handihaler

Administration Techniques: Spiriva Handihaler

Before You Begin
- Separate only one of the blisters from the blister card
- Open the blister and keep your capsule ready

Step 1
Open dust cap
Administration Techniques: Spiriva Handihaler

**Step 2**
Open the mouthpiece

**Step 3**
Place the capsule

Administration Techniques: Spiriva Handihaler

Step 4
Close the mouthpiece

Step 5
Pierce the capsule

Administration Techniques: Spiriva Handihaler

Step 6
Breathe out

Step 7
Inhale medicine

Administration Techniques: Spiriva Handihaler

Step 8

10

Hold your breath

Step 9

Inhale again

Administration Techniques: Spiriva Handihaler

Step 10
Discard capsule

Step 11
Close the inhaler

Additional Spiriva Tips

• NEVER swallow capsules

• Capsules must be stored in blister packs until ready to use

• Clean device as needed
  • wait 24 hours to dry

Administration Techniques: Pulmicort Flexhaler
Administration Techniques: Pulmicort Flexhaler

Step 1

Remove the cap

Step 2

Rotate the base

Administration Techniques: Pulmicort Flexhaler

Step 3
Rotate the base again

Step 4
Breathe out

Administration Techniques: Pulmicort Flexhaler

Step 5
Inhale medicine

Step 6
Hold your breath

Additional Pulmicort Flexhaler Tips

• Dose indicator on barrel

• Red mark = 20 doses left
  • As soon as you see the red mark, refill your prescription

• When the “0” appears in the dose indicator window, throw away the Flexhaler and start a new one

• Keep the Flexhaler closed when not in use & store the Flexhaler in a cool dry, place

• If the mouthpiece gets dirty, wipe it with a cloth
Administration Techniques: Asmanex Twisthaler

Figure 1: Inhaler (upright position)

Figure 2: Inhaler with Cap Removed
Administration Techniques: Asmanex Twisthaler

Step 1
Remove the cap

Step 2
Load the dose

Administration Techniques: Asmanex Twistrhaler

**Step 3**
Ensure the arrow

**Step 4**
Breathe out

Administration Techniques: Asmanex Twisthaler

Step 5
Inhale medicine

Step 6
Hold your breath

Administration Techniques: Asmanex Twisthaler

Step 7
Close the inhaler

Step 8
Ensure the groove

Additional Asmanex Twisthaler Tips

- Can only properly load medicine by twisting cap
- Keep the cap on the inhaler when not in use
- “01” in dose indicator = one dose remaining
- When counter reads “00” the pink base will lock
- Throw away inhaler after 45 days or when “00”
- Store the Twisthaler in a cool, dry place. If the mouthpiece gets dirty, wipe it with a cloth
Diskus Inhaler

Administration Techniques: Diskus Inhaler

Step 1
Check counter

Step 2
Open the inhaler

Administration Techniques: Diskus Inhaler

Step 3
Slide the Lever

Step 4
Breathe out

Administration Techniques: Diskus Inhaler

Step 5

Inhale medicine

Step 6

Hold your breath

Additional Diskus Inhaler Tips

• Doses 5 through zero = Red Zone
  • Refill inhaler

• “0” in dose window = discard and start new Diskus

• Keep the Diskus closed when not in use and store the Diskus in a cool dry, place

• Keep the Diskus dry. If the mouthpiece gets dirty, wipe it with a cloth

Combivent Respimat

Mouthpiece
Air vents (one on each side)
Dose-release button
Dose Indicator

Administration Technique: Combivent Respimat
Administration Technique: Combivent Respimat

Step 1
Hold the inhaler

Step 2
Turn the base

Administration Technique: Combivent Respimat

Step 3
Open the cap

Step 4
Sit straight

Administration Technique: Combivent Respimat

Step 5
Tilt your head

Step 6
Breathe out

Administration Technique: Combivent Respimat

Step 7: Inhale medicine

Step 8: Hold your breath

Administration Technique: Combivent Respimat

Step 9

Close the inhaler

Additional Combivent Respimat Tips

- Inhaler requires assembly
- Do not remove cartridge after insertion
- Inhaler should last 30 days
- Pointer dose counter
  - “Red zone” = 7 days left
- Write discard date on the label of the inhaler
  - 3 months from the date the cartridge is inserted

Nebules
Nebules

Nebulizers

- Place mouthpiece in your mouth

- Breathe slowly through your mouth until all the medicine is used up (usually 10 to 15 minutes)

- Use nose clip to help mouth breathing

- Small children usually do better with mask

- Wash medicine cup and mouthpiece with water, and air dry until next treatment

## Inhaler Comparison

<table>
<thead>
<tr>
<th></th>
<th>Metered Dose Inhaler (MDI)</th>
<th>Dry Powder Inhaler (DPI)</th>
<th>MDI with Spacer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portability</td>
<td>Yes</td>
<td>Maybe</td>
<td>No</td>
</tr>
<tr>
<td>Require deep/fast breath</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Exhalation affecting delivery</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Throat deposition</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Maintenance required</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Dose counter</td>
<td>Maybe</td>
<td>Yes</td>
<td>Maybe</td>
</tr>
</tbody>
</table>

# Inhaler Priming

<table>
<thead>
<tr>
<th>Inhaler</th>
<th>Instructions</th>
</tr>
</thead>
</table>
| **Proventil HFA** | Prime 4X away from face:  
1. Before first use  
2. If inhaler has not been used for > 2 weeks |
| **Atrovent HFA**  | Prime against mouthpiece 2X:  
1. Before first use  
2. If inhaler has not been used for > 3 days |
| **Combivent Respimat** | Prime by actuating toward ground 1x & when cloud visible actuate 3x:  
1. Before first use  
2. If Inhaler has not been used for >21 days  
*If not used for > 3 days then actuate inhaler once |
| **Xopenex HFA**   | Prime 4X away from face:  
1. Before first use  
2. If inhaler has not been used for > 3 days |
| **Flovent HFA**   | Prime 2X:  
1. Before first use  
2. If inhaler has not been used for > 7 days  
3. If inhaler has been dropped |
| **Pulmicort Flexhaler** | Prime prior to **first** use ONLY |

General Inhaler Instructions

- Wait 1 minute between multiple puffs/doses
- If a bronchodilator and maintenance medications are prescribed
  - Use bronchodilator first, wait 5 mins, then use maintenance inhaler
- Always keep the protective cap on the inhaler when not in use
General Inhaler Instructions

- Store your inhaler in a clean plastic bag while carrying it in your pocket or purse

- Store your inhaler in a cool, dry place
  - Never in car

- Make sure your inhalers are not expired
  - DO NOT try to float inhaler to see # of doses left
Catching Your Breath:
A Review of Inhaler Products

Jillian Dougherty
University of Rhode Island
PharmD Candidate 2014