

# Catching Your Breath:

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## 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

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# Categories of Inhaler Products

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

# 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



# SA $\beta$ <sub>2</sub>A Side Effects

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

# SAβ<sub>2</sub>A Dosing Guidelines

Brand	Generic	Indication	Dosage
<b>Proair HFA, Proventil HFA, Ventolin HFA</b>	albuterol sulfate	Asthma; EIA PPx	<u>Acute Exacerbation</u> <ul style="list-style-type: none"> <li>• 4-8 inh q 20 mins up to 4 hours, then q1-4h PRN</li> </ul> <u>Bronchospasm</u> <ul style="list-style-type: none"> <li>• 2 inh q4-6 (or 1 inh q4 PRN)</li> </ul> <u>EIA</u> <ul style="list-style-type: none"> <li>• 2 inh 15 to 30 mins prior to exercise</li> </ul>
<b>Xopenex HFA</b>	levalbuterol tartrate	Asthma	<u>Acute Exacerbation</u> <ul style="list-style-type: none"> <li>• 4-8 inh every 20 min up to 4 hours, then every 1 to 4 hr prn</li> </ul> <u>Bronchospasm</u> <ul style="list-style-type: none"> <li>• 2 inh q4-6 PRN (may only need 1 q4 PRN)</li> </ul>

# SA $\beta$ <sub>2</sub>A Counseling Points

“Rescue Inhaler” – use for <b>ACUTE</b> attacks	Instruct patient to <b>prime</b> inhaler when: <ul style="list-style-type: none"><li>• First time</li><li>• Inhaler has not been used for <math>\geq 3</math> days</li></ul>
Instruct patient to report <b>increased</b> use	<b>Wash &amp; dry</b> mouthpiece once a week
Concomitant <b>caffeine/stimulants</b> may increase SEs	<u><b>ALL</b></u> asthma/COPD patients should have a SA $\beta$ <sub>2</sub> A

# Long Acting $\beta_2$ Agonists

## Serevent Diskus



## Foradil Aerolizer



# LA $\beta_2$ A Side Effects

- Increased HR
- Nervousness
- Headache
- Sleeplessness
- Palpitations
- Tremor, shaking feeling
- Nausea & Vomiting
- Hoarseness
- Coughing

# LAB<sub>2</sub>A Dosing Guidelines

Brand	Generic	Indication	Dosage
<b>Serevent Diskus</b>	salmeterol xinafoate	Asthma; EIA PP <sub>x</sub> ; COPD	One inhalation (50mcg) by mouth twice daily
<b>Foradil Aerolizer</b>	formoterol fumarate	Asthma; COPD; EIA PP <sub>x</sub>	One capsule every 12 hours via oral inhalation

# LA $\beta_2$ A Counseling Points

NOT for acute attacks	Avoid other LA $\beta_2$ A
Instruct patient to report <b>increased</b> asthma exacerbations	<b>Formoterol only:</b> <ul style="list-style-type: none"><li>• Warn patient that the drug capsules must not be swallowed</li></ul>
Patient should <b>not exceed</b> 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

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

# ICS Counseling Points

<b>NOT</b> for acute attacks	<b>Diabetic</b> patients should report any difficulties with glycemic control
Avoid exposure to <b>chickenpox &amp; measles</b>	Do <b>NOT discontinue</b> without speaking with healthcare professional
Report any signs of <b>infection</b>	

# Anticholinergics

## Ipratropium



## Spiriva Handihaler



# Anticholinergics Side Effects

- May increase wheezing for some patients
- Hypersensitivity reactions
- **Dry mouth**
- Blurred vision
- Sinusitis

# Anticholinergics Dosing Guidelines

Brand	Generic	Indication	Dosage
<b>Atrovent HFA</b>	ipratropium bromide	COPD	2 inhalations QID
<b>Spiriva Handihaler</b>	tiotropium bromide	COPD	1 capsule (18 mcg) via 2 oral inhalations once daily

# Anticholinergics Counseling Points

<b>NOT</b> for acute attacks	Increase <b>water</b> intake
Avoid activities requiring <b>balance/visual acuity</b> until drug effects are realized	If paradoxical <b>bronchospasm</b> occurs, stop drug & contact healthcare professional
Use saline <b>eye lubricants</b> as needed	

# Combination Inhalers

Combination Medications		Agents
ICS + LABA	<b>Advair Diskus</b>	fluticasone propionate/ salmeterol xinafoate
	<b>Symbicort</b>	budesonide/ formoterol fumarate
	<b>Dulera</b>	mometasone furoate/formoterol fumarate
Anticholinergic + SABA	<b>Combivent Respimat</b>	ipratropium bromide/ albuterol sulfate
	<b>Duonebs</b>	ipratropium bromide/ albuterol sulfate



# Part Two: Inhaler Administration & Techniques

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# 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

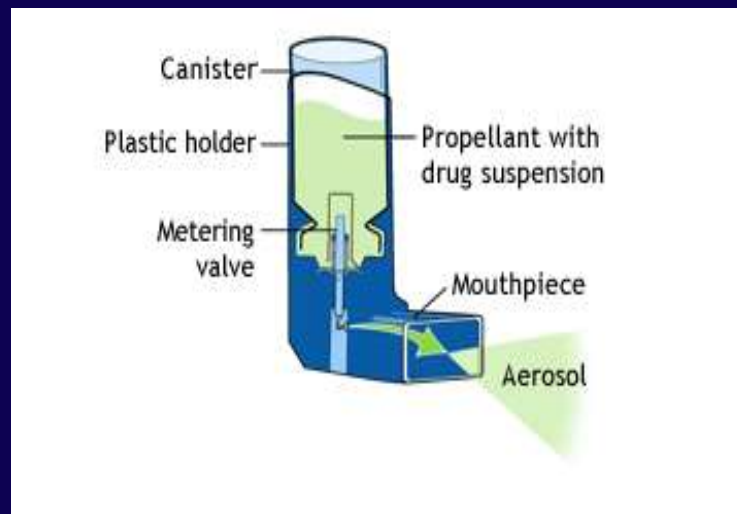
- Language/Literacy Barriers
- Age
- Dexterity
- Inspiratory capacity/rate
- Hand-Lung Coordination

1. Al-Jahdali H, Ahmed A, Al-Harbi A, et al. Improper inhaler technique is associated with poor asthma control and frequent emergency department visits. *Allergy Asthma Clin Immunol*. 2013 Mar 6;9(1):8.
2. “How to Use Inhalers.” Saralsoft LLC. Accessed December 22, 2013. Available at: <http://use-inhalers.com>.

# 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



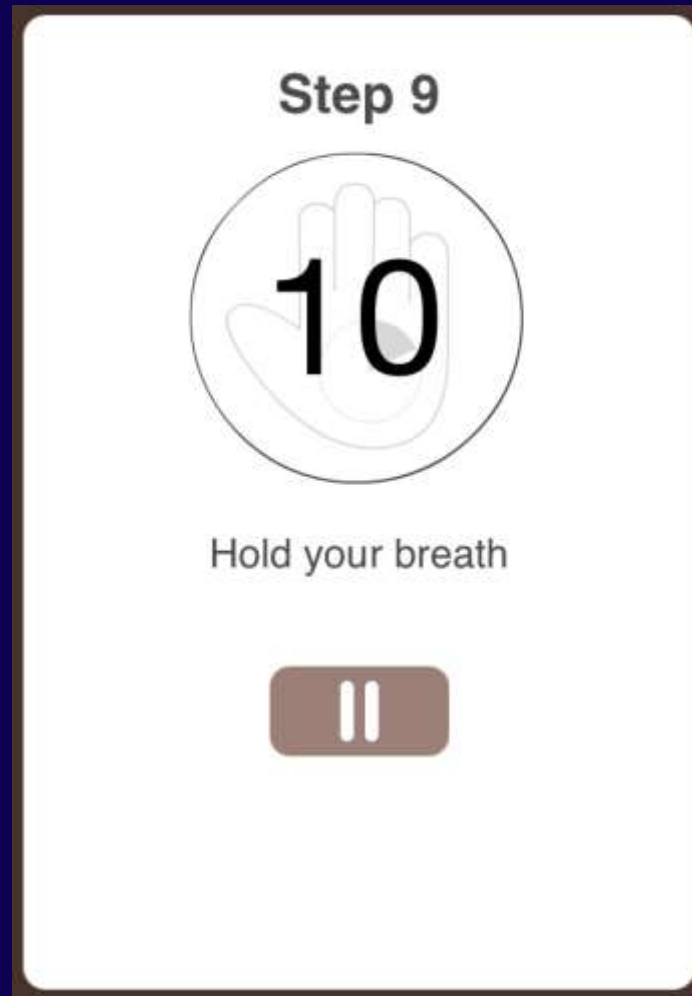
**Step 8**



Inhale medicine



# Administration Technique: MDI with Spacer



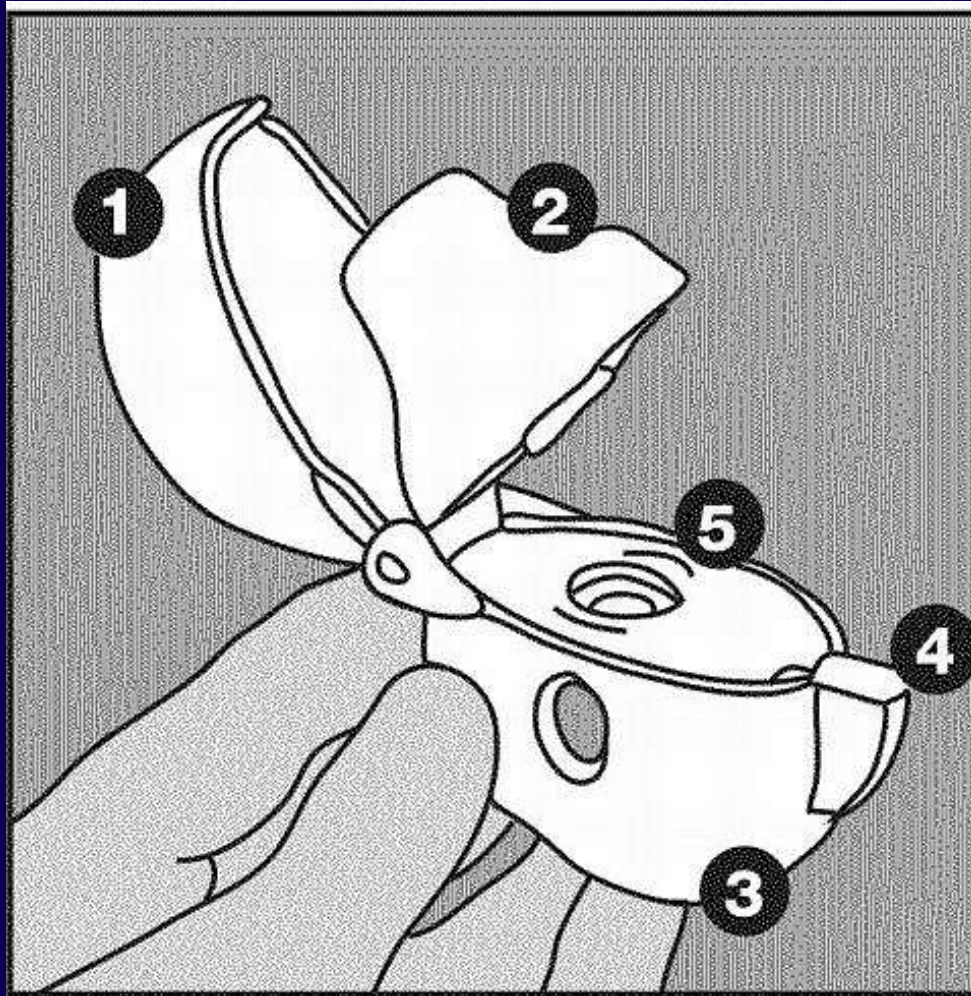
# Dry Powder Inhalers



# 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

Go

## 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

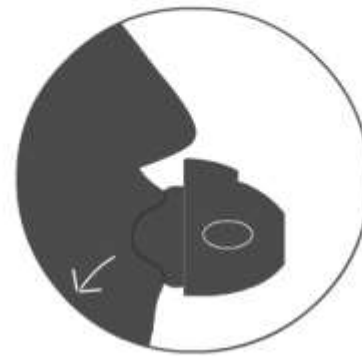
**Step 6**



Breathe out



**Step 7**



Inhale medicine



# Administration Techniques: Spiriva Handihaler

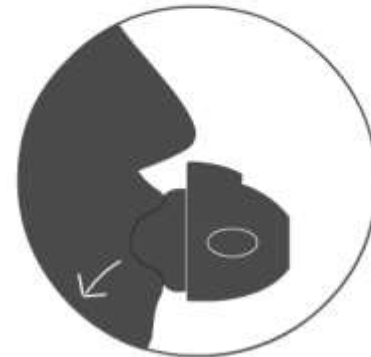
## Step 8



Hold your breath



## Step 9



Inhale again



# Administration Techniques: Spiriva Handihaler

**Step 10**



Discard capsule



**Step 11**



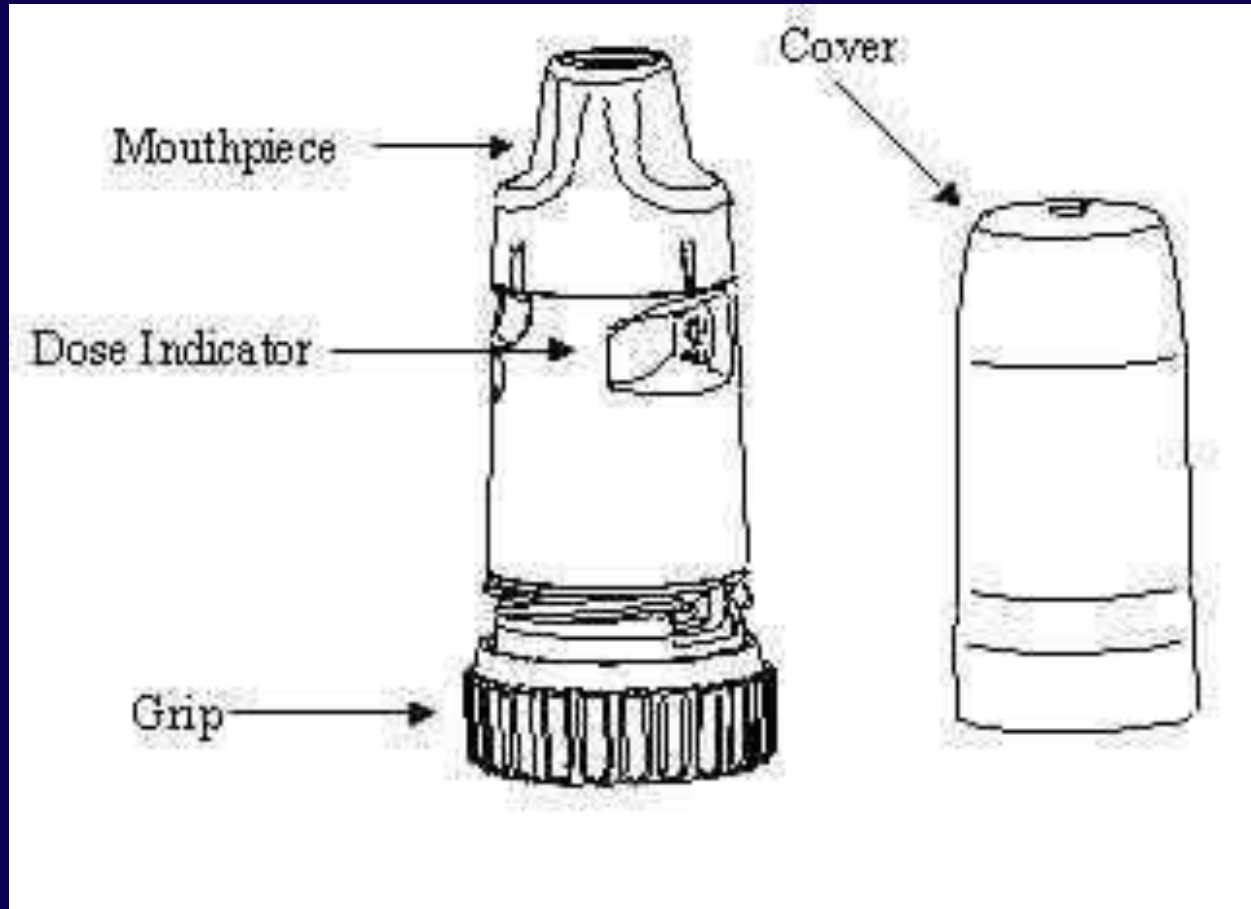
Close the inhaler



# 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

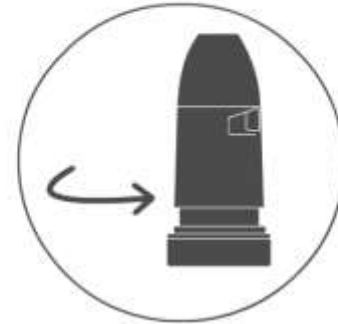
## Step 1



Remove the cap



## Step 2

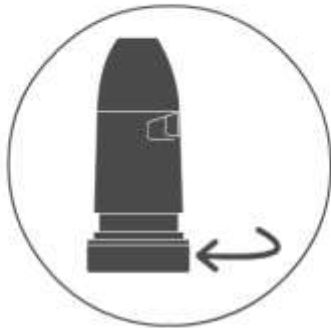


Rotate the base



# 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 “o” 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



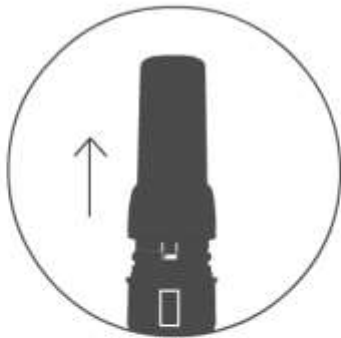
Figure 1: Inhaler (upright position)



Figure 2: Inhaler with Cap Removed

# Administration Techniques: Asmanex Twisthaler

## Step 1



Remove the cap



## Step 2



Load the dose



# Administration Techniques: Asmanex Twisthaler

**Step 3**



Ensure the arrow



**Step 4**



Breathe out



# Administration Techniques: Asmanex Twisthaler

## Step 5



Inhale medicine



## Step 6

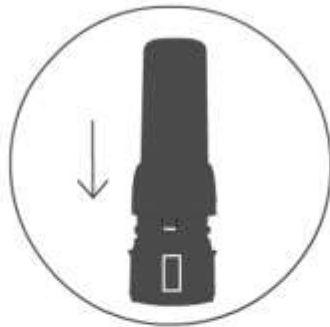


Hold your breath



# Administration Techniques: Asmanex Twisthaler

## Step 7



Close the inhaler



## Step 8



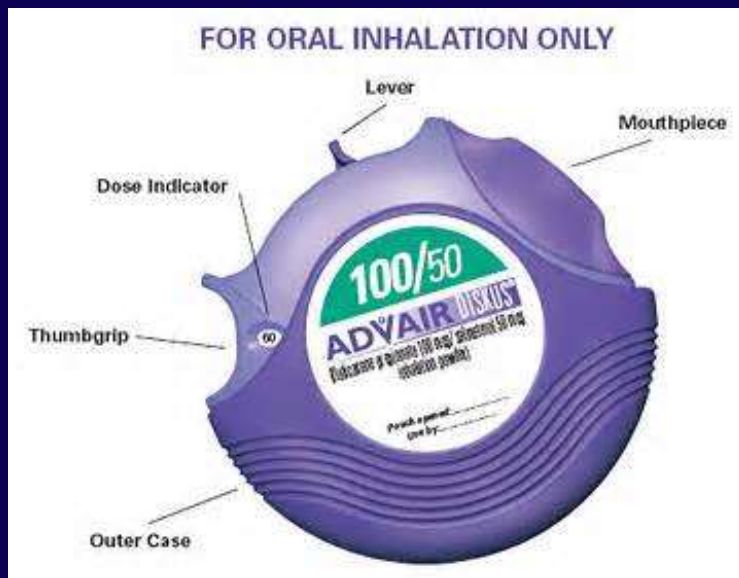
Ensure the groove



# 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



1. Advair Diskus package insert. GlaxoSmithKline; Research Triangle Park, NC. January 2011.
2. Serevent Diskus package insert. GlaxoSmithKline; Research Triangle Park, NC. December 2010.



# 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



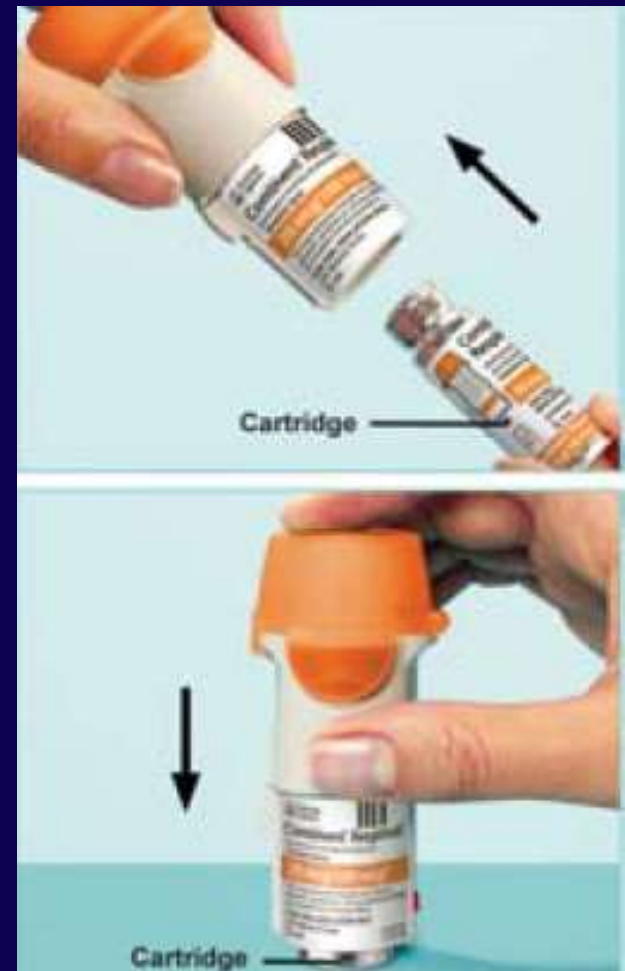
# Additional Diskus Inhaler Tips

- Doses 5 through zero = Red Zone
  - Refill inhaler
- “o” 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



# Administration Technique: Combivent Respimat



# Administration Technique: Combivent Respimat

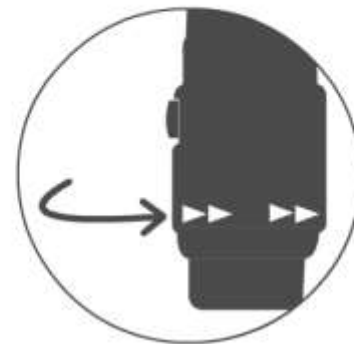
**Step 1**



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**

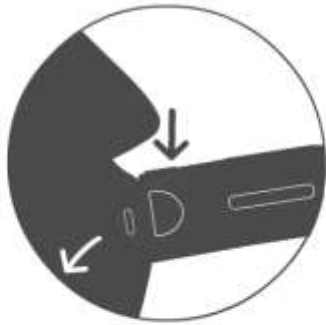


Breathe out



# Administration Technique: Combivent Respimat

Step 7



Inhale medicine



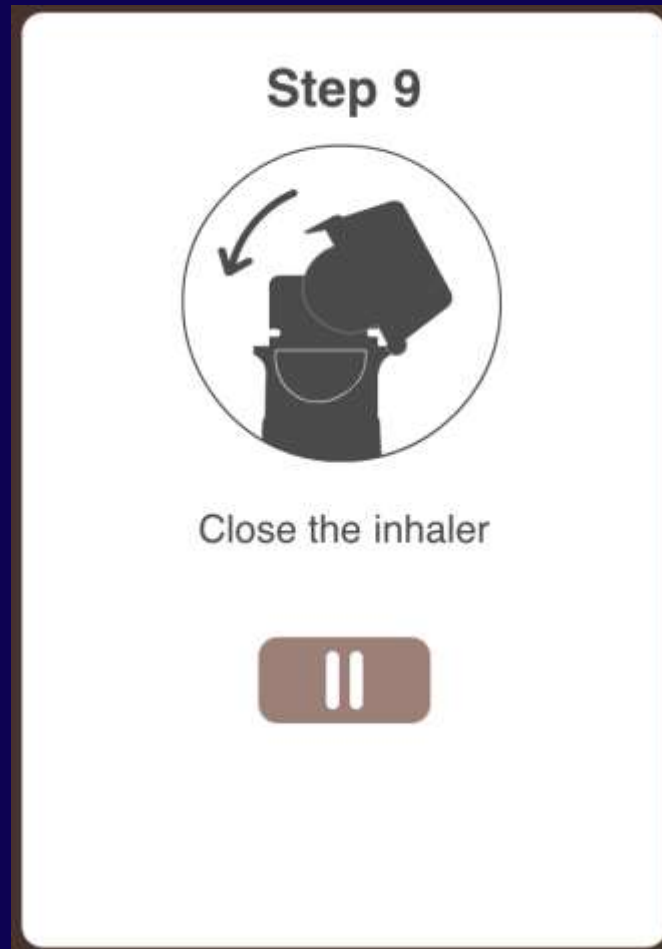
Step 8



Hold your breath



# Administration Technique: Combivent Respimat



# 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

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



# Inhaler Priming

Proventil HFA	Prime <b>4X</b> away from face: 1. Before first use 2. If inhaler has not been used for > 2 weeks
Atrovent HFA	Prime against mouthpiece <b>2X</b> : 1. Before first use 2. If inhaler has not been used for > 3 days
Combivent Respimat	Prime by actuating toward ground <b>1x</b> & when cloud visible actuate <b>3x</b> : 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 <b>4X</b> away from face: 1. Before first use 2. If inhaler has not been used for > 3 days
Flovent HFA	Prime <b>2X</b> : 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 <b>first</b> 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:

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## A Review of Inhaler Products

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University of Rhode Island

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