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COPD: Guidelines and Devices Update

Amber M. Hutchison, PharmD, BCPS, BCGP
Associate Clinical Professor
Auburn University
Harrison School of Pharmacy

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Objectives

- Discuss updated guideline recommendations for treatment of chronic obstructive pulmonary disease (COPD)
- Review available treatment options for COPD including medication classes and medication delivery devices available
- List important patient-specific considerations for medication and medication delivery device selection
- Demonstrate appropriate counseling points for devices used for the treatment of COPD



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Disclosures

- Neither I, nor my spouse, have relationships with pharmaceutical companies, biomedical device manufacturers, or other commercial companies whose products or services are related to the subject matter of this presentation.



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COPD Definition

- Chronic obstructive pulmonary disease (COPD)
 - Common, preventable, and treatable
 - Characterized by persistent respiratory symptoms and airflow limitation
 - Usually caused by exposure to noxious particles or gas

GOLD Guidelines 2019. www.goldcopd.org



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COPD Prevalence

- The direct costs of COPD for the US has been estimated around \$30 billion per year
- Worldwide COPD is the fourth highest cause of death
 - Estimated to become the third leading cause of death by 2020
- In the United States:
 - In 2011, 6.5% of the US population had COPD
 - In 2010, there were 133,575 deaths caused by COPD
 - Overall, death rates for COPD have not declined

GOLD Guidelines 2019. www.goldcopd.org

Ford ES. CHEST. 2013;144(1):284-305.

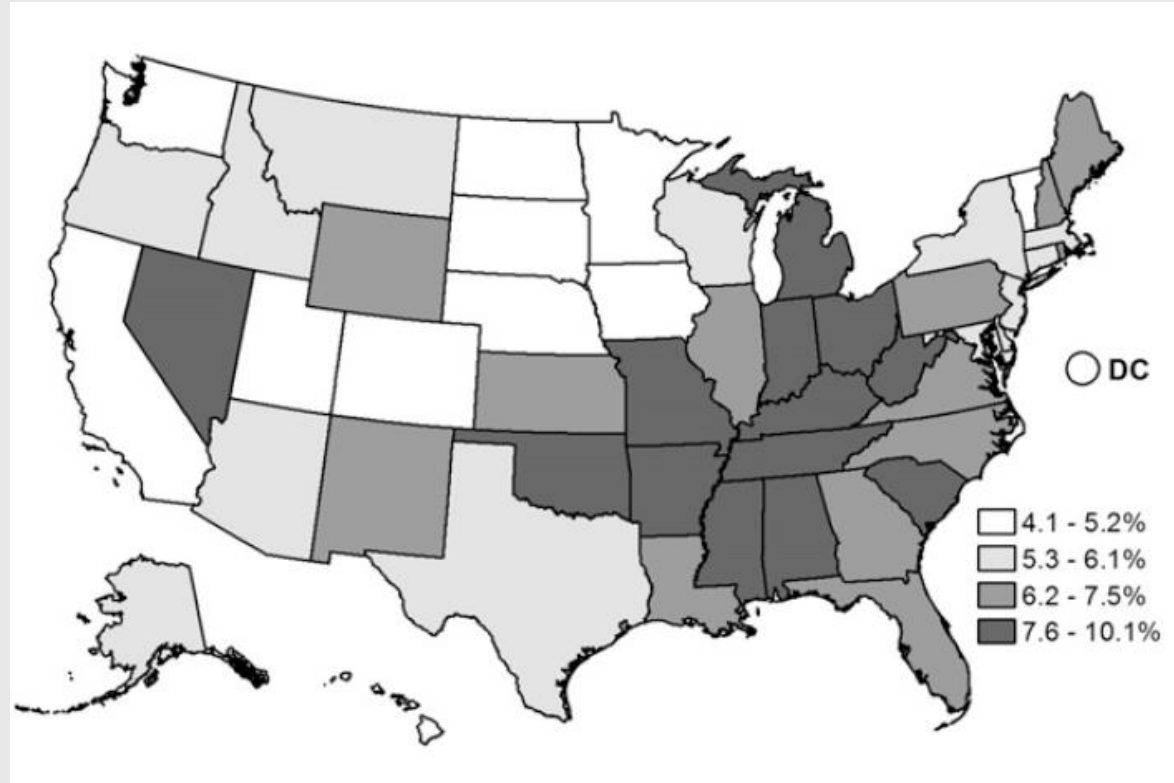


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COPD Prevalence



Age Adjusted Prevalence of COPD
in adults ≥ 25 years of age in 2011

Ford ES. CHEST. 2013;144(1):284-305.

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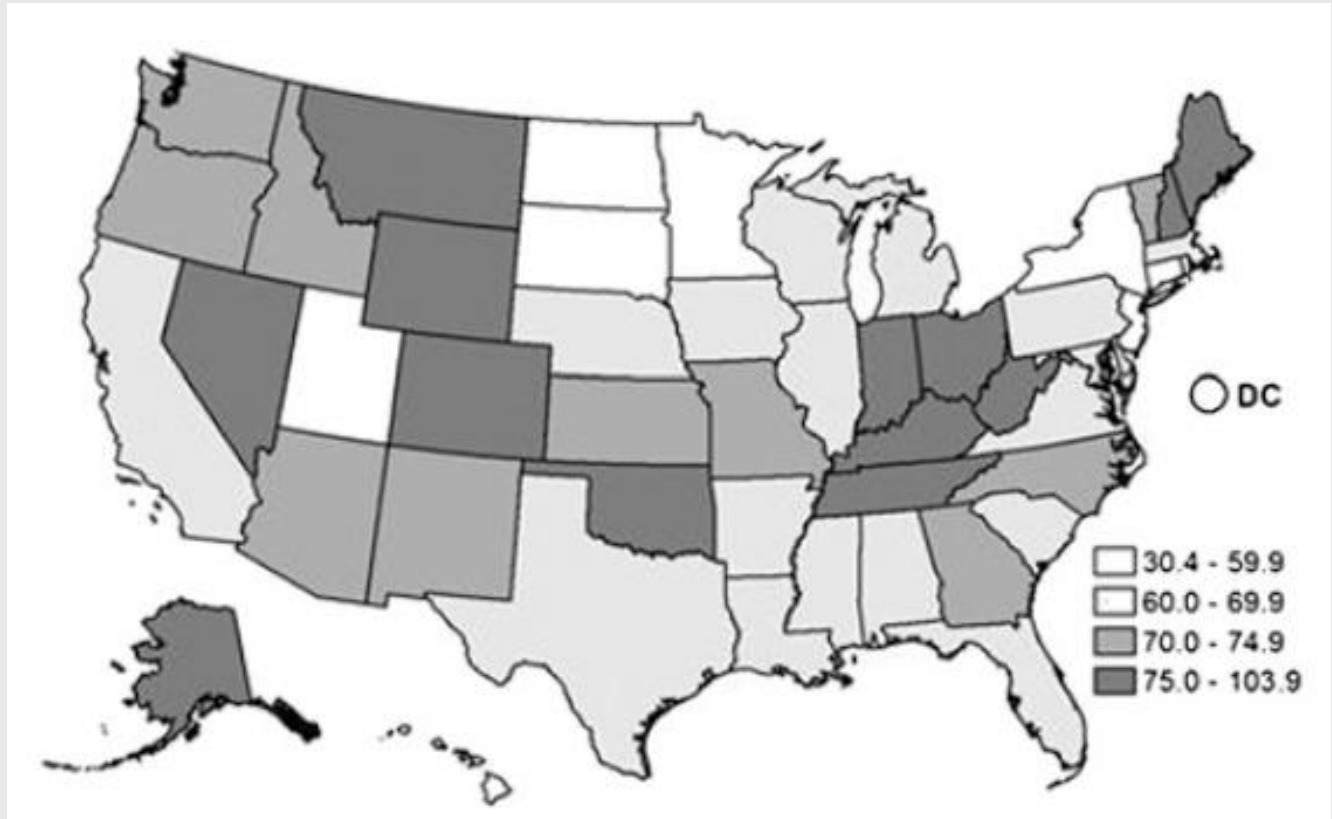


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COPD Prevalence



Age Adjusted Death-rates (per 100,000) of COPD
in adults ≥ 25 years of age between 1999-2000

Ford ES. CHEST. 2013;144(1):284-305.

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Risk Factors

- Genetic factors
 - Alpha-1 antitrypsin deficiency
- Age and gender
- Lung growth and development
- Exposure to particles
 - Cigarette smoking
- Socioeconomic status—questionable
- Asthma/bronchial hyper-reactivity
- Chronic bronchitis
- Infections

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COPD Treatment

- Pharmacologic treatment
 - No agent has been shown to decrease mortality for COPD patients
 - Reduces COPD symptoms, frequency of exacerbations, and improve health status
- Smoking cessation
 - Slows disease progression
- Oxygen therapy
 - Increases survival in patients with severe resting hypoxemia
- Pulmonary rehabilitation

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COPD Symptoms and Diagnosis

- Symptoms
 - Dyspnea
 - Cough
 - Sputum production
 - Wheezing and chest tightness
- Diagnosis
 - Spirometry demonstrating post-bronchodilator $FEV_1/FVC < 0.70$

GOLD Guidelines 2019. www.goldcopd.org



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Blood Eosinophil Count

- Eosinophils are part of the innate immune system
 - Contains different types of anti-inflammatory enzymes
- Predicts ICS effectiveness (when added to regular maintenance bronchodilators)

Eosinophil Count	Effectiveness
<100 cells/ μ L	Low likelihood of efficacy/benefit
>300 cells/ μ L	Greatest likelihood of benefit

Haynes BF, et al. Introduction to the Immune System. In: Harrison's Internal Medicine 20th ed. GOLD Guidelines 2019. www.goldcopd.org

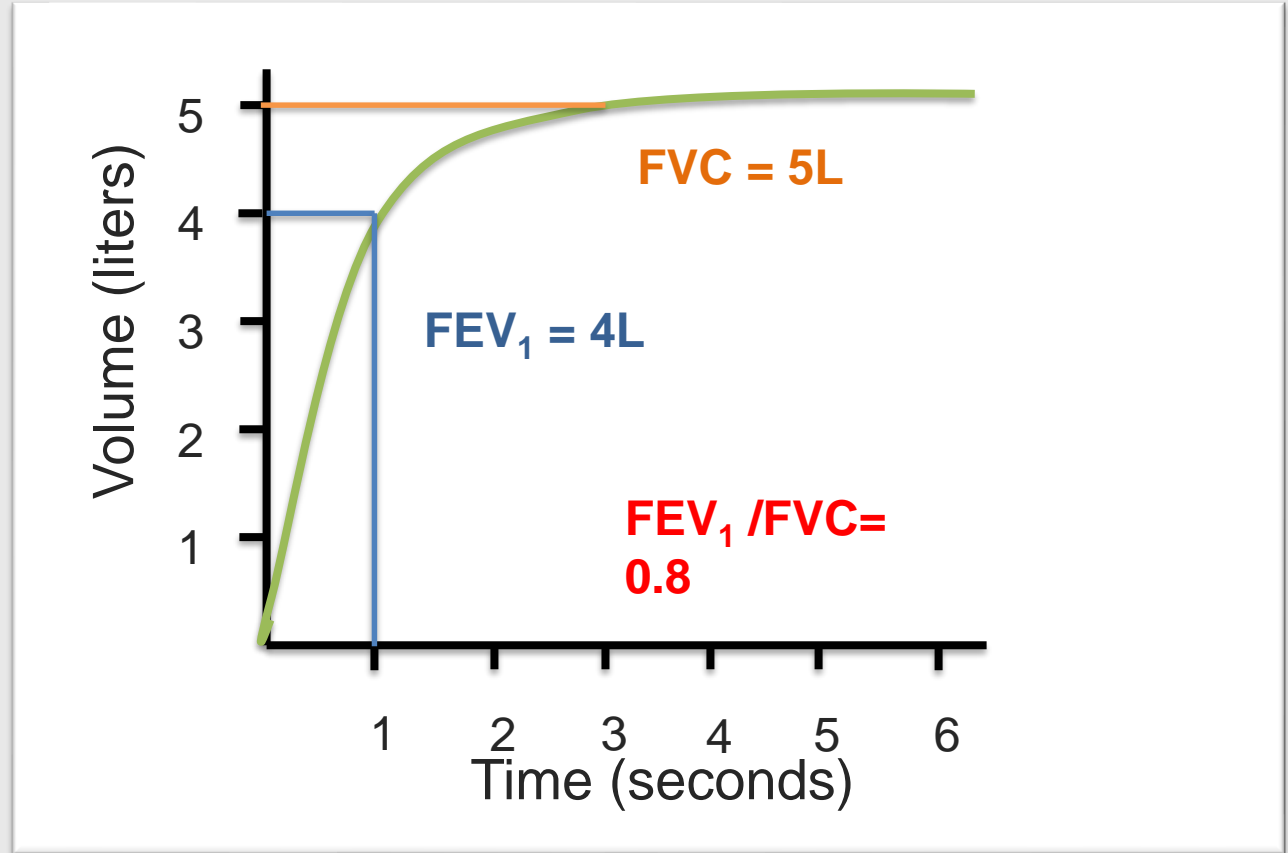


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Normal Spirometry



Adapted from: GOLD Guidelines 2019. www.goldcopd.org

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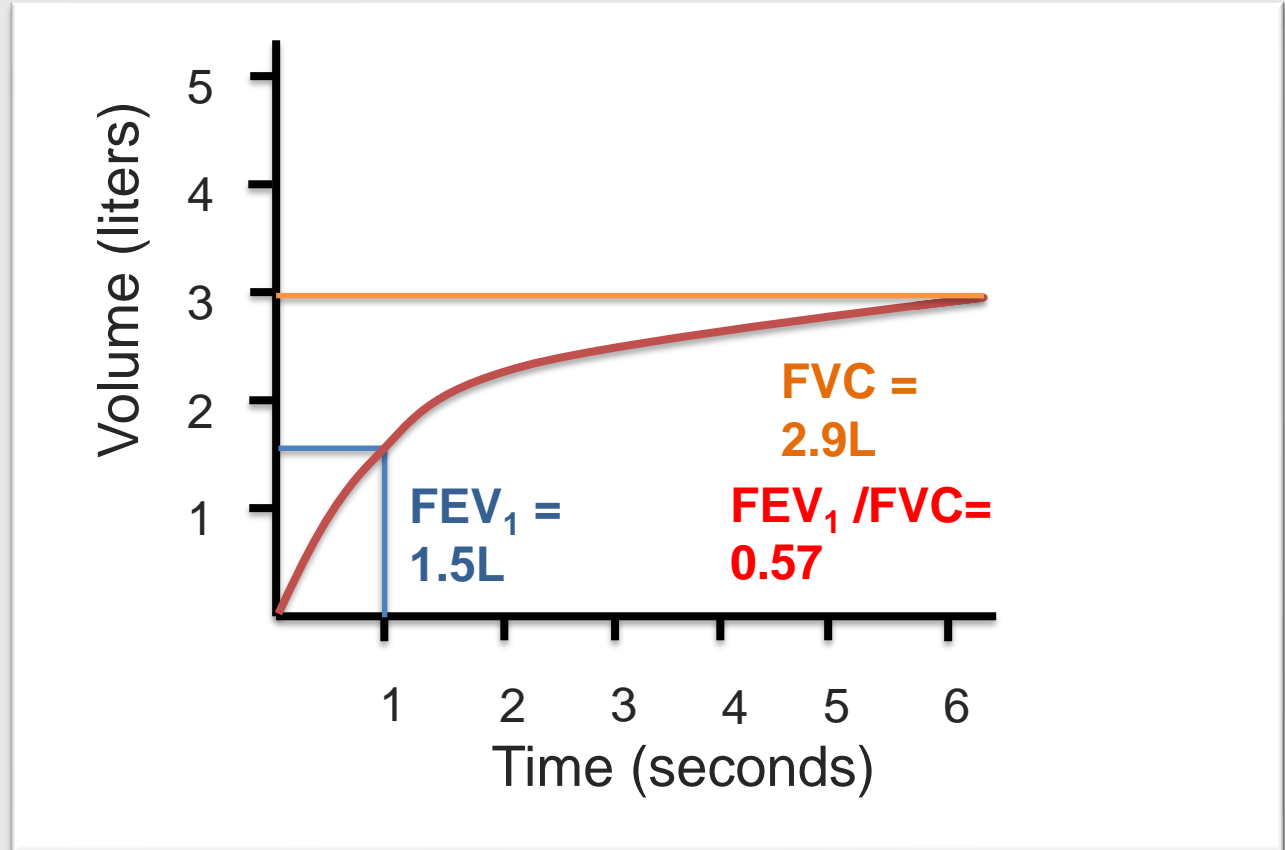


Spirometry in Obstructive Disease

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ABCD Assessment Tool

Confirm dx via
spirometry

Assess Airflow
Limitation

Asses symptoms and
exacerbation risk

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GOLD Classification

GOLD Grade	Severity	FEV ₁
GOLD 1	Mild	FEV ₁ ≥ 80% predicted
GOLD 2	Moderate	50% ≤ FEV ₁ < 80% predicted
GOLD 3	Severe	30% ≤ FEV ₁ < 50% predicted
GOLD 4	Very severe	FEV ₁ < 30% predicted

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ABCD Assessment Tool

Exacerbation History	≥ 2 /year OR ≥ 1 leading to admit	C	D
	0-1 exac/ year	A	B
		CAT < 10 mMRC 0-1	CAT \geq 10 mMRC \geq 2

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COPD Treatment Common Agents

- Inhalers
 - Beta agonists
 - Short vs. long acting
 - Anticholinergics
 - Short vs. long acting
 - Corticosteroids
 - Combination inhalers
- Oral agents
 - Methylxanthines
 - Theophylline
 - Aminophylline
 - Phosphodiesterase-4 inhibitor (PDE4 inhibitor)
 - Roflumilast (Daliresp[®])
 - Systemic corticosteroids
 - Mucolytic agent (not approved)
 - Erdosteine

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COPD Treatment Inhalers

- Beta₂-agonists
 - SABA: Short-acting beta agonists
 - Albuterol, levalbuterol
 - LABA: Long-acting beta agonists
 - Formoterol, aformoterol, indacaterol, salmeterol, olodaterol
- Anticholinergics (muscarinic agents)
 - SAAC: Short-acting anticholinergics
 - Ipratropium
 - LAAC: Long-acting anticholinergics
 - Aclidinium, tiotropium, glycopyrrolate, umeclidinium
- Corticosteroids
 - ICS—inhaled corticosteroid—always in combination inhalers

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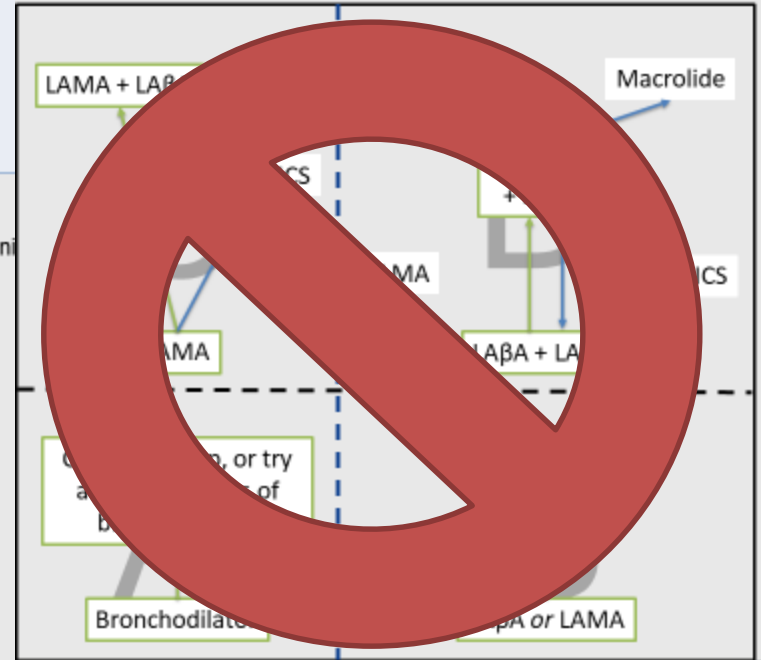
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Previous Guidelines

2016 COPD Treatment Selection

Group	First Line	Other
A		Theophylline
B		LABA or SAAC or Theophylline
C		LABA+LAAC or LAAC+PDE4 inhibitor or LABA+PDE4 inhibitor
D	LABA and LAAC or LABA+LAAC or LABA+PDE4 inhibitor	

SAAC: short acting beta-agonist
SAA: short acting anticholinergic
LAAC: long acting anticholinergic → LAMA
LABA: long acting beta-agonist
ICS: inhaled corticosteroid
GOLD Guidelines 2016





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ABCD Assessment Tool

Exacerbation History	≥ 2 /year OR ≥ 1 leading to admit	C	D
	0-1 exac/ year	A	B
		CAT < 10 mMRC 0-1	CAT \geq 10 mMRC \geq 2

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Initial Treatment

<p>C LAMA</p>	<p>D LAMA or LAMA+LABA* or ICS+LABA**</p> <p>* If highly symptomatic ** EOS \geq300</p>
<p>A Bronchodilator</p>	<p>B Long acting bronchodilator (LABA or LAMA)</p>

GOLD Guidelines 2019. www.goldcopd.org

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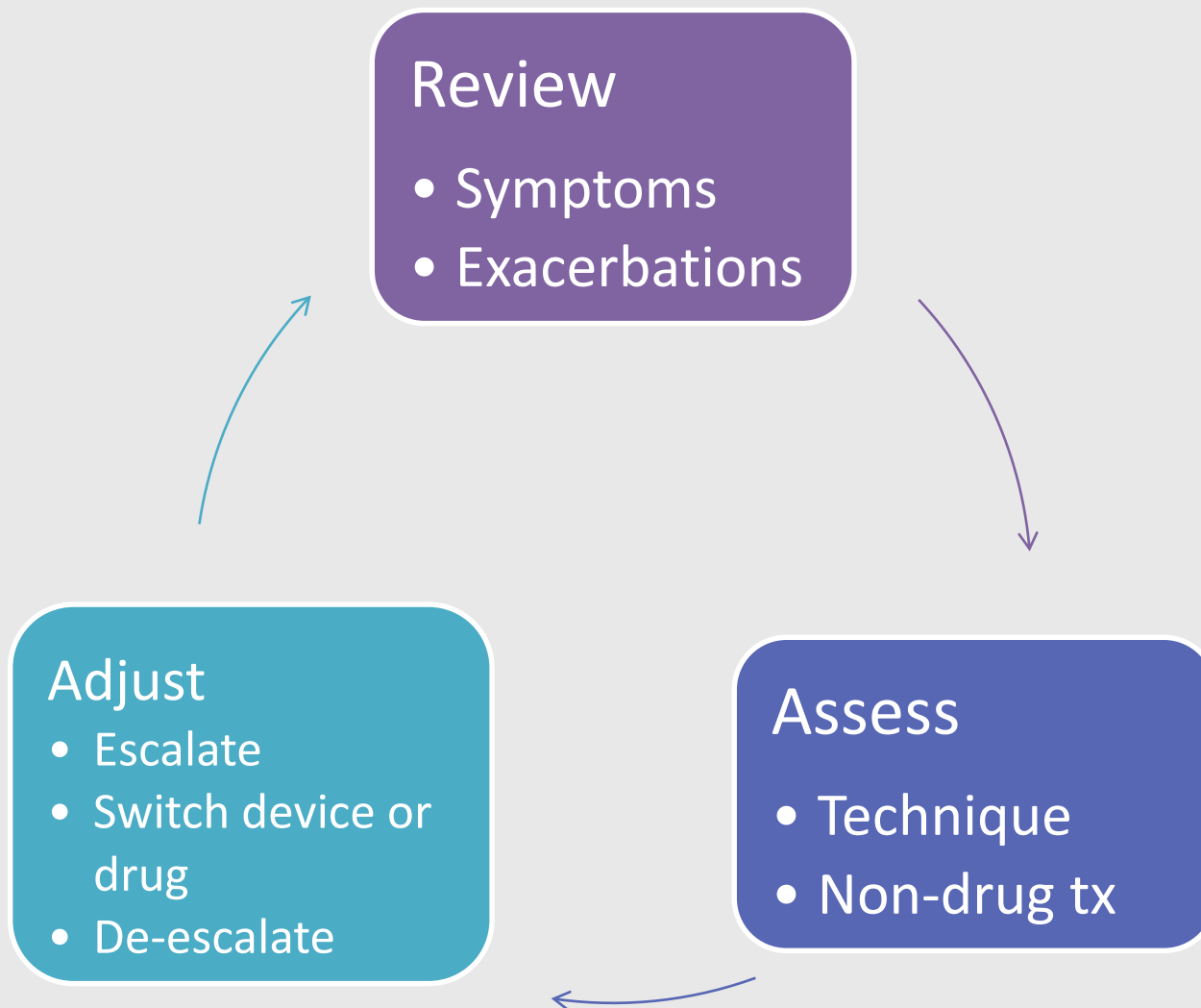


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Management Cycle



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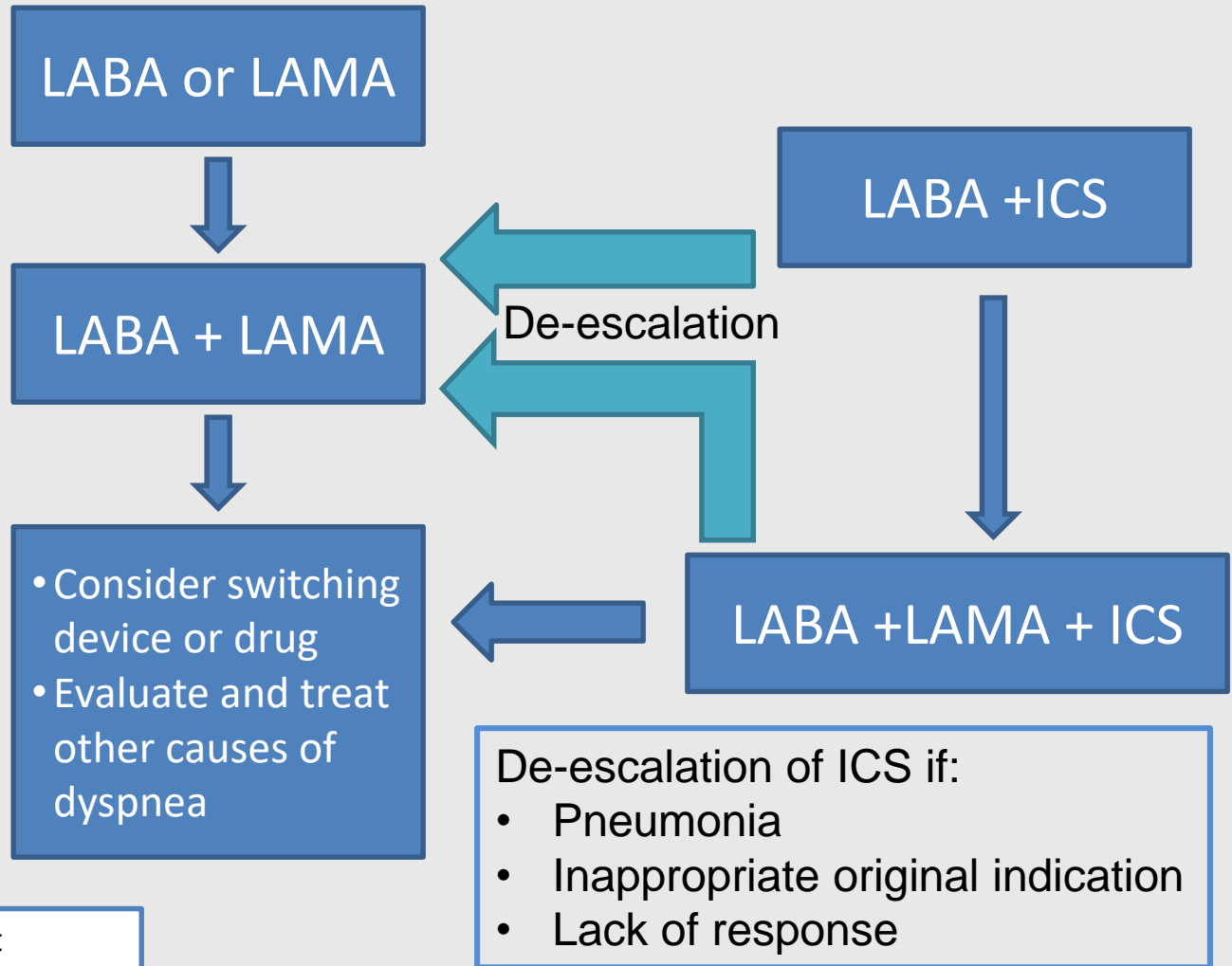
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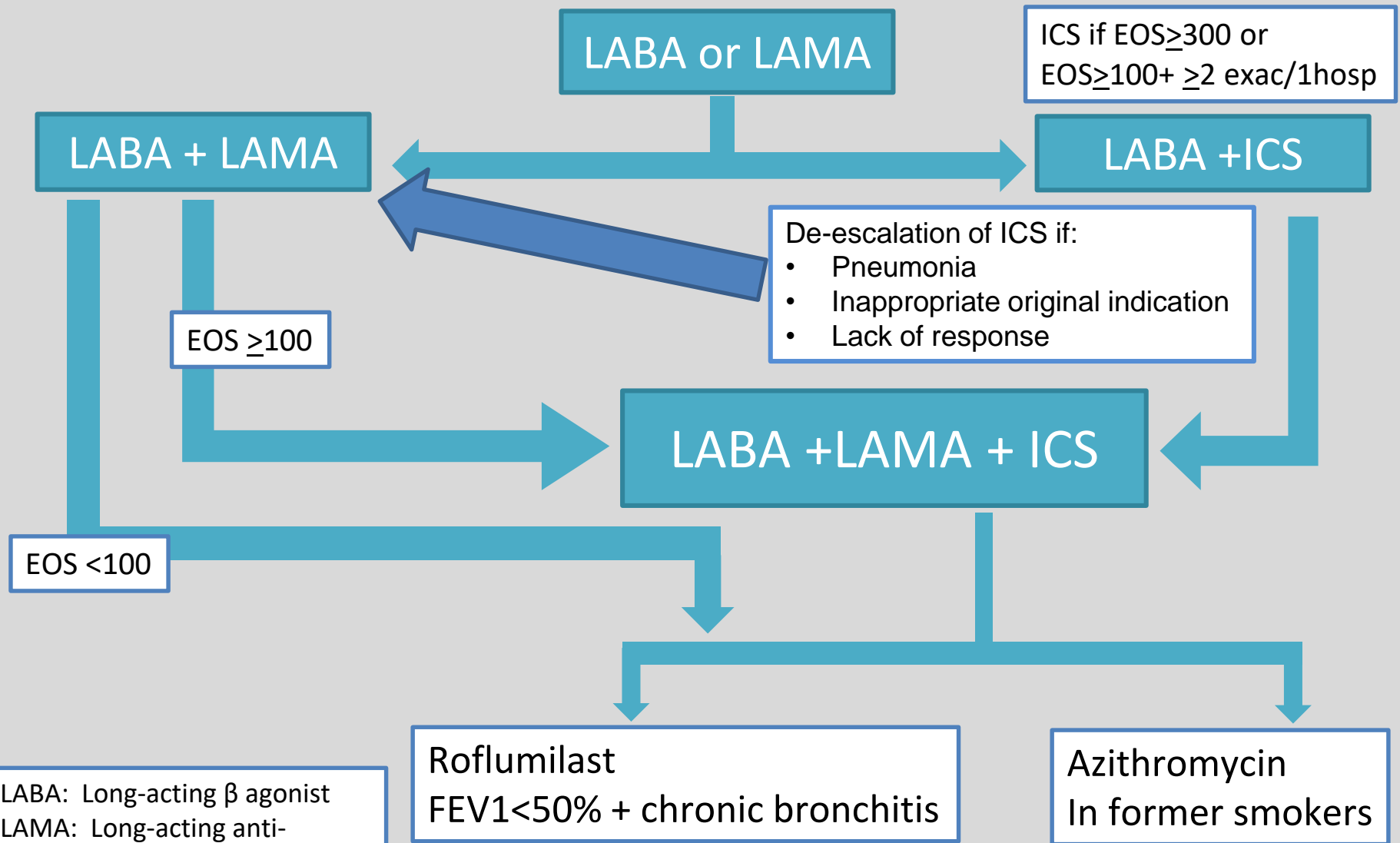
LABA: Long-acting β agonist
LAMA: Long-acting anti-muscarinic
ICS: Inhaled corticosteroid

Treatment Strategy: Dyspnea



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Treatment Strategy: Exacerbations



LABA: Long-acting β agonist
LAMA: Long-acting anti-muscarinic
ICS: Inhaled corticosteroid
EOS: Eosinophils



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COPD Treatment

- Methods of inhalation administration
 - Metered dose inhalers
 - Soft mist inhalers
 - Dry powder inhalers
 - Nebulizer solutions



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COPD Treatment

- Metered dose inhaler
 - Medication is administered as aerosol with propellant
 - Actuation and inhalation require coordination
 - Can use with spacer to help with coordination
 - Patient should inhale slowly
 - Priming is required
 - Shake before use



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COPD Treatment

- Dry powder inhaler
 - Multiple forms on the market
 - Medication is in powder form
 - No propellant
 - Patient inhalation triggers actuation
 - Coordination is not necessary
 - Spacer cannot be used
 - Patient should inhale quickly
 - Relies on peak inspiratory flow



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COPD Treatment

- Nebulizers
 - Medication is in liquid form
 - Device uses compressed air to aerosolize medication
 - Nebulization device is bulky and requires electricity
 - Administration time is prolonged compared to other devices
 - No coordination required

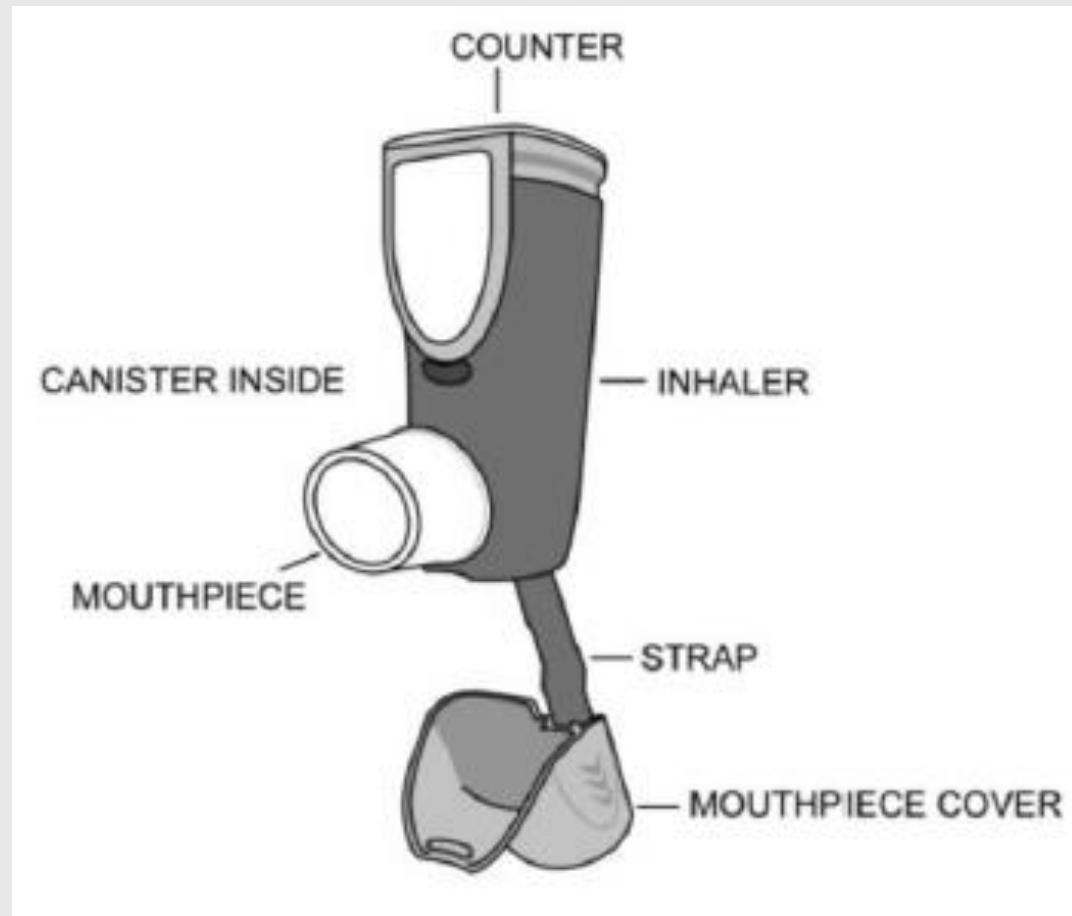


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Symbicort® PI. Wilmington, DE: AstraZeneca; 2017.

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- Ingredients
 - Albuterol—ProAir HFA[®]
 - Albuterol and ipratropium—Combivent[®]
 - Budesonide and formoterol—Symbicort[®]
- Counseling points
 - Priming
 - Spray away from face 3 times
 - Shake before each spray
 - Will need to be re-primed if not used for 3 weeks

ProAir[®] PI. Horsham, PA: Teva Respiratory LLC; 2018.

Symbicort[®] PI. Wilmington, DE: AstraZeneca; 2017.



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- Counseling points
 - Administration:
 - Shake well
 - Breathe out through the mouth
 - Mouthpiece in mouth
 - Seal lips around the mouthpiece
 - Push the canister down while breathing in slowly and deeply
 - Hold breath for ~10 seconds
 - Breathe out slowly
 - Wait 1 minute between doses

ProAir® PI. Horsham, PA: Teva Respiratory LLC; 2018.



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- Counseling points
 - Clean the device once per week
 - Remove the canister
 - Run the actuator under warm running water through both the top and through the mouth piece for 30 seconds each
 - Let dry overnight
 - Replace the canister and spray twice away from the face

ProAir® PI. Horsham, PA: Teva Respiratory LLC; 2018.



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- Symbicort[®] specific information
 - Only requires 2 sprays for priming
 - Re-prime if not in use for 7 days
 - Rinse mouth out with water and spit the water out after administration
 - Wipe mouthpiece every 7 days with a clean, dry cloth

Symbicort[®] PI. Wilmington, DE: AstraZeneca; 2017.

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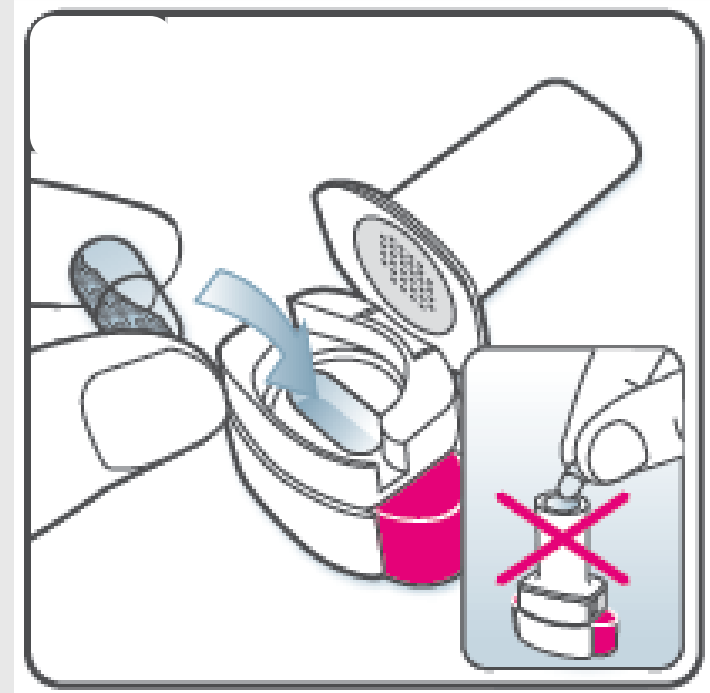
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Neohaler[®]

- DPI—capsule
- Ingredients:
 - Indacaterol
 - Glycopyrrolate
 - Combo



Arcapta[®] PI. Marlborough, MA: Sunovion; 2017.

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Neohaler[®]

- Counseling points:
 - Capsule is pierced by buttons on the side of the device
 - Whirring noise as patient is breathing in
 - After dose administration, pt to open the device and check for remaining power
 - Take another inhalation if there is powder left
 - Not meant to be washed

Arcapta[®] Pl. Marlborough, MA: Sunovion; 2017.



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Diskus[®]

- DPI—preloaded
- Ingredients
 - Fluticasone
 - Fluticasone/
Salmeterol



Advair[®] PI. Triangle Park, NC: GlaxoSmithKline; 2019.



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Diskus[®]

- Counseling points
 - Needs to be held in a level, flat position (think: hamburger)
 - Once the dose is activated it needs to be inhaled
 - Do not breathe into the mouthpiece
 - Not meant to be washed

Advair[®] PI. Triangle Park, NC: GlaxoSmithKline; 2019.

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Pressair[®]

- DPI—preloaded
- Ingredients
 - Acclidinium



Tudorza[®] PI. Wilmington, DA: AstraZeneca Pharmaceuticals; 2018.

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Pressair[®]

- Counseling points
 - Inhaler held horizontally with the green button on top
 - Cannot be tilted
 - Indicator window
 - Red → green when dose is loaded
 - Green → red after dose administered
 - Good for 45 days after opening
 - Not meant to be washed

Tudorza[®] PI. Wilmington, DA: AstraZeneca Pharmaceuticals; 2018.



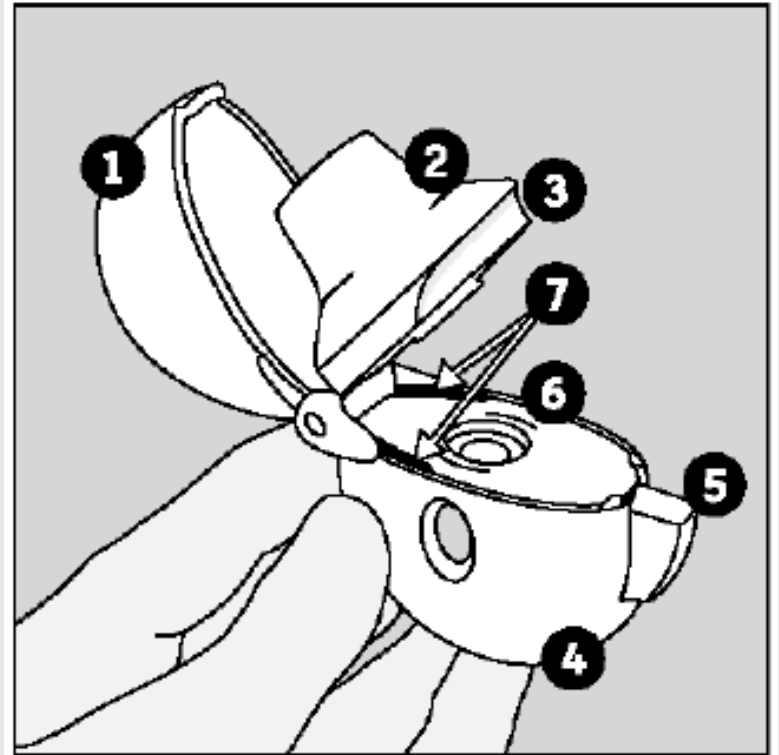
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Handihaler[®]

- DPI—capsule
- Ingredients:
 - Tiotropium



Spiriva[®] PI. Ridgefield, CT: Boehringer Ingelheim Pharmaceuticals; 2018.



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Handihaler[®]

- Counseling points
 - Do not pierce the capsule more than once
 - Breathe from the same capsule twice
 - Capsules should not be stored in the device
 - Can be cleaned, but takes 24 hours to fully dry

Spiriva[®] PI. Ridgefield, CT: Boehringer Ingelheim Pharmaceuticals; 2018.

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Ellipta[®]

- DPI—preloaded
- Ingredients
 - Umeclidinium and vilanterol—Anoro[®]
 - Fluticasone, umeclidinium, and vilanterol—Trelegy[®]
 - Fluticasone and vilanterol—Breo[®]
 - Umeclidinium—Incruse[®]
 - Fluticasone—Arnuity[®]

Anoro[®] Ellipta[®] PI. Triangle Park, NC: GlaxoSmithKline; 2017.

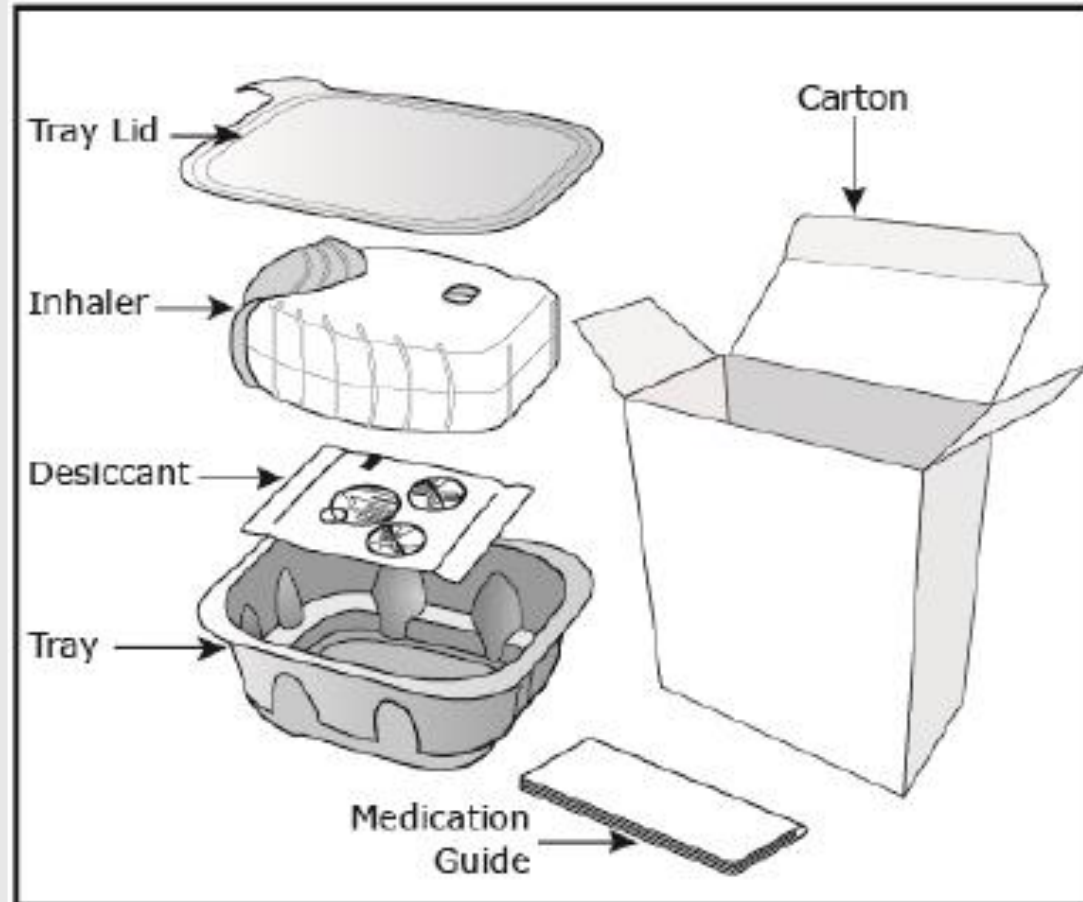


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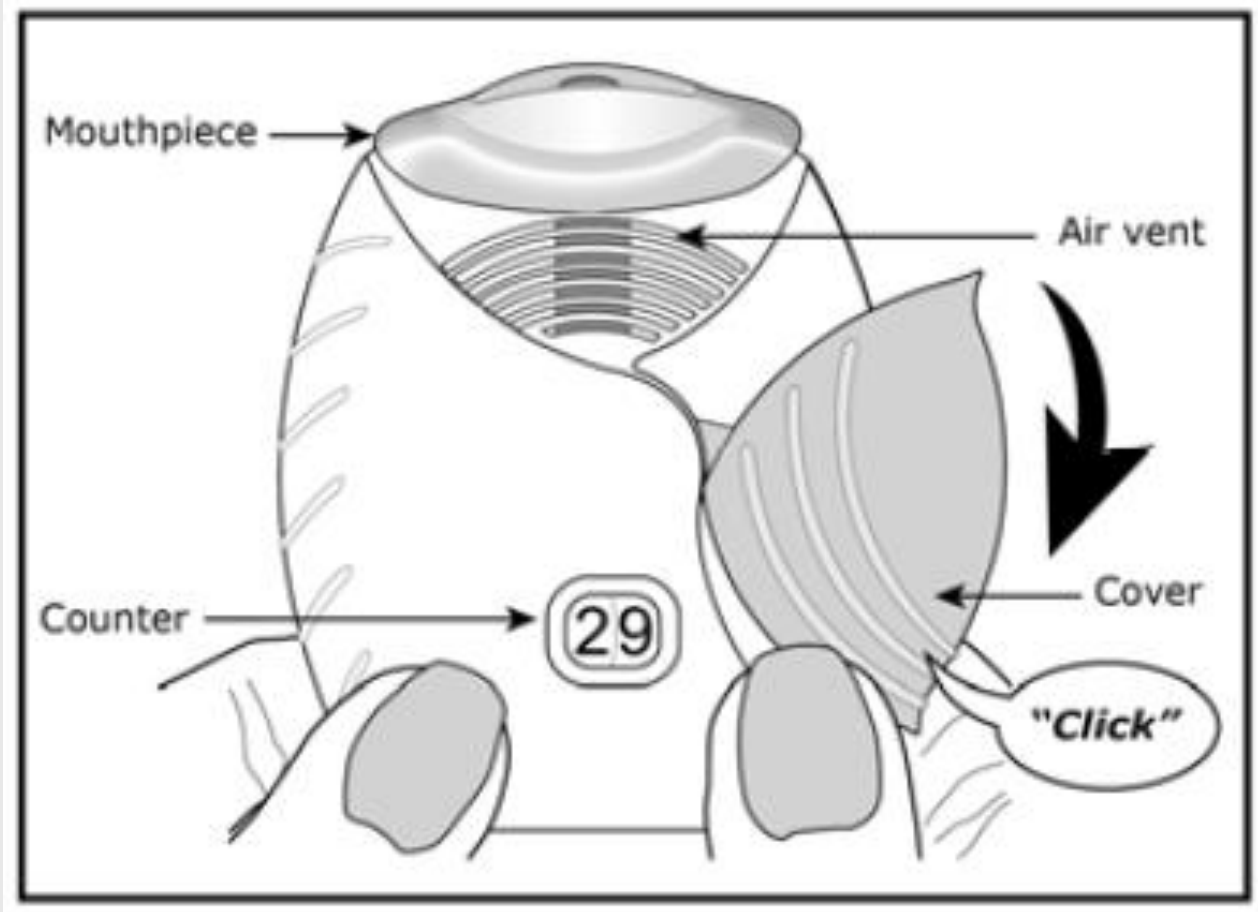


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Ellipta[®]

- Counseling points
 - Do not block the air vents during inhalation
 - Opening the cover loads a dose
 - If the cover is closed before the dose is inhaled, the dose will be lost
 - 1 breath per dose
 - Discard 6 weeks after opening the tray

Anoro[®] Ellipta[®] PI. Triangle Park, NC: GlaxoSmithKline; 2017.

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Respimat[®]

- Soft-mist inhaler
- Ingredients
 - Ipratropium and albuterol
 - Tiotropium—Spiriva[®]
 - Olodaterol—Striverdi[®]
 - Tiotropium and olodaterol—Stiolto[®]

Spiriva[®] Respimat[®] PI. Ridgefield, CT: Boehringer Ingelheim Pharmaceuticals; 2018.

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Respimat®



Spiriva® Respimat® PI. Ridgefield, CT: Boehringer Ingelheim Pharmaceuticals; 2018.

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Respimat[®]

- Counseling points
 - Discard 3 months after cartridge inserted
 - Prepare for first use (after cartridge insertion)
 - Turn the clear base clockwise until it clicks
 - Open cap
 - Point inhaler to the ground and press gray dose-release button
 - Repeat until mist is seen
 - After mist is seen, repeat 3 more times

Spiriva[®] Respimat[®] PI. Ridgefield, CT: Boehringer Ingelheim Pharmaceuticals; 2018.

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Respimat[®]

- Counseling points
 - If not used for extended period:
 - 3 days—release 1 puff to the ground
 - 21 days—go through “prepare for first use” until mist is visible, then repeat 3 more times
 - Inhaler will lock up after the number of doses have been used
 - Keep the cap closed when loading the dose

Spiriva[®] Respimat[®] PI. Ridgefield, CT: Boehringer Ingelheim Pharmaceuticals; 2018.

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Inhalers and Ingredients



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	LABA	LAMA	ICS
Symbicort®	Formoterol		Budesonide
Arcapta® Neohaler®	Indacaterol		
Seebri® Neohaler®		Glycopyrrolate	
Utibron® Neohaler®	Indacaterol	Glycopyrrolate	
Advair® Diskus®	Salmeterol		Fluticasone
Tudorza® Pressair®		Aclidinium	
Spiriva® Handihaler®		Tiotropium	
Anoro® Ellipta®	Vilanterol	Umeclidinium	
Breo® Ellipta®	Vilanterol		Fluticasone
Incruse® Ellipta®		Umeclidinium	
Trelegy® Ellipta®	Vilanterol	Umeclidinium	Fluticasone
Spiriva® Respimat®		Tiotropium	
Stiolto® Respimat®	Olodaterol	Tiotropium	
Striverdi® Respimat®	Olodaterol		



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Inhalers and Ingredients

	LABA	LAMA	ICS
Arcapta® Neohaler®	Indacaterol		
Striverdi® Respimat®	Olodaterol		
Tudorza® Pressair®		Aclidinium	
Seebri® Neohaler®		Glycopyrrolate	
Spiriva® Handihaler®		Tiotropium	
Spiriva® Respimat®		Tiotropium	
Incruse® Ellipta®		Umeclidinium	
Utibron® Neohaler®	Indacaterol	Glycopyrrolate	
Stiolto® Respimat®	Olodaterol	Tiotropium	
Anoro® Ellipta®	Vilanterol	Umeclidinium	
Symbicort®	Formoterol		Budesonide
Advair® Diskus®	Salmeterol		Fluticasone
Breo® Ellipta®	Vilanterol		Fluticasone
Trelegy® Ellipta®	Vilanterol	Umeclidinium	Fluticasone

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OTHER INHALERS NOT APPROVED/APPROPRIATE FOR COPD

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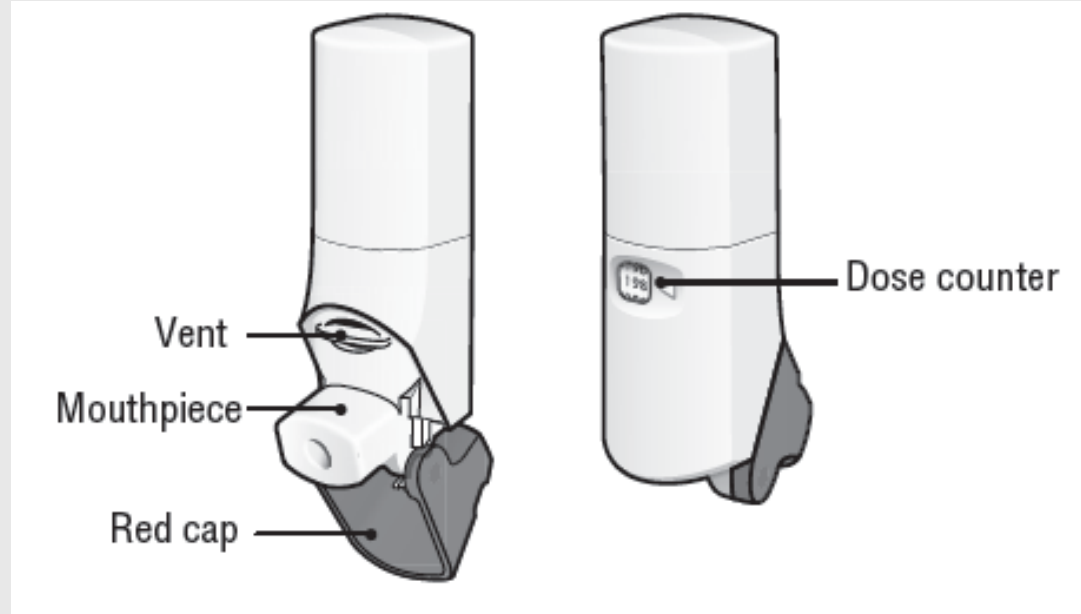
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Respiclick[®]

- DPI—preloaded
- Ingredients
 - Albuterol

Not indicated for COPD



Proair[®] Respiclick[®] PI. Horsham, PA: Teva Respiratory LLC; 2018.



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Respiclick[®]

- Counseling points
 - Do not use if allergic to lactose or milk proteins
 - Do not open the cap unless the medication is about to be administered
 - Hold the inhaler upright
 - There is no activation button
 - Do not block the vent
 - Do not wash

Proair[®] Respiclick[®] PI. Horsham, PA: Teva Respiratory LLC; 2018.

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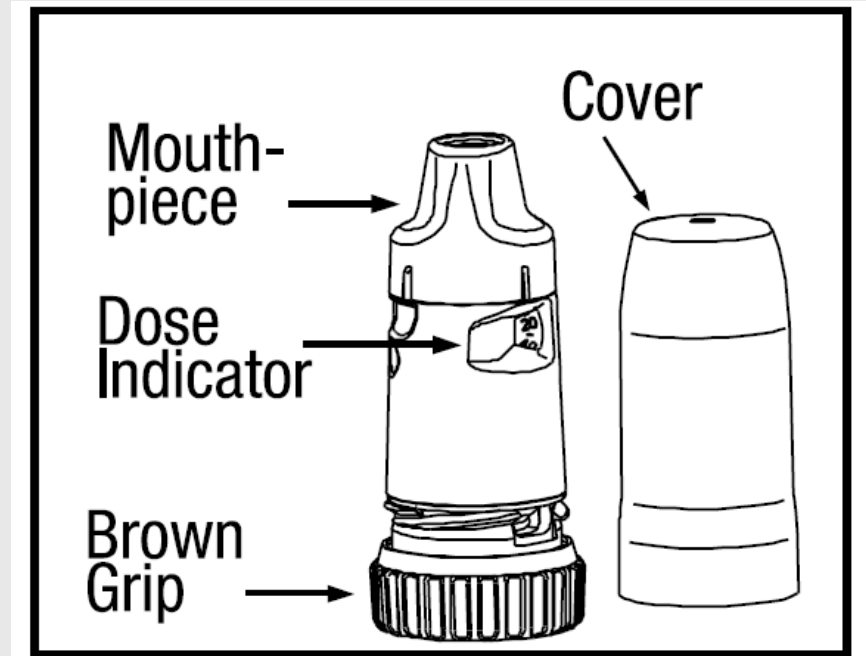
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Flexhaler®

- DPI—preloaded
- Ingredient
 - Budesonide
- Not indicated for COPD



Pulmicort® Flexhaler® PI. Wilmington, DE: AstraZeneca; 2016.



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Flexhaler[®]

- Counseling points
 - Dose loading
 - Twist the white cover off
 - Hold the inhaler upright
 - Twist the brown grip in one direction as far as it will go, then twist fully back in the other direction as far as it will go
 - Initial direction doesn't matter
 - Will hear a click during one of the twisting movements

Pulmicort[®] Flexhaler[®] PI. Wilmington, DE: AstraZeneca; 2016.

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Flexhaler[®]

- Counseling points
 - The inhaler will not load more doses for multiple turns
 - Counter will say zero but doses will still be in the device
 - The dose counter only moves with about every 5 doses
 - Do not wash it

Pulmicort[®] Flexhaler[®] PI. Wilmington, DE: AstraZeneca; 2016.

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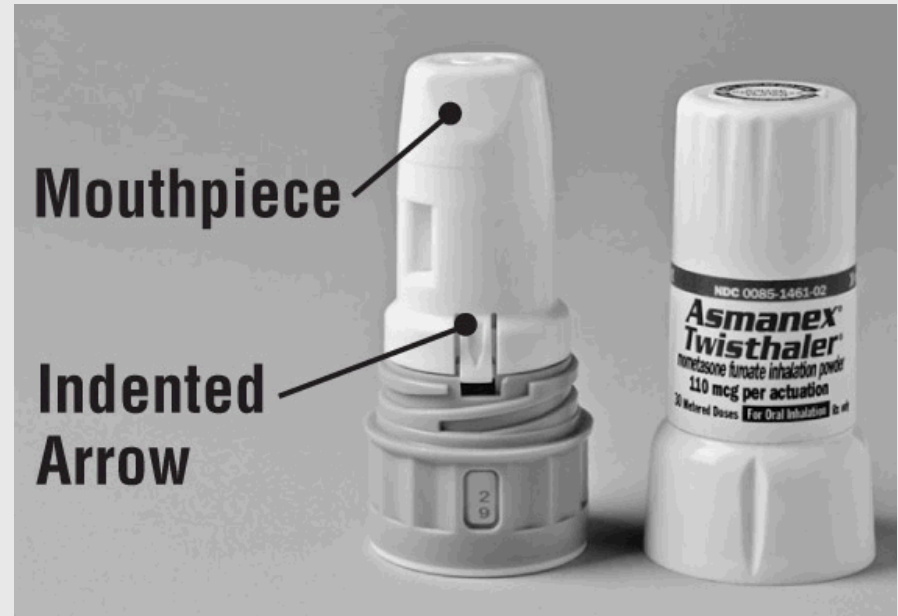
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Twisthaler[®]

- DPI—preloaded
- Ingredient
 - Mometasone
- Not indicated for COPD



Axmanex[®] Twisthaler[®] PI. Whitehouse Station, NJ: Merck & Co, Inc.; 2018.

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Twisthaler[®]

- Counseling points
 - Good for 45 days after date removed from pouch
 - Dose loading
 - Twist the white cover off
 - Hold the inhaler upright
 - Twist the base counterclockwise to both remove the cap AND load a dose
 - Replacing the cap to the indented arrow ensures dose is properly loaded

Axmanex[®] Twisthaler[®] PI. Whitehouse Station, NJ: Merck & Co, Inc.; 2018.

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ADJUNCTIVE THERAPIES

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Smoking Cessation



Lung function vs. age and the relationship between smoking and lung function decline

Parkes G. BMJ. 2008;336(7644):598-600

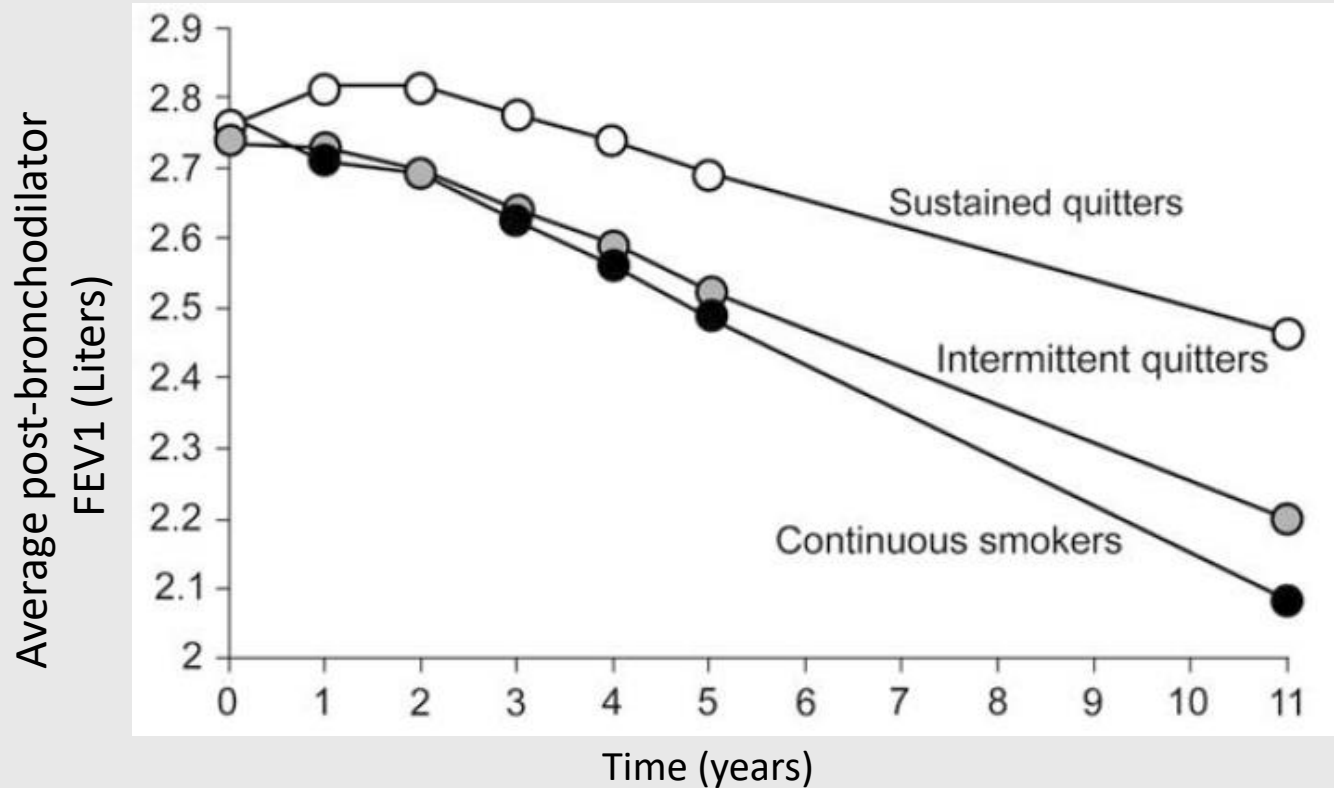


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Smoking Cessation



Loss of lung function over 11 years based on smoking status

Tashkin DP. *Resp Med.* 2009;103:963-974.

Anthonisen NR. *Am J Respir Crit Care Med.* 2002;166(5):675-679.



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Smoking Cessation

- Counseling delivered by healthcare professionals increases quit rates
- Brief strategies to help the patient willing to quit (the 5 A's):
 - Ask—identify all tobacco users
 - Advise—strongly urge all tobacco users to quit
 - Assess—determine willingness to make a quit attempt
 - Assist—aid the patient in quitting
 - Arrange—schedule follow-up contact

GOLD Guidelines 2019. www.goldcopd.org

JAMA. 2000;283(24):3244-3254.



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Immunizations

- Review the immunization history for all patients
 - Can be done in community setting, clinic setting, or hospital setting
 - Follow guidelines from the Centers for Disease Control Advisory Committee on Immunization Practices (CDC ACIP)
 - Guidelines are released yearly
- Available from:
 - <http://www.cdc.gov/vaccines/schedules/hcp/adult.html>

GOLD Guidelines 2019. www.goldcopd.org



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Immunizations

- Influenza vaccination
 - Inactivated influenza vaccine (IIV) recommended yearly
 - A list of available flu vaccines can be found here:
 - <http://www.cdc.gov/flu/protect/vaccine/vaccines.htm>
 - 18-64 years of age may receive intradermal or intramuscular IIV
 - ≥ 65 years of age may receive the standard IIV or the high-dose IIV
- Benefits
 - Reduces exacerbations
 - Reduces influenza infections
 - Decreases risk of death

GOLD Guidelines 2014. www.goldcopd.org

CDC ACIP 2016 Adult Immunization schedule. <http://www.cdc.gov/vaccines/schedules/downloads/adult/adult-combined-schedule.pdf>

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Immunizations

- Pneumococcal vaccination
 - All COPD patients 19-64 years of age should receive PPSV23
 - At age ≥ 65 years:
 - Administer PCV13 at least one year after PPSV23
 - Followed by another PPSV23 at least one year after PCV13 and at least 5 years after PPSV23
- Benefits
 - Reduces community acquired pneumonia caused by pneumococcus
 - Reduces pneumonia caused by both pneumococcus and unknown etiology for COPD patients < 65 years of age and $FEV_1 < 40\%$ predicted

GOLD Guidelines 2019. www.goldcopd.org

CDC ACIP 2019 Adult Immunization schedule. <http://www.cdc.gov/vaccines/schedules/downloads/adult/adult-combined-schedule.pdf>

CDC Pneumococcal vaccine timing. Available from: <https://www.cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf>

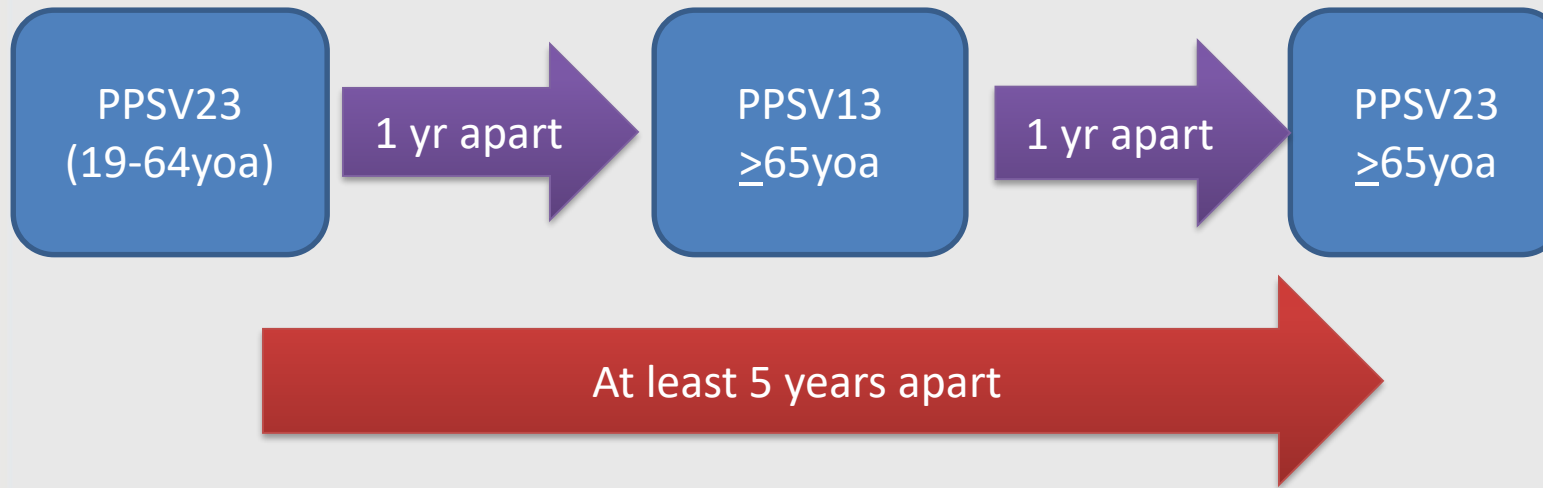


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Pneumococcal Vaccine



CDC ACIP 2019 Adult Immunization schedule. <http://www.cdc.gov/vaccines/schedules/downloads/adult/adult-combined-schedule.pdf>

Adapted from: CDC Pneumococcal vaccine timing. Available from: <https://www.cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf>

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Considerations

- Disease is progressive—but therapy may be stepped down
- Counseling
 - Role of maintenance versus rescue medication
 - Inhaler devices
 - Check use at each visit
 - Demonstrate technique for patient
 - Utilize teach-back



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QUESTIONS??

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Assessment Questions

- Which of the following has been proven to decrease mortality in patients with COPD?
 - Use of dry-powder inhalers
 - Monotherapy with inhaled corticosteroids
 - Smoking cessation
 - Avoiding the use of supplementary oxygen in all COPD patients



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Assessment Questions

- Which of the following inhalers requires forceful inhalation?

– Ellipta[®]

– Respimat[®]

– Metered dose inhaler

– Neohaler[®]



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Assessment Questions

- KL has had COPD for approximately 5 years. On her last visit to her physician, her CAT score was 15 and she has had a lot of dyspnea. She has had no exacerbations. She has been previously stable with prn albuterol. What agent would you recommend for her?
 - Continue PRN albuterol as no additional medication is warranted
 - Arcapta[®] Neohaler[®]--indacaterol
 - Anoro[®] Ellipta[®]--vilanterol+umeclidinium
 - Symbicort[®]--formoterol+budesonide



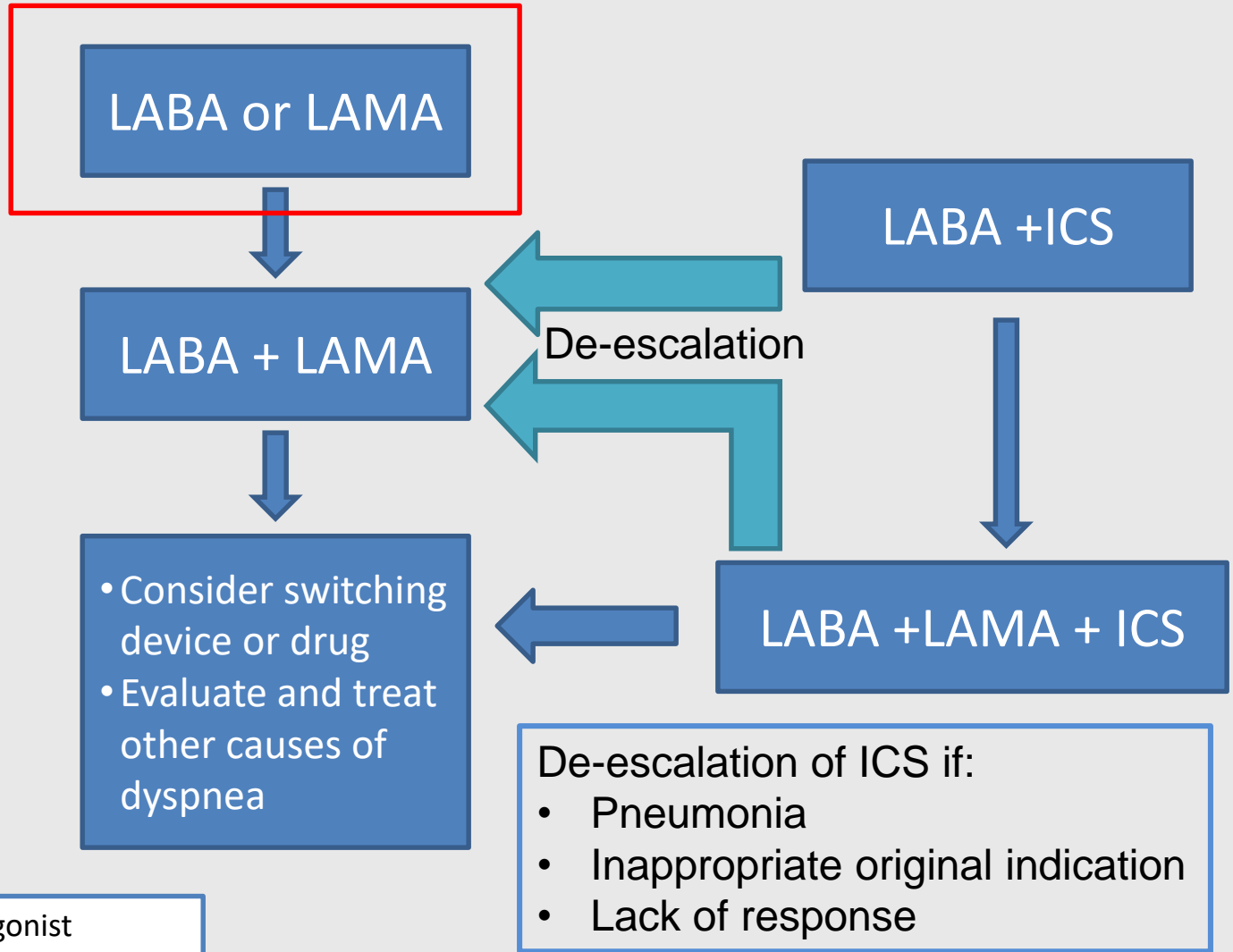
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LABA: Long-acting β agonist
LAMA: Long-acting anti-muscarinic
ICS: Inhaled corticosteroid

Treatment Strategy: Dyspnea



Adapted from: GOLD Guidelines 2019. www.goldcopd.org



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Assessment Questions

- KL has been taking the Arcapta[®] Neohaler[®] (indacaterol) but has been having worsening dyspnea. What agent would you recommend for her?
 - Striverdi[®] Respimat[®]--Olodaterol
 - Seebri[®] Neohaler[®]--Glycopyrrolate
 - Utibron[®] Neohaler[®]--
Indacaterol+glycopyrrolate
 - Breo[®] Ellipta[®]--Vilanterol+Umeclidinium



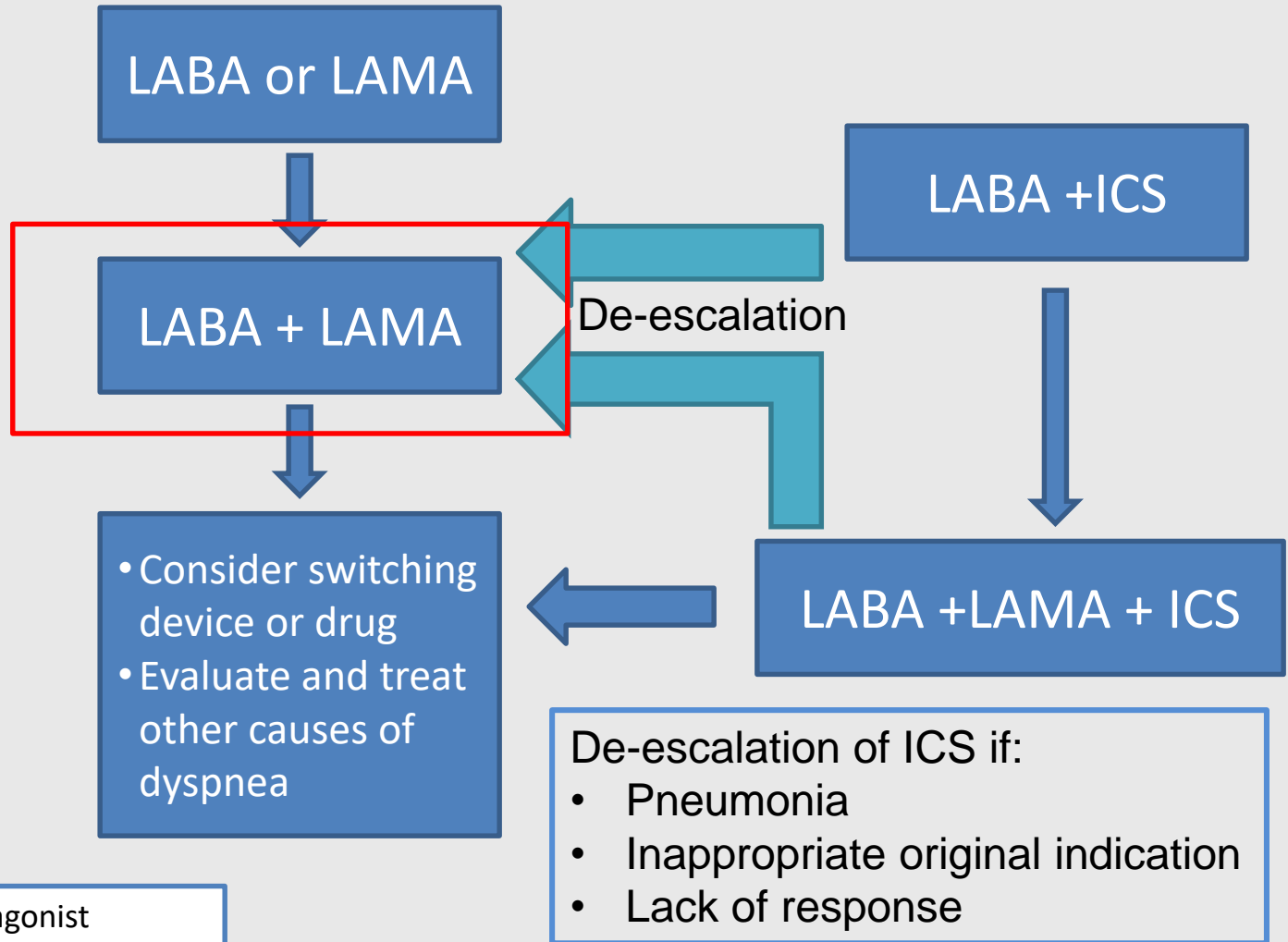
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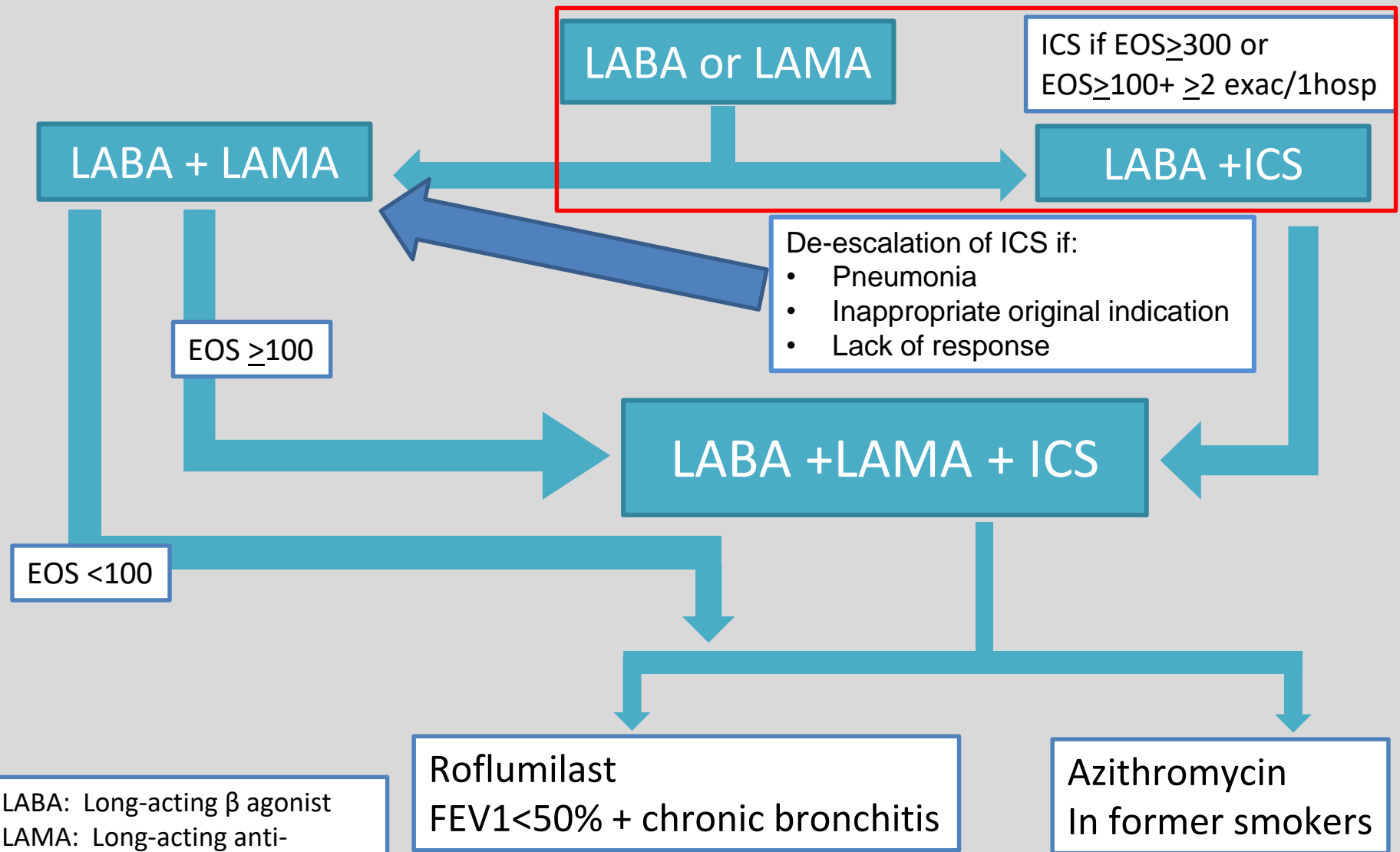
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Assessment Questions

- DW has had COPD for approximately 10 years. On his last visit to his physician, his CAT score was 8, but he has had 2 exacerbations leading to hospitalization. He had been previously stable with Arcapta[®] Neohaler[®]. His eosinophil count is 454. What agent would you recommend?
 - Arcapta[®] Neohaler[®]--indacaterol
 - Trelegy[®] Ellipta[®]--vilanterol+umeclidinium+fluticasone
 - Stiolto[®] Respimat[®]--olodaterol+tiotropium
 - Symbicort[®]--formoterol+budesonide

Treatment Strategy: Exacerbations



LABA: Long-acting β agonist
LAMA: Long-acting anti-muscarinic
ICS: Inhaled corticosteroid
EOS: Eosinophils



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Assessment Questions

- HG has long standing COPD. He received an PPSV 23 in 2011 when he turned 65. What pneumococcal vaccine should he receive now?
 - No pneumococcal vaccine is recommended at this time.
 - Another PPSV with a PCV13 in 5 years
 - A PCV 13 followed by a PPSV23 in 5 years
 - A PCV13 followed by a PPSV23 in 1 year



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Assessment Questions

- RF is a 64 year old who has been recently diagnosed with COPD. She has never received a pneumococcal vaccine before. What pneumococcal vaccine schedule should she follow?
 - PPSV 23 when she turns 65 followed by a PCV 13 in 5 years
 - PCV13 now then PPSV in 1 year followed by another PCV13 1 year after that
 - PPSV 23 now, PCV13 in 1 year, PPSV23 1 year after that
 - PPSV23 now and PCV 13 in 5 years



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Assessment Questions

- RB is a 67 year old who has been recently diagnosed with COPD. He has never received a pneumococcal vaccine before. What pneumococcal vaccine schedule should he follow?
 - PPSV 23 now followed by a PCV 13 in 1 year
 - PCV13 now then PPSV in 1 year followed by another PCV13 1 year after that
 - PPSV 23 now, PCV13 in 1 year, PPSV23 1 year after that
 - PPSV23 now and PCV 13 in 5 years



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COPD: Guidelines and Devices Update

Amber M. Hutchison, PharmD, BCPS, BCGP
Associate Clinical Professor
Auburn University
Harrison School of Pharmacy

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