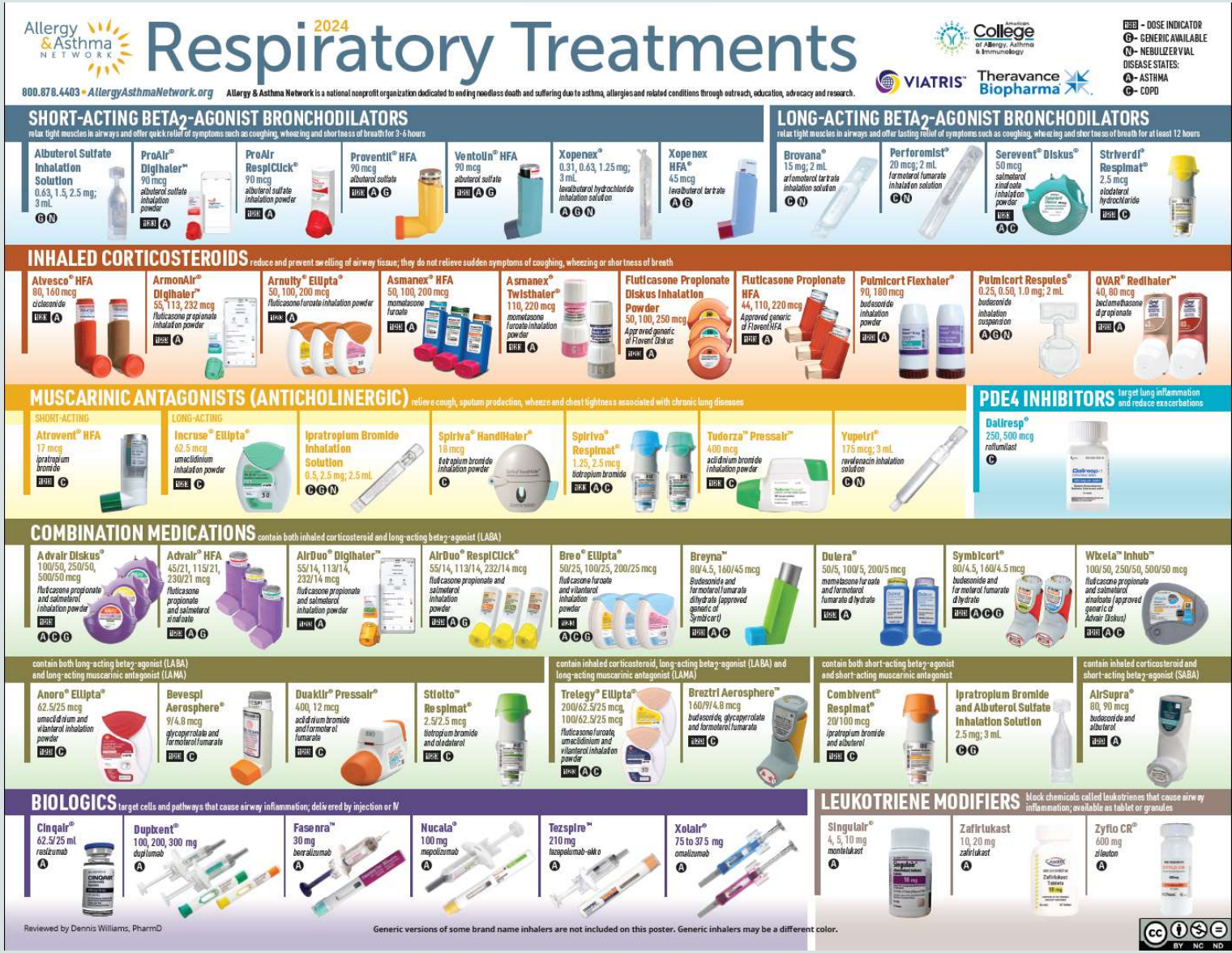
# Asthma and COPD What's New?

Presented By,

Tom Simpson PharmD., RPh.



# Conflicts of Interest

None identified

# Objectives

Discuss the role of leukotrienes

Review what is new in the GINA guideline

Discuss asthma exacerbation in the ED

Review changes to COPD management

## SHORT-ACTING BETA$_2$-AGONIST BRONCHODILATORS

relax tight muscles in airways and offer quick relief of symptoms such as coughing, wheezing and shortness of breath for 3-6 hours

- **Albuterol Sulfate Inhalation Solution** — 0.63, 1.5, 2.5 mg; 3 mL — G N
- **ProAir® Digihaler™** — 90 mcg — albuterol sulfate inhalation powder — DPI A
- **ProAir RespiClick®** — 90 mcg — albuterol sulfate inhalation powder — DPI A
- **Proventil® HFA** — 90 mcg — albuterol sulfate — HFA A G
- **Ventolin® HFA** — 90 mcg — albuterol sulfate — HFA A G
- **Xopenex®** — 0.31, 0.63, 1.25 mg; 3 mL — levalbuterol hydrochloride inhalation solution — A G N
- **Xopenex HFA®** — 45 mcg — levalbuterol tartrate — A G

## LONG-ACTING BETA$_2$-AGONIST BRONCHODILATORS

relax tight muscles in airways and offer lasting relief of symptoms such as coughing, wheezing and shortness of breath for at least 12 hours

- **Brovana®** — 15 mg; 2 mL — arformoterol tartrate inhalation solution — C N
- **Perforomist®** — 20 mcg; 2 mL — formoterol fumarate inhalation solution — C N
- **Serevent® Diskus®** — 50 mcg — salmeterol xinafoate inhalation powder — DPI A C
- **Striverdi® Respimat®** — 2.5 mcg — olodaterol hydrochloride — HFA C

## INHALED CORTICOSTEROIDS

reduce and prevent swelling of airway tissue; they do not relieve sudden symptoms of coughing, wheezing or shortness of breath

- **Alvesco® HFA** — 80, 160 mcg — ciclesonide — HFA A
- **ArmonAir® Digihaler™** — 55, 113, 232 mcg — fluticasone propionate inhalation powder — DPI A
- **Arnuity® Ellipta®** — 50, 100, 200 mcg — fluticasone furoate inhalation powder — DPI A
- **Asmanex® HFA** — 50, 100, 200 mcg — mometasone furoate — HFA A
- **Asmanex® Twisthaler®** — 110, 220 mcg — mometasone furoate inhalation powder — DPI A
- **Fluticasone Propionate Diskus Inhalation Powder** — 50, 100, 250 mcg — Approved generic of Flovent Diskus — DPI A
- **Fluticasone Propionate HFA** — 44, 110, 220 mcg — Approved generic of Flovent HFA — HFA A
- **Pulmicort Flexhaler®** — 90, 180 mcg — budesonide inhalation powder — DPI A
- **Pulmicort Respules®** — 0.25, 0.50, 1.0 mg; 2 mL — budesonide inhalation suspension — A G N
- **QVAR® Redihaler™** — 40, 80 mcg — beclomethasone dipropionate — HFA A

## MUSCARINIC ANTAGONISTS (ANTICHOLINERGIC)

relieve cough, sputum production, wheeze and chest tightness associated with chronic lung diseases

SHORT-ACTING

- **Atrovent® HFA** — 17 mcg — ipratropium bromide — HFA C

LONG-ACTING

- **Incruse® Ellipta®** — 62.5 mcg — umeclidinium inhalation powder — DPI C
- **Ipratropium Bromide Inhalation Solution** — 0.5, 2.5 mg; 2.5 mL — C G N
- **Spiriva® HandiHaler®** — 18 mcg — tiotropium bromide inhalation powder — C
- **Spiriva® Respimat®** — 1.25, 2.5 mcg — tiotropium bromide — HFA A C
- **Tudorza™ Pressair™** — 400 mcg — aclidinium bromide inhalation powder — DPI C
- **Yupelri®** — 175 mcg; 3 mL — revefenacin inhalation solution — C N

## PDE4 INHIBITORS

target lung inflammation and reduce exacerbations

- **Daliresp®** — 250, 500 mcg — roflumilast — C

## COMBINATION MEDICATIONS

contain both inhaled corticosteroid and long-acting beta$_2$-agonist (LABA)

- **Advair Diskus®** — 100/50, 250/50, 500/50 mcg — fluticasone propionate and salmeterol inhalation powder — DPI A C G
- **Advair® HFA** — 45/21, 115/21, 230/21 mcg — fluticasone propionate and salmeterol xinafoate — DPI A G
- **AirDuo® Digihaler™** — 55/14, 113/14, 232/14 mcg — fluticasone propionate and salmeterol inhalation powder — DPI A
- **AirDuo® RespiClick®** — 55/14, 113/14, 232/14 mcg — fluticasone propionate and salmeterol inhalation powder — DPI A G
- **Breo® Ellipta®** — 50/25, 100/25, 200/25 mcg — fluticasone furoate and vilanterol inhalation powder — DPI A C G
- **Breyna™** — 80/4.5, 160/45 mcg — Budesonide and formoterol fumarate dihydrate (approved generic of Symbicort) — HFA A C
- **Dulera®** — 50/5, 100/5, 200/5 mcg — mometasone furoate and formoterol fumarate dihydrate — HFA A
- **Symbicort®** — 80/4.5, 160/4.5 mcg — budesonide and formoterol fumarate dihydrate — DPI A C G
- **Wixela™ Inhub™** — 100/50, 250/50, 500/50 mcg — fluticasone propionate and salmeterol xinafoate (approved generic of Advair Diskus) — DPI A C

contain both long-acting beta$_2$-agonist (LABA) and long-acting muscarinic antagonist (LAMA)

- **Anoro® Ellipta®** — 62.5/25 mcg — umeclidinium and vilanterol inhalation powder — DPI C
- **Bevespi Aerosphere®** — 9/4.8 mcg — glycopyrrolate and formoterol fumarate — HFA C
- **Duaklir® Pressair®** — 400, 12 mcg — aclidinium bromide and formoterol fumarate — DPI C
- **Stiolto™ Respimat®** — 2.5/2.5 mcg — tiotropium bromide and olodaterol — HFA C

contain inhaled corticosteroid, long-acting beta$_2$-agonist (LABA) and long-acting muscarinic antagonist (LAMA)

- **Trelegy® Ellipta®** — 200/62.5/25 mcg, 100/62.5/25 mcg — fluticasone furoate, umeclidinium and vilanterol inhalation powder — DPI A C
- **Breztri Aerosphere™** — 160/9/4.8 mcg — budesonide, glycopyrrolate and formoterol fumarate — HFA C

contain both short-acting beta$_2$-agonist and short-acting muscarinic antagonist

- **Combivent® Respimat®** — 20/100 mcg — ipratropium bromide and albuterol — HFA C
- **Ipratropium Bromide and Albuterol Sulfate Inhalation Solution** — 2.5 mg; 3 mL — C G

contain inhaled corticosteroid and short-acting beta$_2$-agonist (SABA)

- **AirSupra®** — 80, 90 mcg — budesonide and albuterol — DPI A

## BIOLOGICS

target cells and pathways that cause airway inflammation; delivered by injection or IV

- **Cinqair®** — 62.5/25 ml — reslizumab — A
- **Dupixent®** — 100, 200, 300 mg — dupilumab — A
- **Fasenra™** — 30 mg — benralizumab — A
- **Nucala®** — 100 mg — mepolizumab — A
- **Tezspire™** — 210 mg — tezepelumab-ekko — A
- **Xolair®** — 75 to 375 mg — omalizumab — A

## LEUKOTRIENE MODIFIERS

block chemicals called leukotrienes that cause airway inflammation; available as tablet or granules

- **Singulair®** — 4, 5, 10 mg — montelukast — A
- **Zafirlukast** — 10, 20 mg — zafirlukast — A
- **Zyflo CR®** — 600 mg — zileuton — A


- These are chemical messengers (signaling molecules) produced by leukocytes for inflammation and the immune response. They are produced/released in response to allergens or injury (stored in mast cells).

- There are leukotriene receptors on the bronchial smooth muscle cells as well as on the mucus glands.

# Histamine VS Leukotriene

- In the mechanism of allergic rhinitis, histamine is responsible for major allergic rhinitis symptoms such as rhinorrhea, nasal itching and sneezing. Its effect on nasal congestion is less evident. In contrast, leukotrienes result in increase in nasal airway resistance and vascular permeability.

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Review > Curr Allergy Asthma Rep. 2013 Apr;13(2):203-8. doi: 10.1007/s11882-013-0341-4.

## Role of leukotriene antagonists and antihistamines in the treatment of allergic rhinitis

Bengü Cobanoğlu [1], Elina Toskala, Ahmet Ural, Cemal Cingi

Affiliations + expand

PMID: 23389557 DOI: 10.1007/s11882-013-0341-4

### Abstract

Allergic rhinitis is the most common atopic disorder seen in ENT clinics. It is diagnosed by history, physical exam and objective testing. Patient education, environmental control measures, pharmacotherapy, and allergen-specific immunotherapy are the cornerstones of allergic rhinitis treatment and can significantly reduce the burden of disease. Current treatment guidelines include antihistamines, intranasal corticosteroids, oral and intranasal decongestants, intranasal anticholinergics, intranasal cromolyn, and leukotriene receptor antagonists. In the mechanism of allergic rhinitis, histamine is responsible for major allergic rhinitis symptoms such as rhinorrhea, nasal itching and sneezing. Its effect on nasal congestion is less evident. In contrast, leukotrienes result in increase in nasal airway resistance and vascular permeability. Antihistamines and leukotriene receptor antagonists are commonly used in the treatment of allergic rhinitis. The published literature about combined antihistamines and leukotriene antagonists in mono- or combination therapy is reviewed

# Functions of leukotrienes relevant to asthma pathogenesis

- **Bronchoconstriction** – CysLTs are the most powerful bronchoconstrictors known to exist.
- **Mucus secretion** – Studies of mucus secretion provide evidence that both LTC4 and LTD4 elicit the release of mucus from human bronchi.
- **Eosinophil and basophil recruitment** – Experimental inhalation of LTE4 by subjects with mild to moderate asthma results in sustained increases in eosinophils [92,93] and basophils [93] in induced sputum and bronchial biopsies. This response is attenuated by treatment with CysLT1R antagonists [94]

# MECHANISM

## LEUKOTRIENE RECEPTOR ANTAGONISTS

~ MONTELUKAST ~ ZAFIRLUKAST

BIND to & BLOCK LEUKOTRIENE RECEPTORS

## LEUKOTRIENE SYNTHESIS INHIBITORS

~ ZILEUTON

ENZYME that PRODUCES LEUKOTRIENES

## ↓ LEUKOTRIENE ACTION

↓ SMOOTH MUSCLE CONTRACTION in AIRWAYS

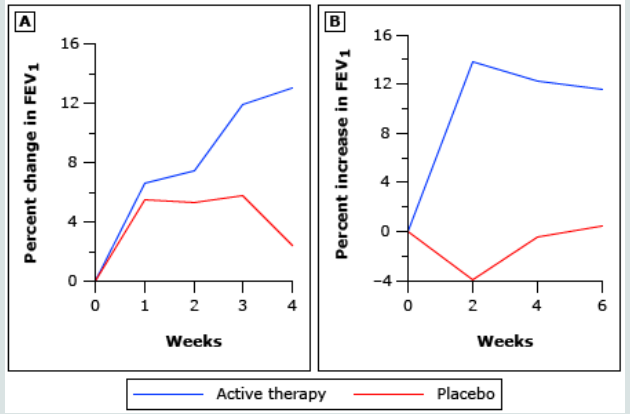
↓ MUCUS SECRETION

↓ INFLAMMATION

# Compared with placebo

- Antileukotriene agents can be effective as monotherapy in the treatment of mild-to-moderate persistent asthma.
- Each agent has been shown to be superior to placebo in the following outcome measures:

- Lung function (typically resulting in a 10 to 15 percent improvement in FEV1
- Daytime and nighttime asthma symptoms and asthma-specific quality of life
- Need for rescue beta-agonist therapy
- Frequency of asthma exacerbations



| Medication | Preparations | Infant and small child | Pediatric | Adolescent and adult |
|---|---|---|---|---|
| Montelukast | Granules: 4 mg per packet<br>Chewable tablets: 4 mg, 5 mg<br>Tablet: 10 mg | 12 months* to 5 years: 4 mg granules or chewable tablet once daily in evening | 6 to 14 years: 5 mg chewable tablet once daily in evening | ≥15 years and adult: 10 mg tablet once daily in evening |
| Zafirlukast¶ | Tablets: 10 mg, 20 mg | (Not studied) | 5 to 11 years: 10 mg twice per day | ≥12 years and adult: 20 mg twice per day |
| Zileuton¶ | Immediate-release tablet: 600 mg<br>Extended-release tablet: 600 mg | (Not studied) | (Not studied) | ≥12 years and adult:<br>▪ Immediate release: 600 mg four times per day<br>▪ Extended release: 1200 mg twice per day |

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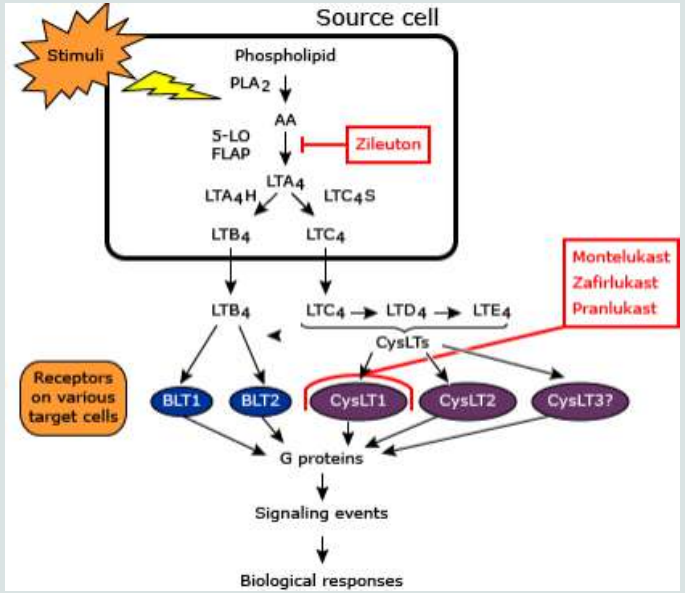
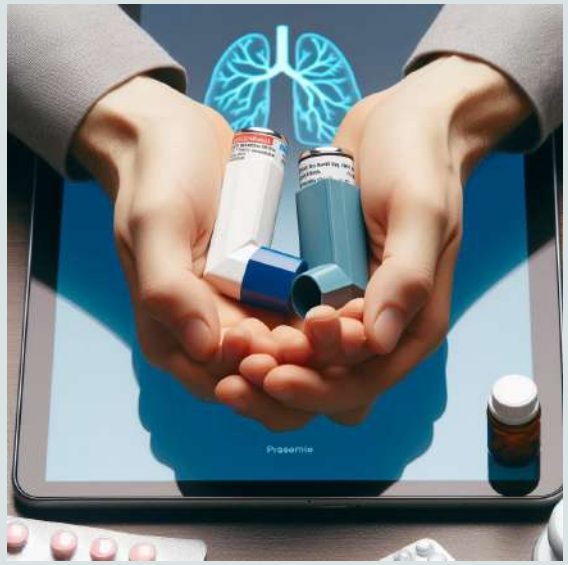





# Compared with inhaled glucocorticoids

- Leukotriene modifiers exert anti-inflammatory effects, such as reducing the numbers of circulating and sputum eosinophils and nonspecific bronchial hyperresponsiveness, however, **the magnitude of such anti-inflammatory effects is less than those of inhaled GCs.**
- In some trials, **inhaled GCs were superior in all endpoints** examined.



# “Real-world” benefits

- It is well known that patient adherence to inhaled GC is suboptimal, and most studies have demonstrated superior patient adherence to once-daily montelukast than to inhaled GC in both children and adults.
- It is also apparent that primary care clinicians tend to under-prescribe inhaled GCs.

- Validation was supported by a so-called "pragmatic" trial conducted in 306 patients managed in primary care practices, in which montelukast was demonstrated to be comparable to inhaled GC as a first-line controller therapy.

# Does addition of an antileukotriene improve asthma control in a patient whose control is inadequate on inhaled GC alone?

**YES**

- A systematic review and meta-analysis (four studies, 815 participants) found that the number of **exacerbations was reduced** with addition of an antileukotriene agent **(RR 0.50, 95% CI 0.29-0.86)** **(that means a 50% reduction)**
- **Addition of an antileukotriene** agent to inhaled GC -**VS- Increasing the dose** of the inhaled GC, a systematic review and meta-analysis (eight studies, 2008 participants) found **no difference** in lung function tests or in the number of participants with exacerbations requiring oral glucocorticoids.

# Does addition of an antileukotriene, in a patient with controlled asthma, allow control to be maintained despite reducing the dose of inhaled GC (ie, a steroid-sparing effect)?

**NO**

- A systematic review and meta-analysis (seven studies, 1150 adults and adolescents) found that adding an antileukotriene agent did not significantly improve the likelihood of success in tapering the inhaled GC dose.

# Exercise-induced symptoms – 6 years of age and older

- Antileukotriene agents are generally **highly protective** against exercise-induced bronchospasm (EIB).
- Montelukast can be particularly useful in young children with EIB, who exert themselves unpredictably throughout the day.
- Protection against EIB with montelukast is detectable as early as **two hours** after a single oral dose and persists for up to 24 hours.

# Montelukast: Most widely used leukotriene-modifying agent

- Selective leukotriene receptor antagonist
- **Indications**:
  - ❖ *Allergic Rhinitis*
  - ❖ *Prophylactic and Chronic Treatment of Asthma*
  - ❖ *Acute Prevention of Exercise-induced bronchoconstriction*
- Tablets, Chewable Tabs, Packets


Adults and children at least 15 yr:
10 mg once daily in the evening
Children 6 to 14 yr:
5 mg chewable tablet once daily in the evening
Children 2 to 5 yr:
4 mg chewable tablet once daily in the evening
Children 12 to 23 mo:
1 packet of 4 mg granules
MSD
28 Tablets
Calendar Pack
SINGULAIR
10mg Tablets
montelukast sodium
MSD
Paediatric
SINGULAIR
(Montelukast, MSD)
5 mg
14 Chewable Tablets
MSD
14 Tablets
SINGULAIR PAEDIATRIC
4mg Chewable Tablets
montelukast
14 Sachets
Paediatric
MSD
SINGULAIR
4mg GRANULES
(montelukast)
SINGULAIR PAEDIATRIC
GRANULES
montelukast (as sodium)

# Adverse Effects

- Montelukast and zafirlukast are generally well-tolerated. Zileuton is associated with more frequent adverse effects, including liver inflammation and drug interactions.
- **Montelukast:**

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1% to 10%:

Dermatologic: Atopic dermatitis (children: ≥2%), dermatitis (children: ≥2%), eczema (children: ≥2%), skin infection (children: ≥2%), skin rash (2%), urticaria (children: ≥2%)

Gastrointestinal: Abdominal pain (children: ≥2%), diarrhea (children and adolescents: ≥2%), dyspepsia (2%), gastroenteritis (2%), nausea (children and adolescents: ≥2%), tooth infection (children: ≥2%), toothache (adolescents and adults: 2%)

Genitourinary: Pyuria (adolescents and adults: 1%)

Hepatic: Increased serum alanine aminotransferase (adolescents and adults: ≥1%), increased serum aspartate aminotransferase (adolescents and adults: 2%)

Infection: Influenza (children and adolescents: ≥2%), varicella zoster infection (children: ≥2%), viral infection (children and adolescents: ≥2%)

Nervous system: Dizziness (adolescents and adults: 2%), fatigue (adolescents and adults: ≤2%), headache (children and adolescents: ≥2%)

Neuromuscular & skeletal: Asthenia (adolescents and adults: ≤2%)

Ophthalmic: Conjunctivitis (children: ≥2%), myopia (children: ≥2%)

Otic: Otalgia (children: ≥2%), otitis (children and adolescents: ≥2%), otitis media (children and adolescents: ≥2%)

Respiratory: Acute bronchitis (children: ≥2%), cough (3%), epistaxis (adolescents and adults: ≥1%), laryngitis (children and adolescents: ≥2%), nasal congestion (adolescents and adults: 2%), pharyngitis (children: ≥2%), pneumonia (children: ≥2%), rhinitis (infective; children: ≥2%), rhinorrhea (children: ≥2%), sinus headache (adolescents and adults: ≥1%), sinusitis (≥1%), upper respiratory tract infection (≥1%)

Miscellaneous: Fever (2%), trauma (adolescents and adults: 1%)

FDA NEWS RELEASE

# FDA Requires Stronger Warning About Risk of Neuropsychiatric Events Associated with Asthma and Allergy Medication Singulair and Generic Montelukast

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**For Immediate Release:** March 04, 2020

- These events have been noted in adults, teenagers, and younger patients. They include, among others: anxiety, depression, aggressiveness, agitation, attention and memory impairment, sleeping disorders (insomnia, somnambulism, dream anomalies), seizures, paresthesia, hypoesthesia, as well as suicidal thoughts and behavior.

# Neuropsychiatric Adverse Events – FDA Boxed Warning for information purposes

- JAMA Network 2022 "The association was mainly explained by an excess incidence of anxiety and insomnia in patients exposed to montelukast… because montelukast is prescribed to several million patients in the US each year, a small excess risk can be relevant at a population level."
- Incidence is unknown; officially in the monograph it is listed as <1%

- FDA Says… "Avoid prescribing for patients with mild symptoms, particularly those with allergic rhinitis" (FDA).

*JAMA NETW OPEN.* 2022;5(5):E2213643. DOI:10.1001/JAMANETWORKOPEN.2022.13643

# Neuropsychiatric Effect is Controversial

- 2022 meta-analysis showed no significant association between LTRA and neuropsychiatric entities.

# Crossing the Blood Brain Barrier

- Leukotrienes contribute to neurodegenerative disease including Alzheimer's, where they mediate neuroinflammation and neuronal cell death.
- New research suggests leukotriene inhibitors could alleviate AD pathology and improve cognition in animal models.
- A study in 2021 suggested a slower decline in AD dementia associated with the use of Montelukast.

Alzheimer's Research & Therapy

Home About Articles Submission Guidelines Submit manuscript

Research | Open access | Published: 03 September 2021

**Leukotriene receptor antagonist use and cognitive decline in normal cognition, mild cognitive impairment, and Alzheimer's dementia**

Lisa Y. Xiong, Michael Ouk, Che-Yuan Wu, Jennifer S. Rabin, Krista L. Lanctôt, Nathan Herrmann, Sandra E. Black, Jodi D. Edwards & Walter Swardfager

*Alzheimer's Research & Therapy* **13**, Article number: 147 (2021) | Cite this article

**4383** Accesses | **11** Citations | **12** Altmetric | Metrics

# 2024 Respiratory Treatments

Allergy & Asthma Network

800.878.4403 • AllergyAsthmaNetwork.org

Allergy & Asthma Network is a national nonprofit organization dedicated to ending needless death and suffering due to asthma, allergies and related conditions through outreach, education, advocacy and research.

American College of Allergy, Asthma & Immunology

VIATRIS

Theravance Biopharma

DOSE INDICATOR
G- GENERIC AVAILABLE
N- NEBULIZER VIAL
DISEASE STATES:
A- ASTHMA
C- COPD

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## BIOLOGICS

target cells and pathways that cause airway inflammation; delivered by injection or IV

- **Cinqair®** — 62.5/25 mL — reslizumab — A
- **Dupixent®** — 100, 200, 300 mg — dupilumab — A
- **Fasenra™** — 30 mg — benralizumab — A
- **Nucala®** — 100 mg — mepolizumab — A
- **Tezspire™** — 210 mg — tezepelumab-ekko — A
- **Xolair®** — 75 to 375 mg — omalizumab — A

## LEUKOTRIENE MODIFIERS

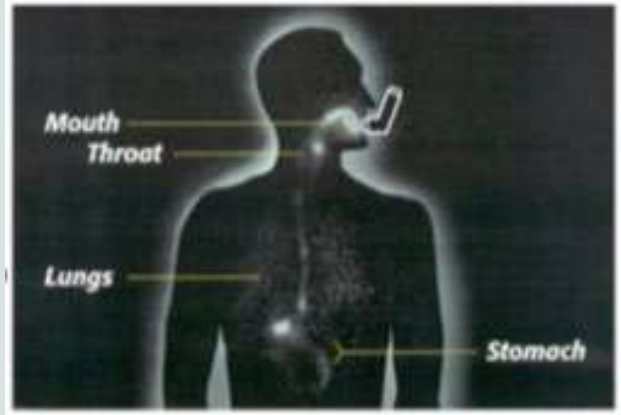
block chemicals called leukotrienes that cause airway inflammation; available as tablet or granules

- **Singulair®** — 4, 5, 10 mg — montelukast — A
- **Zafirlukast** — 10, 20 mg — zafirlukast — A
- **Zyflo CR®** — 600 mg — zileuton — A

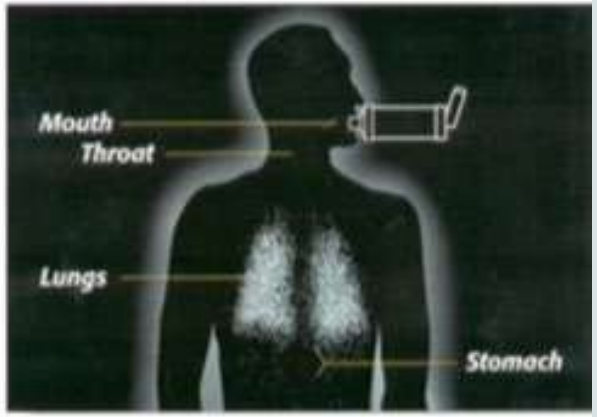
Reviewed by Dennis Williams, PharmD

Generic versions of some brand name inhalers are not included on this poster. Generic inhalers may be a different color.

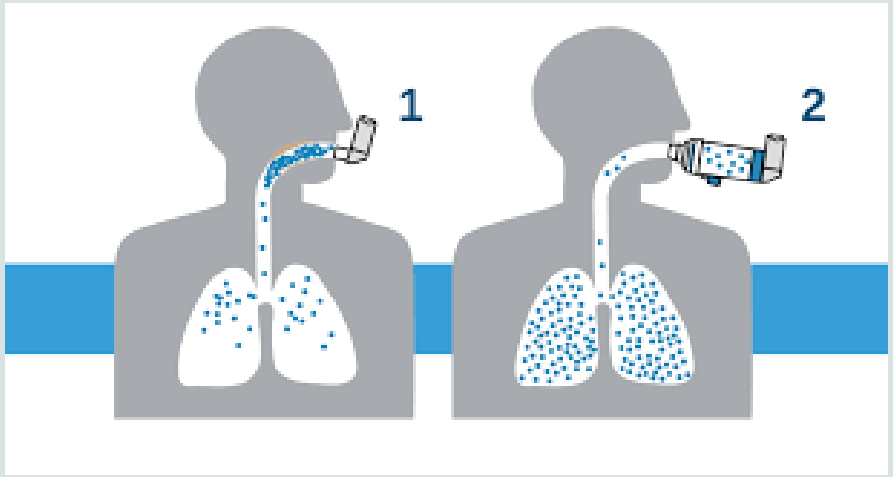
# Why use a Spacer with an Inhaler




Inhaler alone



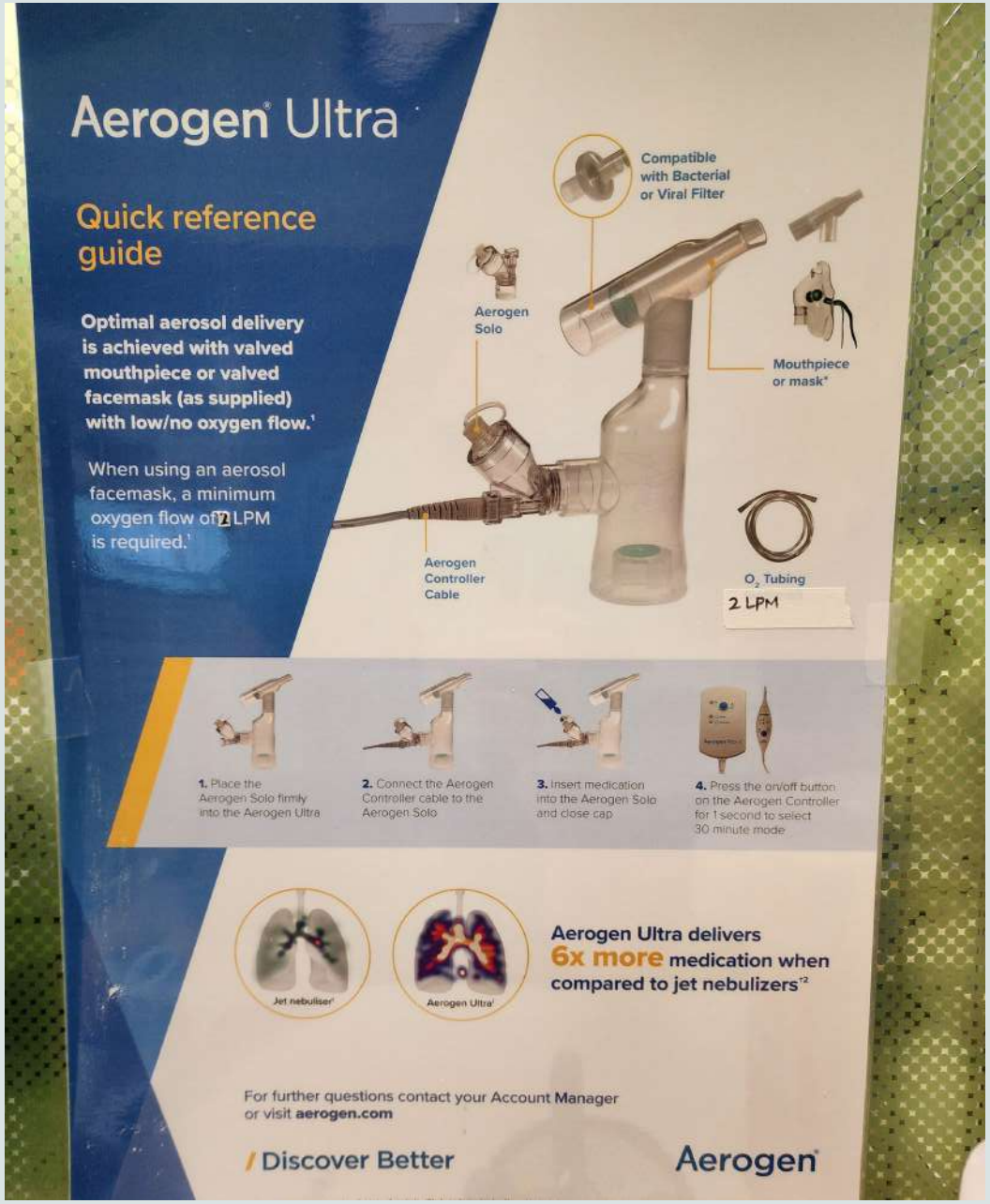

Inhaler used with spacer device


# “Nebulizer Gun”

# Aerogen Ultra

- 7.5 mg of albuterol compared to 20 mg in a traditional nebulizer




Sponsored

Portable Nebulizer - Rechargeable Nebulizer Machine for Adults and Kids, Ultrasonic Mesh Nebulizer with Two Modes & Self-Cleaning Function for Breathing Problems, FSA and HSA Eligible

4.5 out of 5 stars 1,875

$39.99 ($39.99/Count) Typical price: $49.99

FSA or HSA eligible

Save 10% with coupon

prime Same-Day

FREE delivery **Today 2 PM - 6 PM**

Nebulizer for Kids, Ultrasonic Mesh Nebulizer with Auto-Clean, Portable Nebulizer Machine for Adults, Handheld Nebulizer of Cool Mist for Breathing Problems, for Home, Office, Travel,White

4.5 out of 5 stars 20

900+ bought in past month

Limited time deal

$26.99 Typical: $29.99

Save $4.00 with coupon

prime One-Day

FREE delivery **Tomorrow, Jan 28**

UNOSEKS Nebulizer Machine with 1 Set of Kits for Breathing Problems, Adjustable Amount for Adults and Kids, Effective Nebulizer for Home use or Travel

4.5 out of 5 stars 334

$34.99 ($34.99/Count) List: $44.99

FSA or HSA eligible

$33.24 with Subscribe & Save discount

prime Same-Day

FREE delivery **Today 2 PM - 6 PM**

More Buying Choices

$32.98 (2 used & new offers)

# Tips from a respiratory therapist:


## Order of med administration

*Parents bring their child to the ED with an exacerbation explaining that they have been giving the Flovent a bunch (or Symbicort, Advair as they get older) as their child has been getting sicker.*

*2018: five rescue inhalers. Some follow the traditional color coding system. Some do not.*

*ProAir HFA is red*

*ProAir Respiclick is white with a red cap and lettering*

*Proventil HFA is yellow with an orange cap*

*Ventolin is blue with a dark blue cap*

# Tips from a respiratory therapist:

## How much albuterol can a child use?

- The short answer is “as much as they need”
- A continuous neb treatment is equivalent to about 24 puffs of albuterol
- Tachycardia? – Heart Rate will surely be at 220, don’t worry.

  *Normal Heart Rate in a 4-year-old is 80-120 bmp*

  *Asthma exacerbation leads to tachypnea and anxiety. They may be at 200 bpm before albuterol even starts.*

  *Xopenex? – (Side conversation) – Levalbuterol is not magic (still a beta-agonist).*

# Rule of 4 – ALBUTEROL

- Start with **4 PUFFS** – (good starting dose for anyone of any age)
- **4 BREATHS** between each puff
- It's going to work in roughly **4 MINUTES**
- It'll last roughly **4 HOURS**
- If symptoms persist then **REPEAT**. If no improvement after 8 puffs call an **ambulance.**

HTTPS://WWW.NATIONALASTHMA.ORG.AU/ASTHMA-FIRST-AID

National Asthma Council AUSTRALIA

## FIRST AID FOR ASTHMA
AGES 12+

### USE BLUE/GREY PUFFER (E.G. ASMOL, VENTOLIN, ZEMPREON)
Use person's own reliever inhaler, if possible. If not, use blue/grey puffer from first aid kit or borrow one.

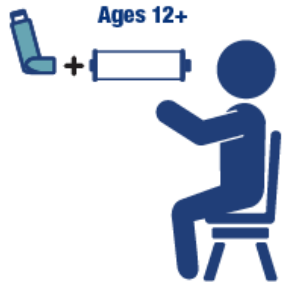
1. **Sit the person comfortably upright.**
   Stay calm and reassure them.
2. **Give 4 puffs of blue/grey puffer**
   How to do this:
   Add 1 puff into spacer – person takes 4 breaths in and out of spacer.
   Repeat until 4 puffs have been given.
   See instructions below: **How to use a blue/grey puffer with spacer**
3. **Wait 4 minutes.** Stay with person – watch carefully and reassure them. Call 000 for an ambulance **at any time** if you need to. Say that someone is having an asthma attack.
4. **After 4 minutes.**

**Worse or no better?**
If getting worse or severe breathing problem, **call 000** for ambulance **NOW.**
**Keep giving 4 puffs every 4 minutes until ambulance arrives.**
(Give 4 separate puffs, 4 breaths with each puff.)

**Still hard to breathe?**
If the person still cannot breathe normally, **give 4 more puffs.**
If still cannot breathe normally within a few minutes, **call 000.**
**Keep giving 4 puffs every 4 minutes until ambulance arrives.**
(Give 4 separate puffs, 4 breaths with each puff.)

**Breathing normally?**
If the person feels better and is breathing normally, get them to a doctor for a check-up.

### HOW TO USE A BLUE/GREY PUFFER WITH SPACER
- Remove puffer cap and shake puffer.
- Insert puffer upright into spacer.
- Put mouthpiece of spacer between person's teeth and seal lips around it.
- Press once firmly on puffer to release one puff into spacer.
- Get them to take 4 breaths in and out of spacer.
- Repeat, 1 puff at a time, until 4 puffs taken.
- Replace cap on puffer.




**Signs that someone is having an asthma attack (any of these):** Sudden shortness of breath, can't talk normally, cough, chest tightness or wheezing.

**Not sure it's asthma?**
If a person stays conscious and their main problem seems to be breathing, use blue/grey reliever puffer and call ambulance on 000. This medicine is unlikely to harm them even if they do not have asthma.

**Severe allergic reactions/ anaphylaxis** If someone is allergic to foods, insect stings or medicines **AND** they have sudden breathing problems (e.g. cough, wheeze, hoarse voice):
Give adrenaline **first.**
Use their own autoinjector (e.g. EpiPen, Anapen) if available. Do this even if there are no other signs of an allergic reaction – see below.
**Then** give asthma reliever puffer by following the 4 steps shown here.
**CALL AMBULANCE (000)**

**If someone is unconscious, start life support.** Scan code for ANZCOR Basic Life Support Flowchart

**If you need an interpreter,** call 131 450

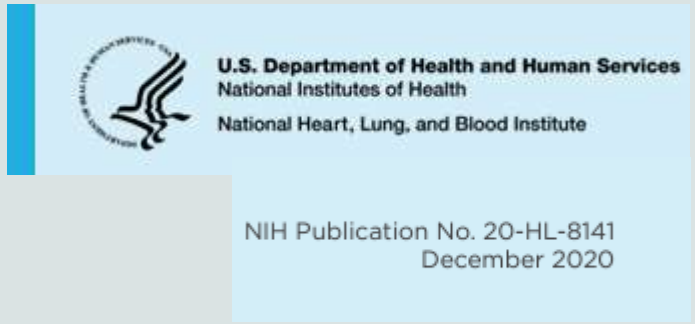
# Tips from a respiratory therapist:

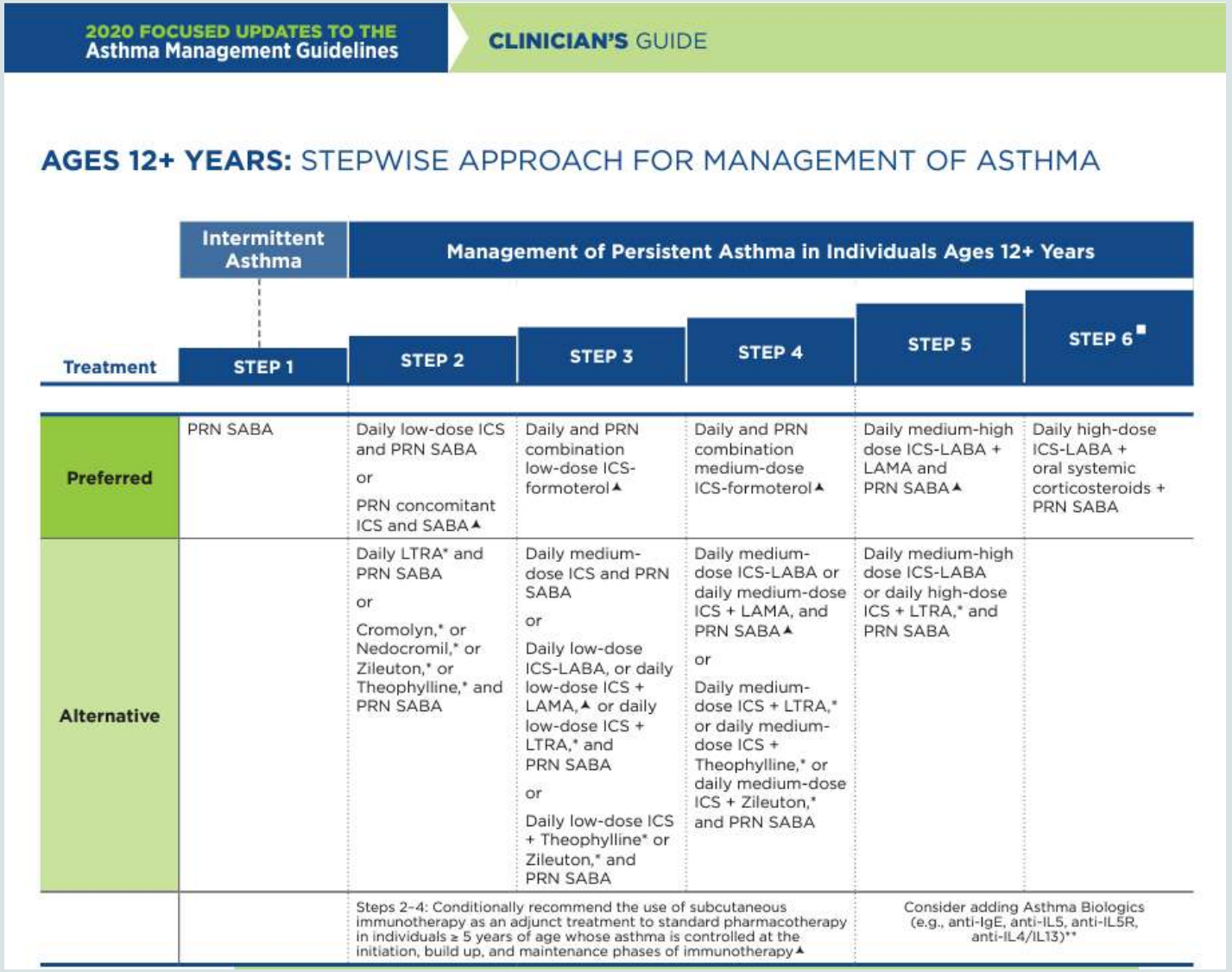
## Dexamethasone tablets may be better tolerated (ED)

- Liquid steroids are very bitter and may be hard to find.


# Initial asthma treatment in adults and adolescents

- There are differing guidelines out there. For example:

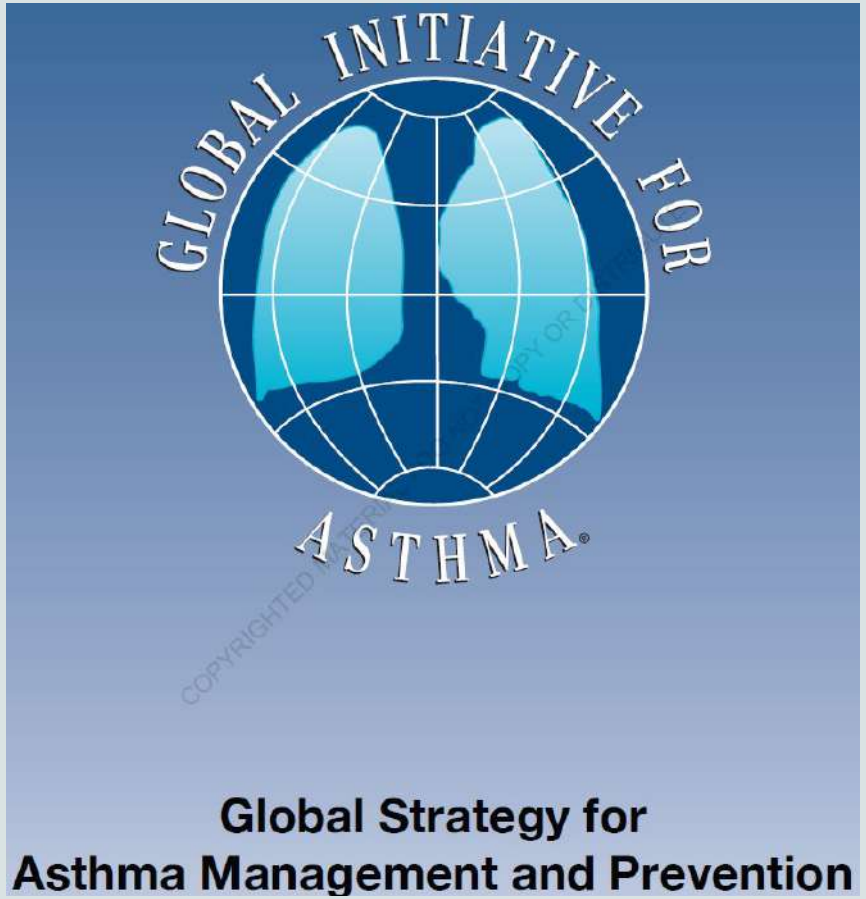


# GINA

- 246 pages to answer all your questions

| | |
|---|---|
| **Anti-inflammatory reliever (AIR)** | Reliever inhaler that contains both a low-dose ICS and a rapid-acting bronchodilator |
| **Maintenance-and-reliever therapy (MART)** | Treatment regimen in which the patient uses an ICS-formoterol inhaler every day (maintenance dose), and also uses the same medication as needed for relief of asthma symptoms (reliever doses) |



**Box 3-7. Selecting initial treatment in adults and adolescents with a diagnosis of asthma**

# GINA 2023 – STARTING TREATMENT
## in adults and adolescents with a diagnosis of asthma

*Track 1 using ICS-formoterol reliever is preferred because it reduces the risk of severe exacerbations, compared with using SABA reliever, and it is simpler for patients as it uses the same medication for reliever and maintenance treatment.*


**FIRST ASSESS:**

- Confirm diagnosis
- Symptom control and modifiable risk factors
- Comorbidities
- Inhaler technique and adherence
- Patient preferences and goals

**START HERE IF:**

**TRACK 1: PREFERRED CONTROLLER and RELIEVER**
Using ICS-formoterol as the reliever* reduces the risk of exacerbations compared with using a SABA reliever, and is a simpler regimen

| Symptoms less than 4–5 days a week | Symptoms most days, or waking with asthma once a week or more | Daily symptoms, or waking with asthma once a week or more, and low lung function |
|---|---|---|
| **STEPS 1–2**<br>As-needed-only low dose ICS-formoterol* | **STEP 3**<br>Low dose maintenance ICS-formoterol | **STEP 4**<br>Medium dose maintenance ICS-formoterol |
| | | **STEP 5**<br>Add-on LAMA<br>Refer for phenotypic assessment ± biologic therapy<br>Consider high dose ICS-formoterol |

*Short course OCS may also be needed for patients presenting with severely uncontrolled asthma*

RELIEVER: As-needed low-dose ICS-formoterol*

**START HERE IF:**

**TRACK 2: Alternative CONTROLLER and RELIEVER**
Before considering a regimen with SABA reliever, check if the patient is likely to adhere to daily controller treatment

| Symptoms less than twice a month | Symptoms twice a month or more, but less than 4–5 days a week | Symptoms most days, or waking with asthma once a week or more | Daily symptoms, or waking with asthma once a week or more, and low lung function |
|---|---|---|---|
| **STEP 1**<br>Take ICS whenever SABA taken* | **STEP 2**<br>Low dose maintenance ICS | **STEP 3**<br>Low dose maintenance ICS-LABA | **STEP 4**<br>Medium/high dose maintenance ICS-LABA |
| | | | **STEP 5**<br>Add-on LAMA<br>Refer for phenotypic assessment ± biologic therapy<br>Consider high dose ICS-LABA |

*Short course OCS may also be needed for patients presenting with severely uncontrolled asthma*

RELIEVER: As-needed SABA, or as-needed ICS-SABA*

*Anti-inflammatory relievers (AIR)

| *Other controller options (limited indications, or less evidence for efficacy or safety – see text)* | *Low dose ICS whenever SABA taken*, or daily LTRA, or add HDM SLIT* | *Medium dose ICS, or add LTRA, or add HDM SLIT* | *Add LAMA or LTRA or HDM SLIT, or switch to high dose ICS* | *Add azithromycin (adults) or LTRA. As last resort consider adding low dose OCS but consider side-effects* |
|---|---|---|---|---|



See list of abbreviations (p.10).

## GINA 2023 – Adults and adolescents
## Track 1

Maintenance and reliever therapy (MART) with ICS-formoterol

As-needed-only ICS-formoterol ('AIR-only')

**TRACK 1: PREFERRED CONTROLLER and RELIEVER**
Using ICS-formoterol as the reliever* reduces the risk of exacerbations compared with using a SABA reliever, and is a simpler regimen

**STEPS 1 – 2**
As-needed-only low dose ICS-formoterol*

**STEP 3**
Low dose maintenance ICS-formoterol*

**STEP 4**
Medium dose maintenance ICS-formoterol

**STEP 5**
Add-on LAMA
Refer for assessment of phenotype. Consider high dose maintenance ICS-formoterol, ± anti-IgE, anti-IL5/5R, anti-IL4Rα, anti-TSLP

RELIEVER: As-needed low-dose ICS-formoterol*

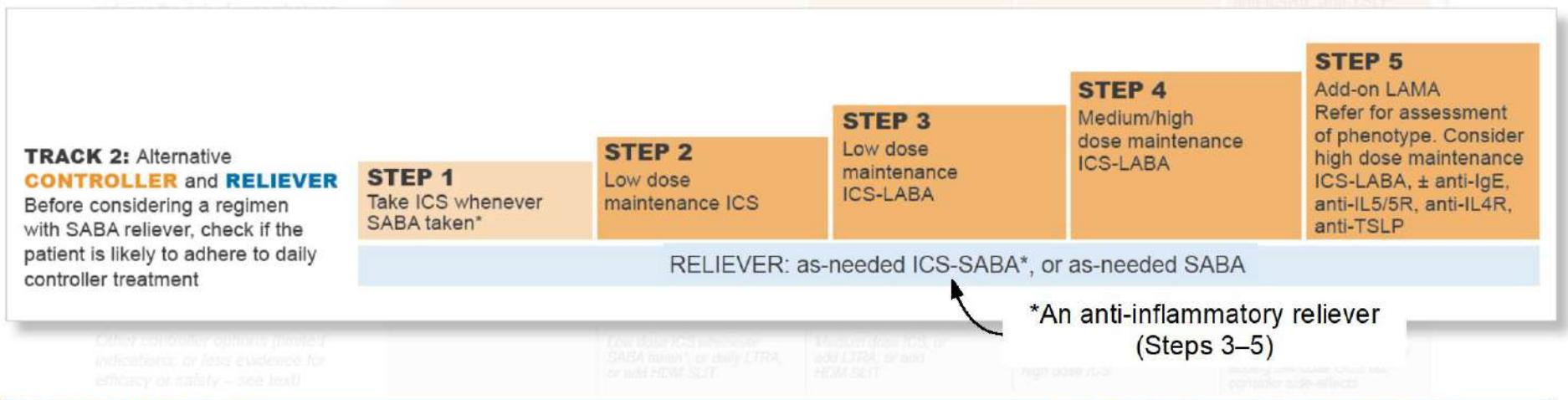
*An anti-inflammatory reliever (AIR)

**Breyna™**
80/4.5, 160/45 mcg
*Budesonide and formoterol fumarate dihydrate (approved generic of Symbicort)*
123 A C

**Dulera®**
50/5, 100/5, 200/5 mcg
*mometasone furoate and formoterol fumarate dihydrate*
123 A


**Symbicort®**
80/4.5, 160/4.5 mcg
*budesonide and formoterol fumarate dihydrate*
123 A C G

## GINA 2023 – Adults and adolescents
## Track 2




Box 3-12 (3/4) Track 2

## GINA 2023 – Adults and adolescents

12+ years

| | | | | | |
|---|---|---|---|---|---|
| *Other controller options (limited indications, or less evidence for efficacy or safety – see text)* | | *Low dose ICS whenever SABA taken*, or daily LTRA, or add HDM SLIT* | *Medium dose ICS, or add LTRA, or add HDM SLIT* | *Add LAMA or LTRA or HDM SLIT, or switch to high dose ICS* | *Add azithromycin (adults) or LTRA. As last resort consider adding low dose OCS but consider side-effects* |

# Terminology

- Reliever
  - For symptom relief, or before exercise or allergen exposure
- Controller
  - Function: targets both domains of asthma control (symptom control and future risk)
  - Mostly used for ICS-containing treatment
- Maintenance treatment
  - Frequency: regularly scheduled, e.g. twice daily

ICS: inhaled corticosteroid; SABA: short-acting beta$_2$-agonist

# Terminology

- **A**nti-**I**nflammatory **R**eliever = **AIR**
  - e.g. ICS-formoterol, ICS-SABA
  - Provides rapid symptom relief, plus a small dose of ICS
  - Reduces the risk of exacerbations, compared with using a SABA reliever

**Regimens with ICS-formoterol anti-inflammatory reliever**

- As-needed-only ICS-formoterol = **AIR-only**
  - The patient takes low-dose ICS-formoterol whenever needed for symptom relief
- **M**aintenance **A**nd **R**eliever **T**herapy with ICS-formoterol = **MART**
  - A low dose of ICS-formoterol is used as the patient's maintenance treatment, plus whenever needed for symptom relief
- ICS-formoterol can also be used before exercise or allergen exposure

ICS: inhaled corticosteroid: SABA: short-acting beta$_2$-agonist; MART is sometimes also called SMART

# A reminder – a key change in asthma management

EDITORIAL
GINA 2019

## GINA 2019: a fundamental change in asthma management

Treatment of asthma with short-acting bronchodilators alone is no longer recommended for adults and adolescents

Helen K. Reddel[1], J. Mark FitzGerald[2], Eric D. Bateman[3], Leonard B. Bacharier[4], Allan Becker[5], Guy Brusselle[6], Roland Buhl[7], Alvaro A. Cruz[8], Louise Fleming[9], Hiromasa Inoue[10], Fanny Wai-san Ko[11], Jerry A. Krishnan[12], Mark L. Levy[13], Jiangtao Lin[14], Søren E. Pedersen[15], Aziz Sheikh[16], Arzu Yorgancioglu[17] and Louis-Philippe Boulet[18]


**Overuse = 3 or more canisters per year**

# GINA 2019 – landmark changes in asthma management

- For safety, GINA no longer recommends SABA-only treatment for Step 1 in adults and adolescents
  - This decision was based on evidence that SABA-only treatment increases the risk of severe exacerbations, and that adding any ICS significantly reduces the risk
- GINA now recommends that all adults and adolescents with asthma should receive ICS-containing controller treatment, to reduce the risk of serious exacerbations
  - The ICS can be delivered by regular daily treatment or, in mild asthma, by as-needed low dose ICS-formoterol
- This is a population-level risk reduction strategy
  - Other examples: statins, anti-hypertensives
  - The aim is to reduce the probability of serious adverse outcomes at a population level
  - Individual patients may not necessarily experience (or be aware of) short-term clinical benefit

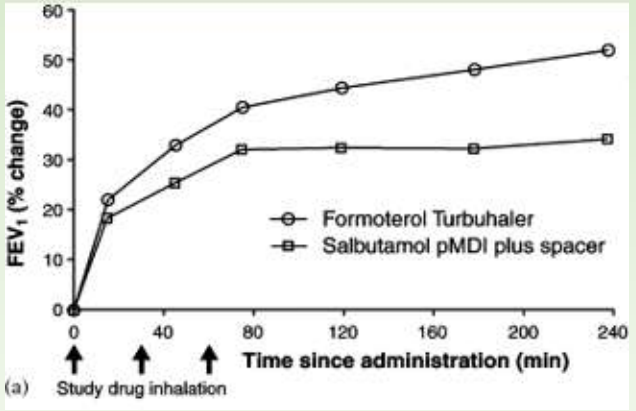
ICS: inhaled corticosteroids; SABA: short-acting beta$_2$-agonist

(SALBUTAMOL is ALBUTEROL in England)

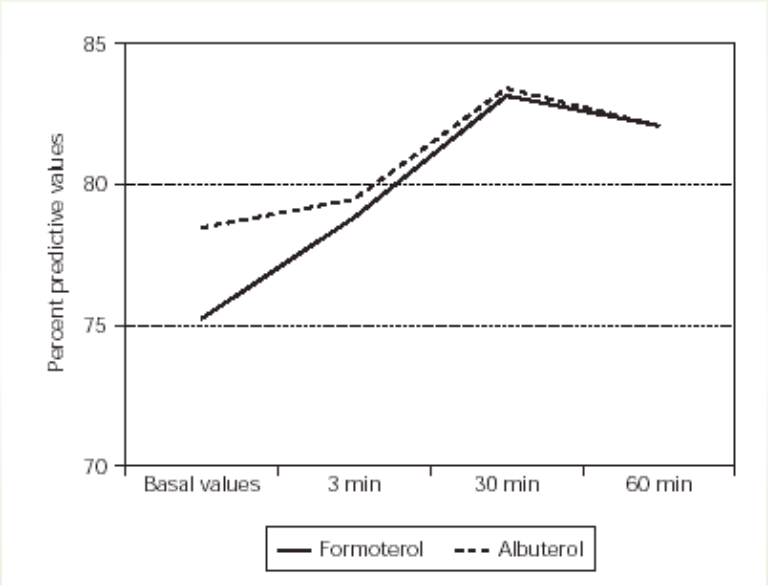
**A comparison of the onset of action of salbutamol and formoterol in reversing methacholine-induced bronchoconstriction**
**Respir Med.** 1998 Dec;92(12):1346-51. doi: 10.1016/s0954-6111(98)90140-8

## Abstract


- This single-centre, randomized, double-blind, double-dummy four-way cross-over study in 24 moderately severe asthmatic patients **compared the speed of onset of recommended doses of salbutamol (200 micrograms) and formoterol** (12 micrograms) delivered by metered-dose inhaler in reversing the bronchoconstriction induced by a cumulative dose of methacholine to produce a 20% decrease (PD20) in forced expiratory volume in 1 s (FEV1)… Specific airway conductance (SGAW) and airway resistance (RAW) were measured… There was no significant difference between the maximum values of SGAW after the two drugs. Changes in RAW and FEV1 reflected the differences in SGAW. **It was concluded that in methacholine-induced bronchoconstriction both formoterol and salbutamol have a very fast onset of action, achieving prechallenge values of SGAW within 3 min, salbutamol being slightly faster than formoterol.**


https://www.sciencedirect.com/science/article/pii/S0954611103001392




**Albuterol and Formoterol work quickly = 3 minutes**

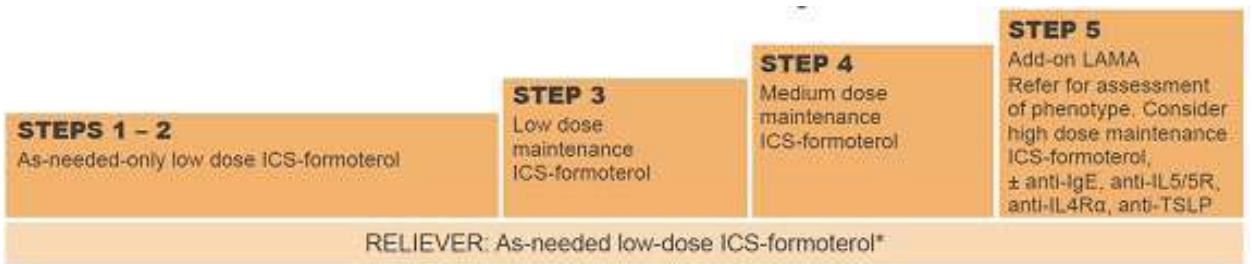
https://www.elsevier.es/en-revista-allergologia-et-immunopathologia-105-articulo-formoterol-vs-albuterol-administered-via-13057765#:~:text=Background:%20Formoterol%20is%20a%20new,duration%20of%20approximately%206%20hours.

| Step | Age (years) | Medication and device (check patient can use inhaler) | Metered dose (mcg/inhalation) | Delivered dose (mcg/inhalation) | Dosage |
|---|---|---|---|---|---|
| Steps 1–2 (AIR-only) | 6–11 | (No evidence) | - | - | - |
| | 12–17 ≥18 | Budesonide-formoterol DPI | 200/6 | 160/4.5 | **1 inhalation whenever needed** |
| Step 3 MART | 6–11 | Budesonide-formoterol DPI | 100/6 | 80/4.5 | **1 inhalation once daily**, PLUS 1 inhalation whenever needed |
| | 12–17 ≥18 | Budesonide-formoterol DPI | 200/6 | 160/4.5 | **1 inhalation once or twice daily,** PLUS 1 inhalation whenever needed |
| | ≥18 | BDP-formoterol pMDI | 100/6 | 84.6/5.0 | |
| Step 4 MART | 6–11 | Budesonide-formoterol DPI | 100/6 | 80/4.5 | **1 inhalation twice daily**, PLUS 1 inhalation whenever needed |
| | 12–17 ≥18 | Budesonide-formoterol DPI | 200/6 | 160/4.5 | **2 inhalations twice daily**, PLUS 1 inhalation whenever needed |
| | ≥18 | BDP-formoterol pMDI | 100/6 | 84.6/5.0 | |
| Step 5 MART | 6–11 | (No evidence) | - | - | - |
| | 12–17 ≥18 | Budesonide-formoterol DPI | 200/6 | 160/4.5 | **2 inhalations twice daily**, PLUS 1 inhalation whenever needed |
| | ≥18 | BDP-formoterol pMDI | 100/6 | 84.6/5.0 | |


*DPI: dry powder inhaler; pMDI: pressurized metered dose inhaler. For budesonide-formoterol pMDI with 3 mcg [2.25 mcg] formoterol, use double number of puffs*

GINA 2023 from Box 3-15





# Adults

# Children

**Daily doses in this table are shown as metered doses. See product information for delivered doses.**

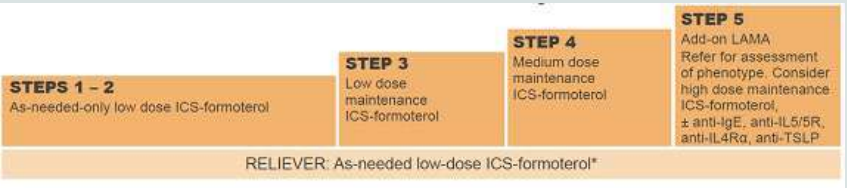
| Adults and adolescents (12 years and older) | | | |
|---|---|---|---|
| **Inhaled corticosteroid (alone or in combination with LABA)** | **Total daily ICS dose (mcg) – see notes above** | | |
| | **Low** | **Medium** | **High** |
| Beclometasone dipropionate (pMDI, standard particle, HFA) | 200–500 | >500–1000 | >1000 |
| Beclometasone dipropionate (DPI or pMDI, extrafine particle, HFA) | 100–200 | >200–400 | >400 |
| Budesonide (DPI, or pMDI, standard particle, HFA) | 200–400 | >400–800 | >800 |
| Ciclesonide (pMDI, extrafine particle, HFA) | 80–160 | >160–320 | >320 |
| Fluticasone furoate (DPI) | 100 | | 200 |
| Fluticasone propionate (DPI) | 100–250 | >250–500 | >500 |
| Fluticasone propionate (pMDI, standard particle, HFA) | 100–250 | >250–500 | >500 |
| Mometasone furoate (DPI) | Depends on DPI device – see product information | | |
| Mometasone furoate (pMDI, standard particle, HFA) | 200–400 | | >400 |
| **Children 6–11 years – see notes above** (for children 5 years and younger, see Box 6-7, p.184) | | | |
| Beclometasone dipropionate (pMDI, standard particle, HFA) | 100–200 | >200–400 | >400 |
| Beclometasone dipropionate (pMDI, extrafine particle, HFA) | 50–100 | >100–200 | >200 |
| Budesonide (DPI, or pMDI, standard particle, HFA) | 100–200 | >200–400 | >400 |
| Budesonide (nebules) | 250–500 | >500–1000 | >1000 |
| Ciclesonide (pMDI, extrafine particle*, HFA) | 80 | >80–160 | >160 |
| Fluticasone furoate (DPI) | 50 | | n.a. |
| Fluticasone propionate (DPI) | 50–100 | >100–200 | >200 |
| Fluticasone propionate (pMDI, standard particle, HFA) | 50–100 | >100–200 | >200 |
| Mometasone furoate (pMDI, standard particle, HFA) | 100 | | 200 |

See list of abbreviations (p.10). ICS by pMDI should preferably be used with a spacer.






Not for young patients

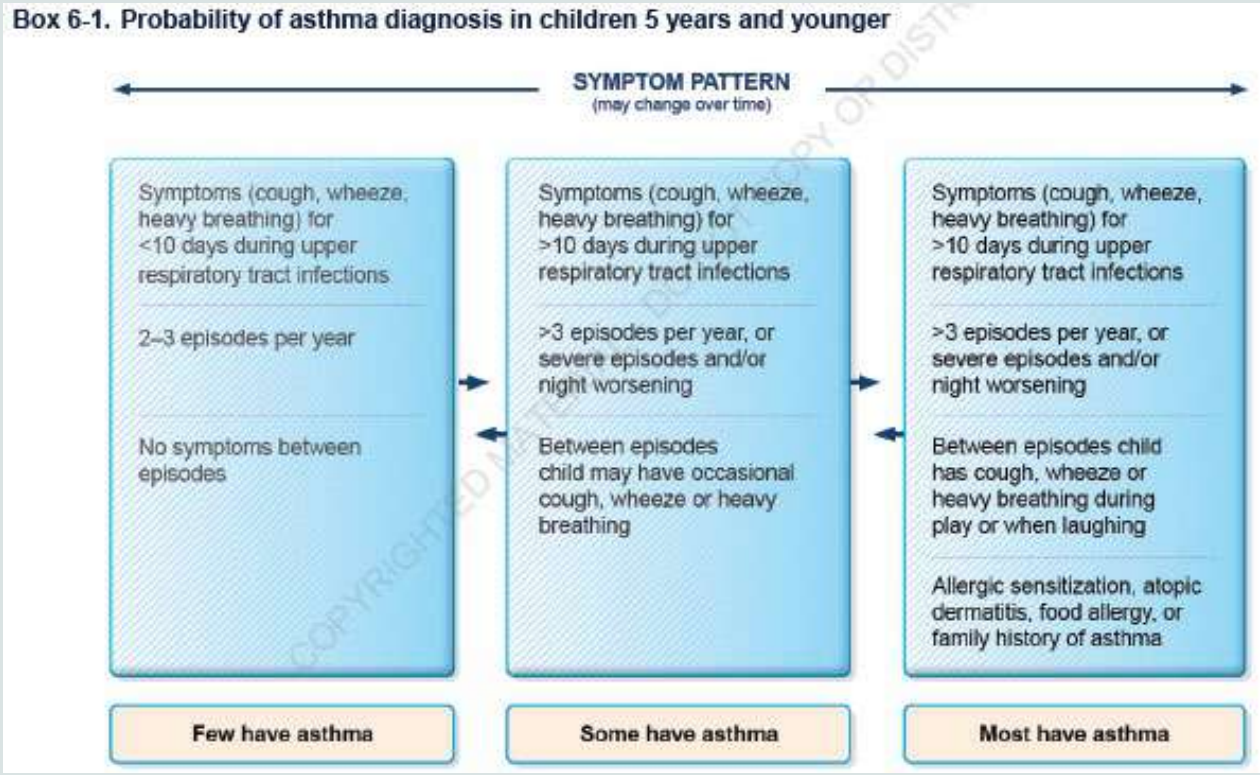


# Asthma in Children – 5 years and younger

- Wheezing with viral infections may occur 6-8 times per year
- 2 out of 3 children with recurrent wheeze aged 1-5 don't have asthma at age 6
- Any controller treatment should be viewed as a trial.
- **INITIAL TREATMENT:**

  *SABA (albuterol)* every 4-6 hours until symptoms resolve 1-7 days
- **SUSPECTED ASTHMA**:

  Controller Treatment



# 5 and Younger

**Box 6-6. Personalized management of asthma in children 5 years and younger**

## GINA 2023 – Children 5 years and younger

**Personalized asthma management:**
Assess, Adjust, Review response


*Exclude alternative diagnoses*
*Symptom control & modifiable risk factors*
*Comorbidities*
*Inhaler technique & adherence*
*Caregiver preferences and goals*

*Symptoms*
*Exacerbations*
*Side-effects*
*Risk factors*
*Comorbidities*
*Caregiver satisfaction*

*Treat modifiable risk factors and comorbidities*
*Non-pharmacological strategies*
*Asthma medications*
*Education & skills training*

**Asthma medication options:**
Adjust treatment up and down for individual child's needs

| | STEP 1 | STEP 2 | STEP 3 | STEP 4 |
|---|---|---|---|---|
| **PREFERRED CONTROLLER CHOICE** | *(Insufficient evidence for daily controller)* | Daily low dose inhaled corticosteroid (ICS) (see table of ICS dose ranges for pre-school children) | Double 'low dose' ICS *(See Box 6-7)* | Continue controller & refer for specialist assessment |
| *Other controller options (limited indications, or less evidence for efficacy or safety)* | *Consider intermittent short course ICS at onset of viral illness* | *Daily leukotriene receptor antagonist (LTRA), or intermittent short course of ICS at onset of respiratory illness* | *Low dose ICS + LTRA Consider specialist referral* | *Add LTRA, or increase ICS frequency, or add intermittent ICS* |
| **RELIEVER** | As-needed short-acting beta$_2$-agonist | | | |
| **CONSIDER THIS STEP FOR CHILDREN WITH:** | Infrequent viral wheezing and no or few interval symptoms | Symptom pattern not consistent with asthma but wheezing episodes requiring SABA occur frequently, e.g. ≥3 per year. Give diagnostic trial for 3 months. Consider specialist referral.<br>Symptom pattern consistent with asthma, and asthma symptoms not well-controlled or ≥3 exacerbations per year. | Asthma diagnosis, and asthma not well-controlled on low dose ICS<br>Before stepping up, check for alternative diagnosis, check inhaler skills, review adherence and exposures | Asthma not well-controlled on double ICS |



See list of abbreviations (p.10). For ICS doses in children, see Box 6-7, p.184

# What is "Low Dose"?

**Box 6-7. Low daily doses of inhaled corticosteroids for children 5 years and younger**

***This is not a table of equivalence***, but instead, suggestions for 'low' total daily doses for the ICS treatment recommendations for children aged 5 years and younger in Box 6-6 (p.183), based on available studies and product information. Data on comparative potency are not readily available, particularly for children, and this table does NOT imply potency equivalence. The doses listed here are the lowest approved doses for which safety and effectiveness have been adequately studied in this age group.

**Low-dose ICS** provides most of the clinical benefit for most children with asthma. Higher doses are associated with an increased risk of local and systemic side-effects, which must be balanced against potential benefits.

| Inhaled corticosteroid | Low total daily dose (mcg) (age-group with adequate safety and effectiveness data) |
|---|---|
| BDP (pMDI, standard particle, HFA) | 100 (ages 5 years and older) |
| BDP (pMDI, extrafine particle, HFA) | 50 (ages 5 years and older) |
| Budesonide nebulized | 500 (ages 1 year and older) |
| Fluticasone propionate (pMDI, standard particle, HFA) | 50 (ages 4 years and older) |
| Fluticasone furoate (DPI) | Not sufficiently studied in children 5 years and younger) |
| Mometasone furoate (pMDI, standard particle, HFA) | 100 (ages 5 years and older) |
| Ciclesonide (pMDI, extrafine particle, HFA) | Not sufficiently studied in children 5 years and younger |

BDP : beclometasone dipropionate. For other abbreviations see p.10. In children, pMDI should always be used with a spacer

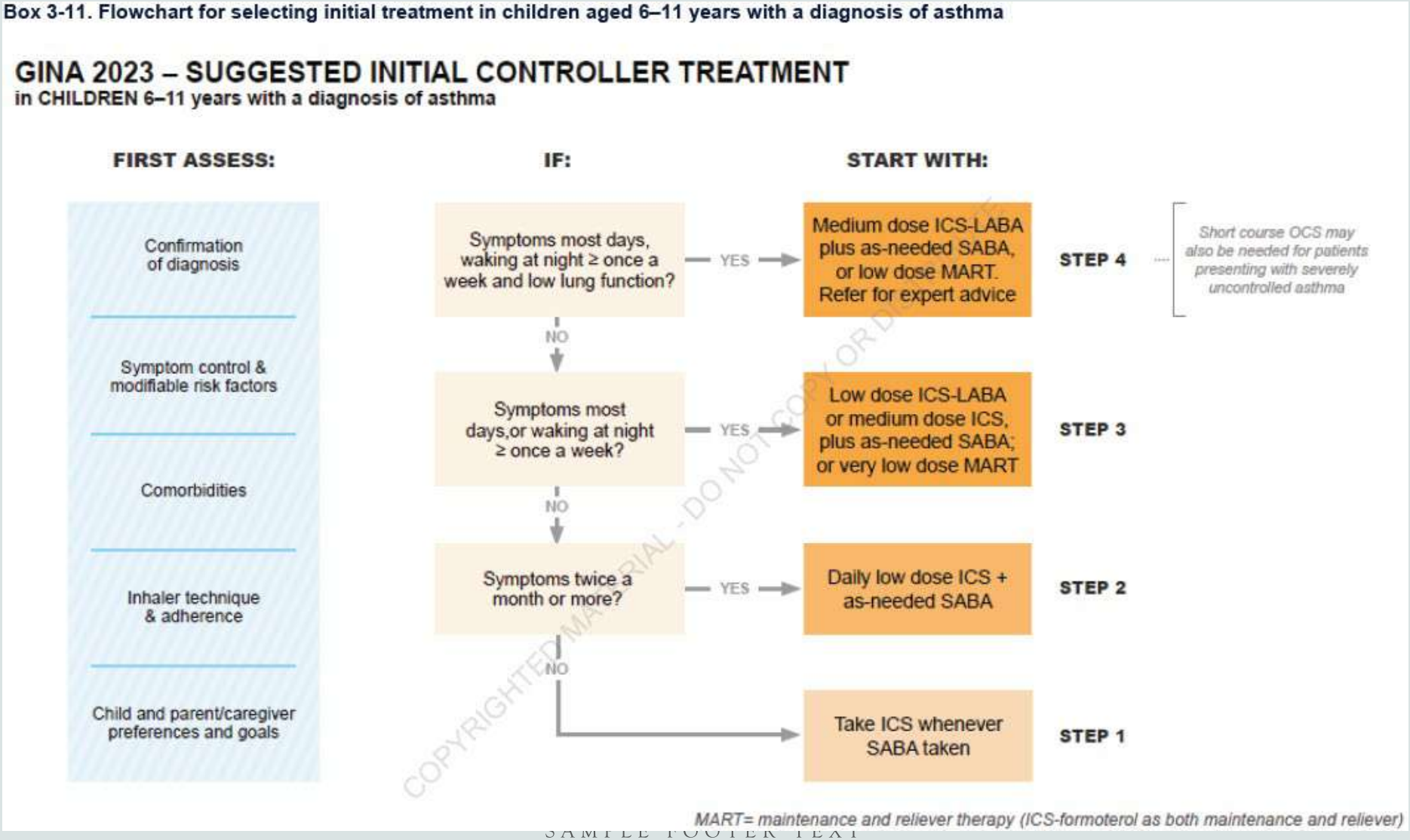


**Box 6-8. Choosing an inhaler device for children 5 years and younger**

| Age | Preferred device | Alternate device |
|---|---|---|
| 0–3 years | Pressurized metered dose inhaler plus dedicated spacer with face mask | Nebulizer with face mask |
| 4–5 years | Pressurized metered dose inhaler plus dedicated spacer with mouthpiece | Pressurized metered dose inhaler plus dedicated spacer with face mask or nebulizer with mouthpiece or face mask |

# Older children – 6-11 years ALSO Based on symptoms

**Box 3-11. Flowchart for selecting initial treatment in children aged 6–11 years with a diagnosis of asthma**



# GINA 2023 – Children 6–11 years

**Personalized asthma management:**
Assess, Adjust, Review


*Confirmation of diagnosis if necessary*
*Symptom control & modifiable risk factors (see Box 2-2)*
*Comorbidities*
*Inhaler technique & adherence*
*Child and parent/caregiver preferences and goals*

*Symptoms*
*Exacerbations*
*Side-effects*
*Lung function*
*Comorbidities*
*Child (and parent/ caregiver) satisfaction*

*Treatment of modifiable risk factors & comorbidities*
*Non-pharmacological strategies*
*Asthma medications (adjust down or up)*
*Education & skills training*

**Asthma medication options:**
Adjust treatment up and down for individual child's needs

| | STEP 1 | STEP 2 | STEP 3 | STEP 4 | STEP 5 |
|---|---|---|---|---|---|
| **PREFERRED CONTROLLER** to prevent exacerbations and control symptoms | Low dose ICS taken whenever SABA taken* | Daily low dose inhaled corticosteroid (ICS) (see table of ICS dose ranges for children) | Low dose ICS-LABA, OR medium dose ICS, OR very low dose ICS-formoterol maintenance and reliever (MART) | Medium dose ICS-LABA, OR low dose ICS-formoterol maintenance and reliever therapy (MART). Refer for expert advice | Refer for phenotypic assessment ± higher dose ICS-LABA or add-on therapy, e.g. anti-IgE, anti-IL4Rα, anti-IL5 |
| *Other controller options (limited indications, or less evidence for efficacy or safety)* | *Consider daily low dose ICS* | *Daily leukotriene receptor antagonist (LTRA), or low dose ICS taken whenever SABA taken** | *Low dose ICS + LTRA* | *Add tiotropium or add LTRA* | *As last resort, consider add-on low dose OCS, but consider side-effects* |
| **RELIEVER** | As-needed SABA (or ICS-formoterol reliever* in MART in Steps 3 and 4) | | | | |

*Anti-inflammatory relievers (AIR)

Box 3-13 

# Steroid Doses in Children

- From UpToDate
- This is nice because you can see that if you have a 44 mcg fluticasone inhaler, different puff amounts provide Low vs Medium steroid.

**Estimated comparative daily doses for inhaled glucocorticoids in children**

| Drug | Low daily dose | | Medium daily dose | | High daily dose | |
|---|---|---|---|---|---|---|
| | Child 0 to 4 | Child 5 to 11 | Child 0 to 4 | Child 5 to 11 | Child 0 to 4 | Child 5 to 11 |
| Beclomethasone HFA<br>40 or 80 mcg/puff | NA | 40 mcg/puff - 1 to 2 puffs twice per day | NA | 40 mcg/puff - 2 to 4 puffs twice per day<br>80 mcg/puff - 1 to 2 puffs twice per day | NA | 80 mcg/puff - 3 to 4 puffs twice per day |
| Budesonide DPI* (breath activated)<br>90 or 180 mcg/inhalation | NA | 90 mcg/inhalation - 1 to 2 inhalations twice per day | NA | 180 mcg/inhalation - 1 to 2 inhalations twice per day | NA | 180 mcg/inhalation - 3 to 4 inhalations twice per day |
| Budesonide nebulization suspension¶<br>0.25 mg/2 mL, 0.5 mg/2 mL, or 1 mg/2 mL | 0.25 to 0.5 mg once daily or as 2 divided doses | 0.5 mg once daily or as 2 divided doses | 0.75 to 1 mg once daily or as 2 or 3 divided doses | 1 mg once daily or as 2 divided doses | 1.25 to 2 mg once daily or as 2 divided doses | 2 mg once daily or as 2 divided doses |
| Ciclesonide HFA△<br>80 or 160 mcg/puff | NA | 80 mcg/puff - 1 to 2 puffs once daily | NA | 80 mcg/puff - 3 to 4 puffs once daily | NA | 80 mcg/puff - 5 to 6 puffs once daily or as 2 divided doses<br>160 mcg/puff - 3 puffs once daily or as 2 divided doses |
| Fluticasone HFA◇<br>44, 110, or 220 mcg/puff | 44 mcg/puff - 2 puffs twice per day◇ | 44 mcg/puff - 1 to 2 puffs twice per day | 44 mcg/puff - 2 to 4 puffs twice per day<br>110 mcg/puff - 1 puff in AM and 2 puffs in PM | 44 mcg/puff - 2 to 4 puffs twice per day<br>110 mcg/puff - 1 puff in AM and 2 puffs in PM | 110 mcg/puff - 2 puffs twice per day<br>220 mcg/puff - 1 puff twice per day | 110 mcg/puff - 2 puffs twice per day<br>220 mcg/puff - 1 puff twice per day |
| Fluticasone DPI (breath activated)§<br>50, 100, or 250 mcg/inhalation | NA | 50 mcg/inhalation - 1 to 2 inhalations twice per day | NA | 50 mcg/inhalation - 3 to 4 inhalations twice per day<br>100 mcg/inhalation - 1 inhalation in AM and 2 inhalations in PM to 2 inhalations twice per day | NA | 100 mcg/inhalation - 2 inhalations in AM and 3 inhalations in PM<br>250 mcg/inhalation - 1 inhalation twice per day |
| Mometasone aerosol DPI (breath activated)*<br>110 or 220 mcg/inhalation | NA | 110 mcg/inhalation - 1 inhalation once daily | NA | 110 mcg/inhalation - 2 to 3 inhalations once daily | NA | 110 mcg/inhalation - 4 inhalations once daily or 2 inhalations twice per day<br>220 mcg/inhalation - 2 inhalations once daily or 1 inhalation twice per day |
| Mometasone HFA MDI<br>50, 100, or 200 mcg/puff | NA | 50 mcg/puff - 1 puff once or twice per day | NA | 50 mcg/puff - 2 to 3 puffs twice per day<br>100 mcg/puff - 1 puff twice per day | NA | 100 mcg/puff - 2 puffs twice per day<br>200 mcg/puff - 1 inhalation twice per day |

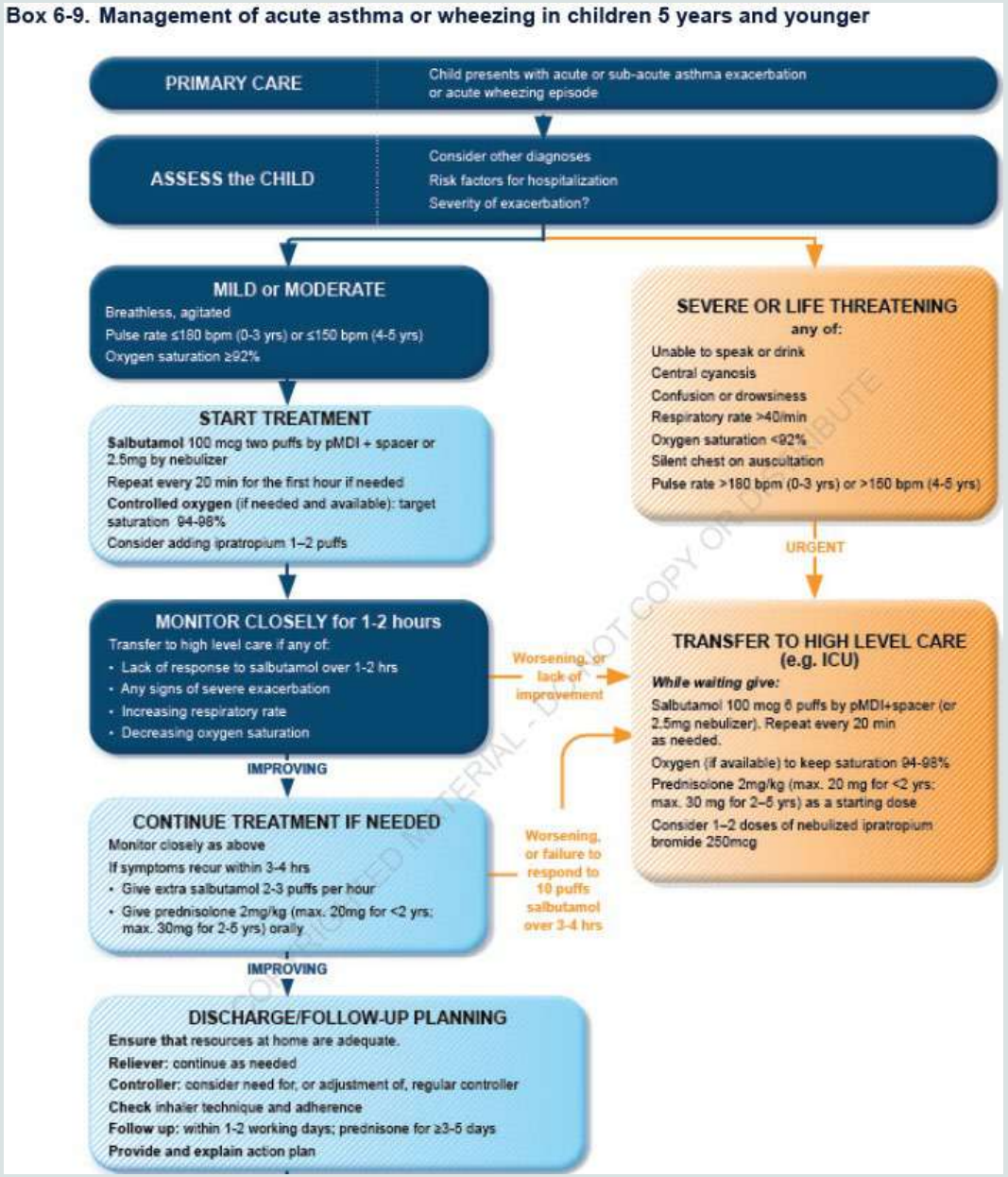
Some doses may be outside approved package labeling, esp ses shown and halati
descriptions approved in the United States, which may differ from how strengths are described for products available in other countries. Consult local product information before

# Exacerbation in children: GINA (1-5 yrs)

- Albuterol 2 puffs with spacer
- Repeat every 20 mins (6 puffs/hr)
- Monitor 1-2 hrs, keep treating…

# Exacerbation in children: Australia

- Albuterol with spacer:
- 1-5 yrs: 2-6 puffs
- 6+ yrs:  4-12 puffs
- Repeat every 20-30 minutes
- 3 hours and no response, call **ambulance** and continue albuterol



# Exacerbation Management is on page 142

- For patients prescribed an anti-inflammatory reliever:

  *budesonide-formoterol 200/6 mcg metered dose (160/4.5 mcg delivered)*

  *"This provides a small extra dose of ICS as well as a rapid-acting bronchodilator.*

  *Both the ICS and the formoterol appear to contribute to the reduction in severe exacerbations compared with using a SABA reliever."*

  *The maximum total recommended dose in any single day (12 yrs+) = 72 mcg formoterol (**12 inhalations**).*

  *(8 inhalations in children = 48 mcg [36 mcg delivered])*

# Seattle Children's Asthma Pathway

- First is a "Respiratory Score"
- ED or Inpatient

## Asthma Pathway v11.0: **Respiratory Score**

**Stop and Review**

**Inclusion Criteria**

- 1-18 y.o. with asthma exacerbation admitted to general medicine service

**Exclusion Criteria**

- Patients with pneumonia, bronchiolitis, or croup as their primary diagnosis
- Chronic lung disease (e.g. cystic fibrosis, restrictive lung disease, bronchopulmonary dysplasia)
- Cardiac disease requiring baseline medication
- Airway Issues (e.g. vocal cord paralysis, tracheomalacia, tracheostomy dependent)
- Medically complex children
- Immune disorders
- Sickle cell anemia

| Variable | 0 points | 1 point | 2 points | 3 points |
|---|---|---|---|---|
| **RR** | | | | |
| 0-8 weeks | | ≤60 | 61-69 | ≥70 |
| 2-11 months | | ≤50 | 51-59 | ≥60 |
| 12-23 months | | ≤40 | 41-44 | ≥45 |
| 2-3 years | | ≤34 | 35-39 | ≥40 |
| 4-5 years | | ≤30 | 31-35 | ≥36 |
| 6-12 years | | ≤26 | 27-30 | ≥31 |
| ≥13 years | | ≤23 | 24-27 | ≥28 |
| **Retractions** | None | Subcostal or intercostal | 2 of the following: subcostal, intercostal, substernal OR nasal flaring (infant) | 3 of the following: subscostal, intercostal, substernal, suprasternal, supraclavicular OR nasal flaring / head bobbing (infant) |
| **Dyspnea** | | | | |
| <2 years | Normal feeding, vocalizations and activity | 1 of the following: difficulty feeding, decreased vocalization or agitated | 2 of the following: difficulty feeding, decreased vocalization or agitated | Stops feeding, no vocalization, drowsy or confused |
| 2 to 4 years | Normal feeding, vocalizations and play | 1 of the following: decreased appetite, increased coughing after play, hyperactivity | 2 of the following: decreased appetite, increased coughing after play, hyperactivity | Stops eating or drinking, stops playing OR drowsy and confused |
| >4 years | Counts to ≥10 in one breath | Counts to 7-9 in one breath | Counts to 4-6 in one breath | Counts to ≤3 in one breath |
| **Auscultation** | Normal breathing, no wheezing present | End-expiratory wheeze only | Expiratory wheeze only (greater than end-expiratory wheeze) | Inspiratory and expiratory wheeze OR diminished breath sounds OR both |

Last Updated: November 2023
Next Expected Review: April 2028

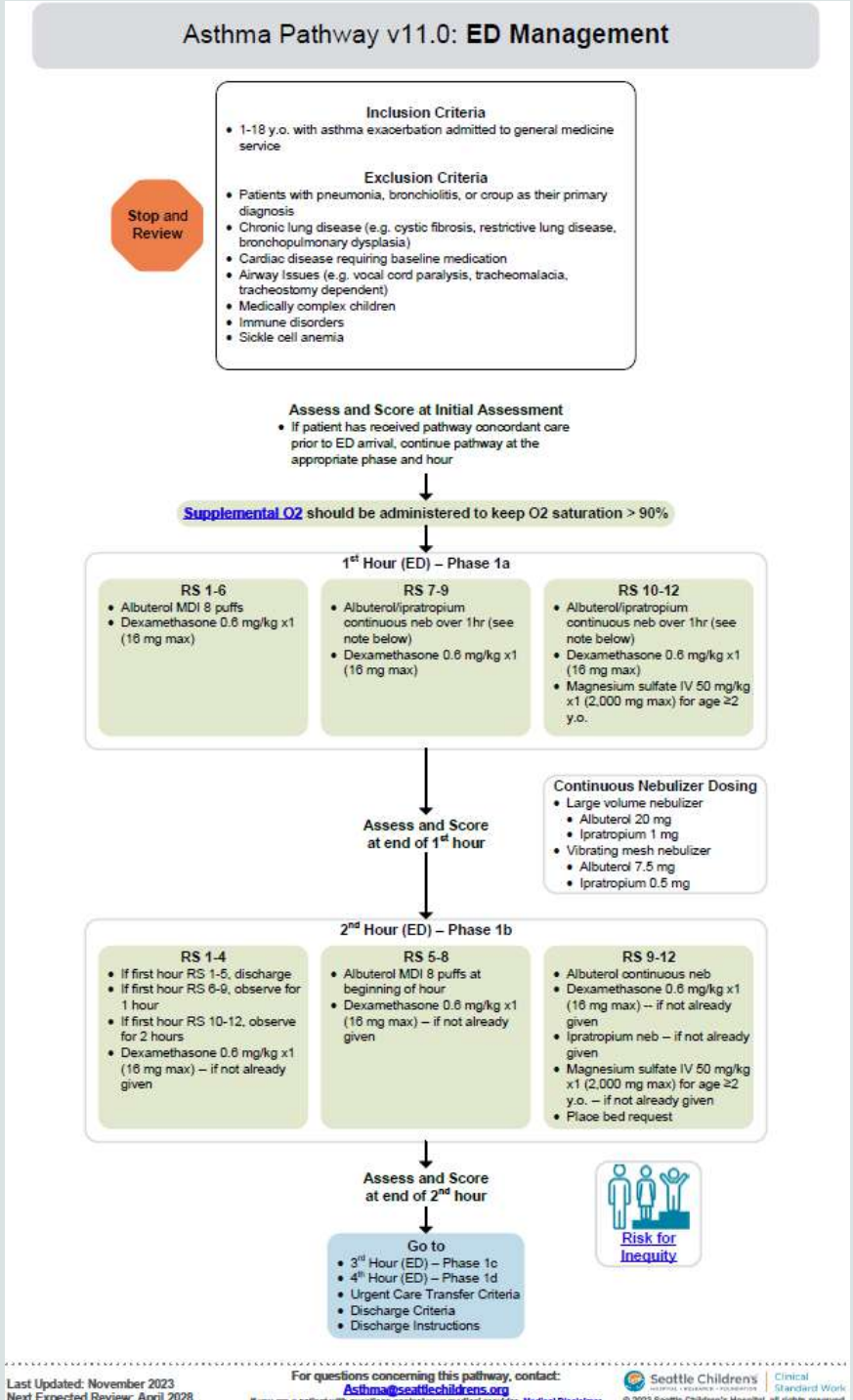
For questions concerning this pathway, contact:
Asthma@seattlechildrens.org
If you are a patient with questions contact your medical provider, Medical Disclaimer

Seattle Children's | Clinical Standard Work

# Seattle Children's Asthma Pathway

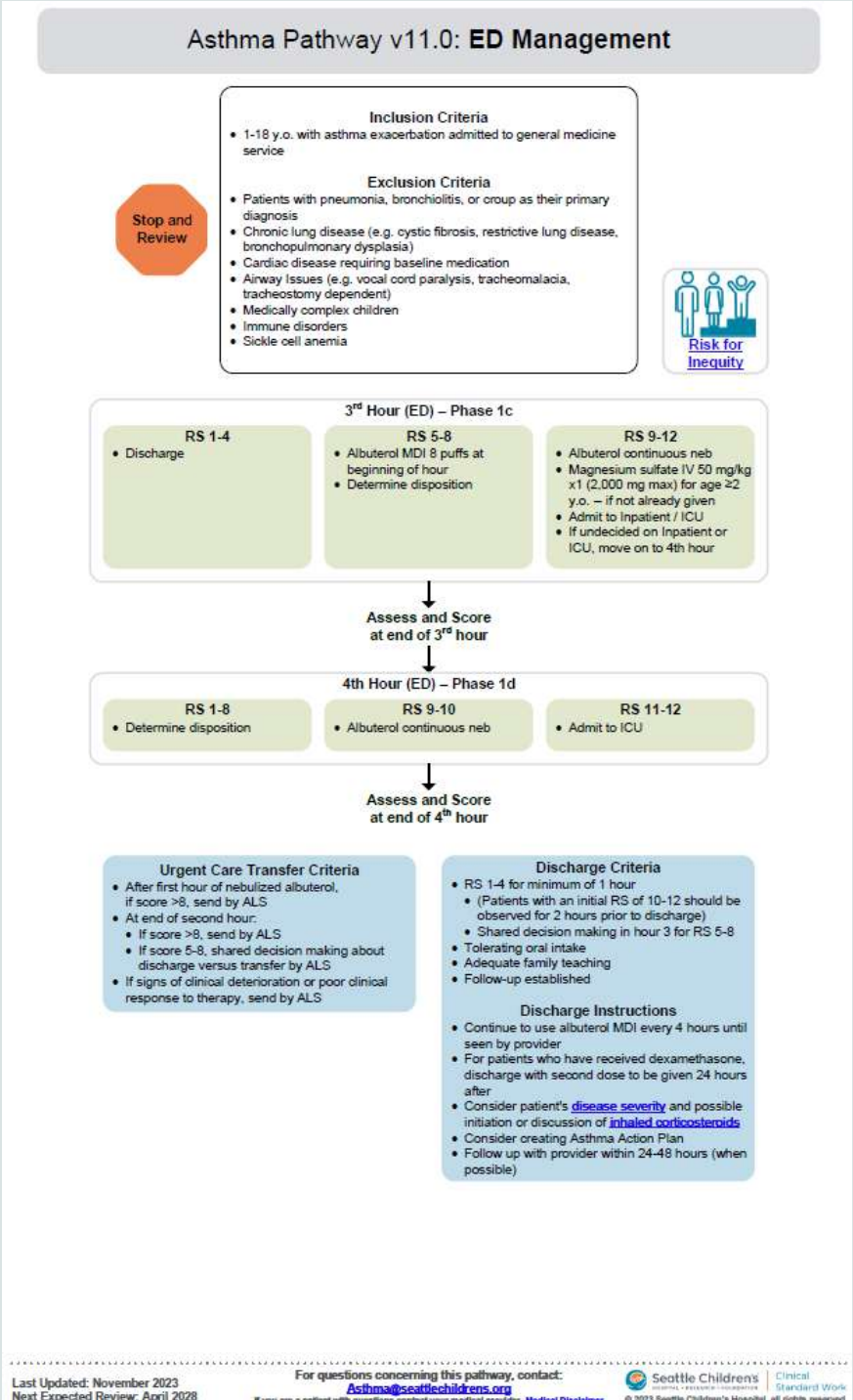
- Next is hour-by-hour care based on the Respiratory Score

- Albuterol/ipratropium continuous neb
- Dexamethasone
- Magnesium sulfate IV

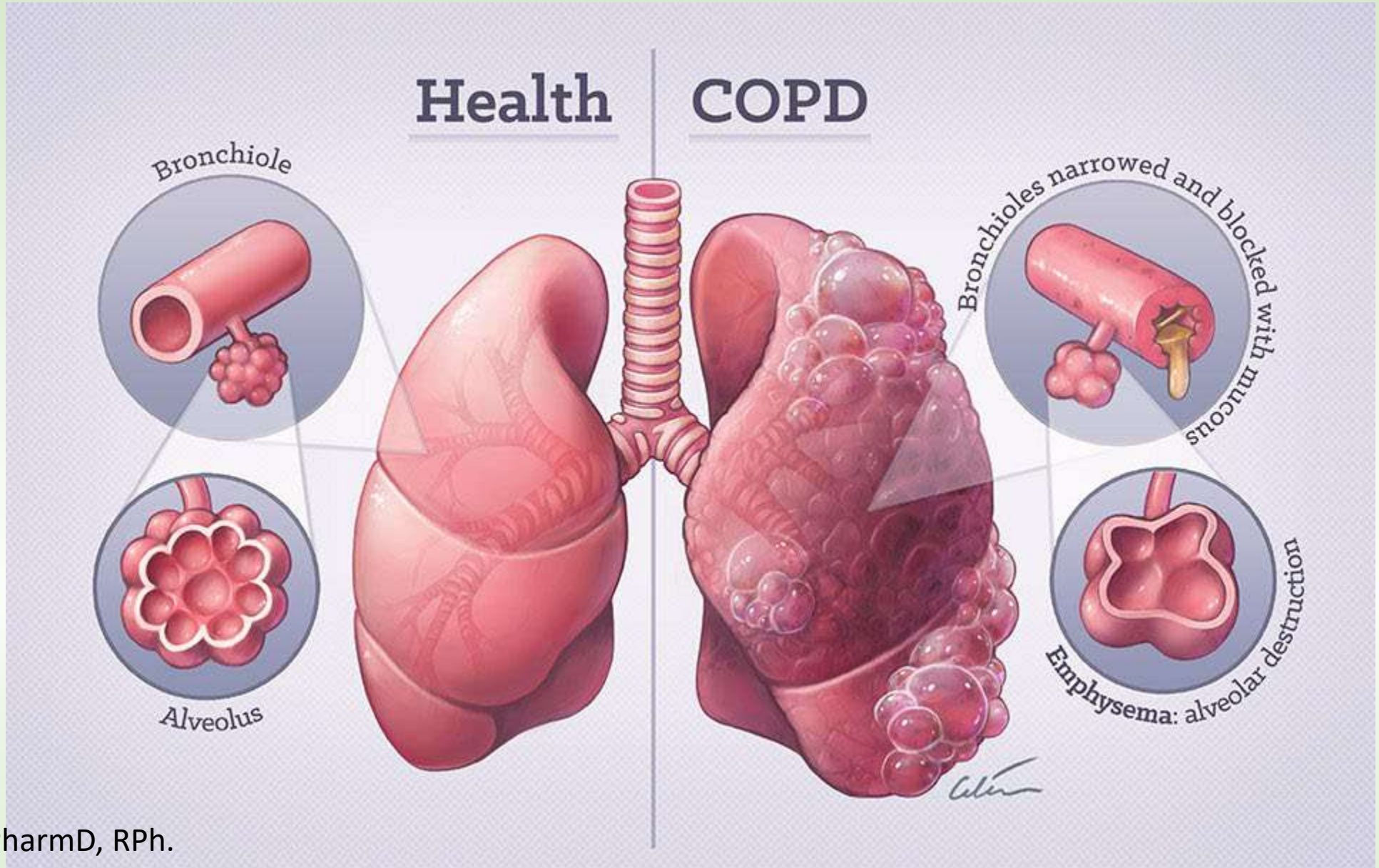


# Seattle Children's Asthma Pathway

- Reassess and continue
- If still sick, give what hasn't been given yet.



# COPD

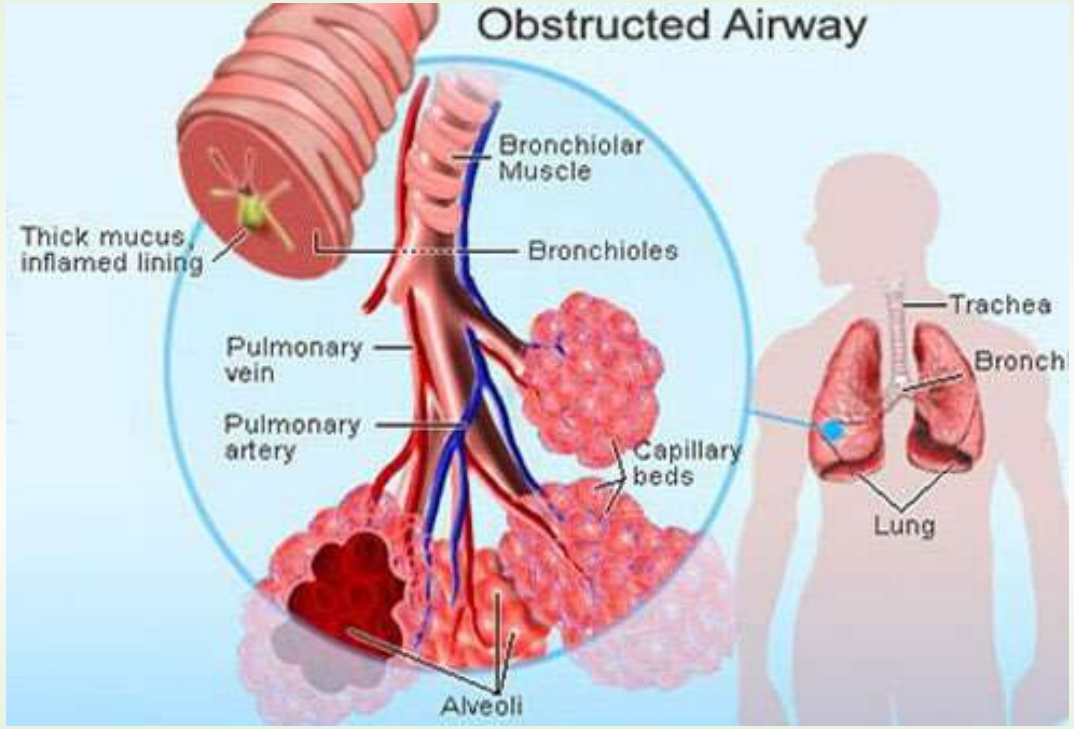



Presented by,
Tom Simpson PharmD, RPh.

# COPD

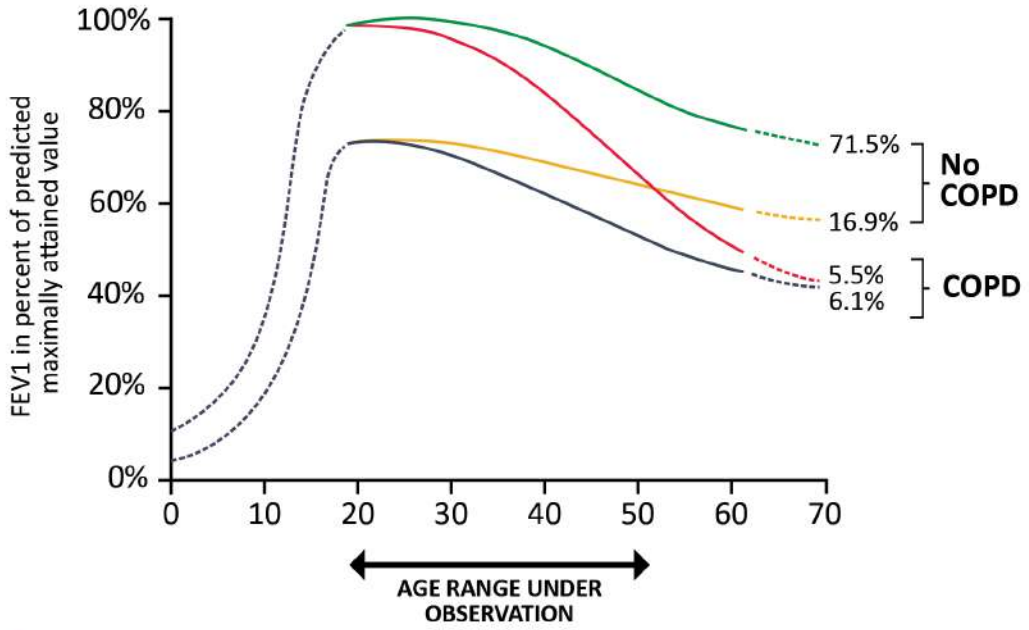
- Definition
  - Condition persistent respiratory symptoms and airflow limitation
    - due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases.

- Most Prevalent Risk factors:
  - Smoking
  - Occupational exposure



# FEV1 Trajectories (TR) Over the Life Course

Figure 1.1




Note: This is a simplified diagram of FEV1 progression over time. In reality, there is heterogeneity in the rate of decline in FEV1 owing to the complex interactions of genes with environmental exposures and risk factors over an individual's lifetime [adapted from Lange et al. NEJM 2015;373:111-22].

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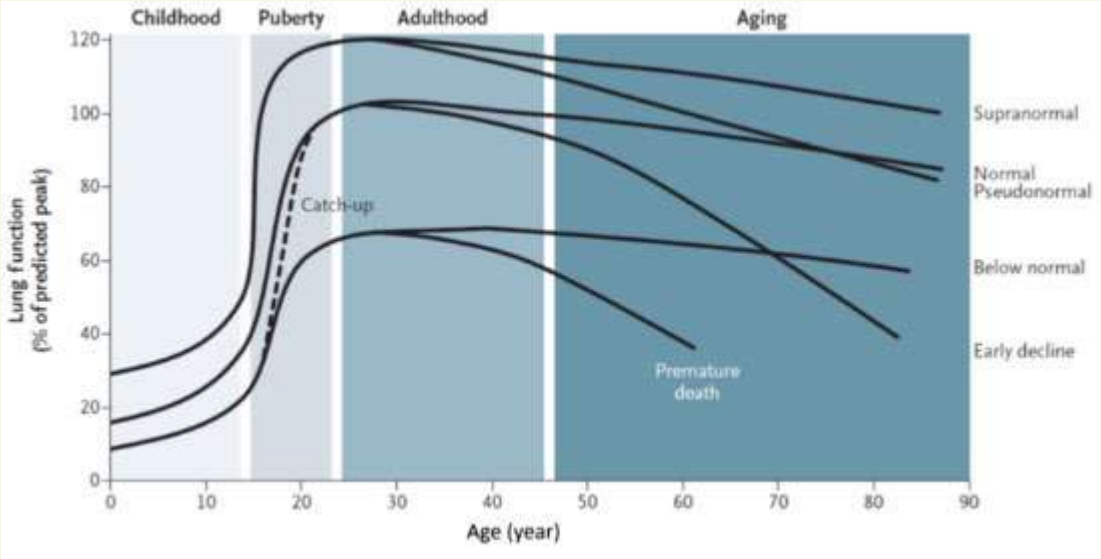
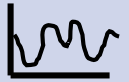
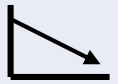


# Asthma vs COPD Summary

| | Primary Issue | 1st Line MOA | Drug Class | Disease Life Cycle |
|---|---|---|---|---|
| **Asthma** | Inflammation due to irritant or allergen | Decrease inflammation | Inhaled Corticosteroids (ICS) | Variable because reversible  |
| **COPD** | Persistent airflow limitation associated chronic cough and chronic sputum production | Bronchodilation | Long-Acting Beta-2 Agonist (LABA)<br><br>Long-Acting Muscarinic Antagonist (LAMA) | Progressive because irreversible  |

# Take Home Messages

- COPD is treatable and we can change the natural course of the disease and preserve lung function.
- The goal is NOT to make the patient breath better for 2-4 hours; short acting is for rescue only.
- Long-acting bronchodilators in symptomatic patients.
- Combination is better than 1+1 (synergy)
  - Anticholinergic opens the proximal airway to get the beta-agonist further down into the distal airway

- **Long-acting bronchodilators**
  - Start soon
  - Start strong
  - No need to de-escalate (only steroids)
  - Improve symptoms
  - Decrease exacerbations
  - Potentially decrease mortality*

- Steroids if eosinophils are high
  - Inflammation
  - Asthma

# KEY POINTS FOR THE USE OF BRONCHODILATORS

- LABAs and LAMAs are preferred over short-acting agents except for patients with only occasional dyspnea **(Evidence A)**, and for immediate relief of symptoms in patients already on long-acting bronchodilators for maintenance therapy.

- Patients may be started on single long-acting bronchodilator therapy or dual long-acting bronchodilator therapy. In patients with persistent dyspnea on one bronchodilator treatment should be escalated to two **(Evidence A)**.

- Inhaled bronchodilators are recommended over oral bronchodilators **(Evidence A)**.

- Theophylline is not recommended unless other long-term treatment bronchodilators are unavailable or unaffordable **(Evidence B)**.

# KEY POINTS FOR INHALATION OF DRUGS

- The choice of inhaler device has to be individually tailored and will depend on access, cost, prescriber, and most importantly, patient's ability and preference.

- It is essential to provide instructions and to demonstrate the proper inhalation technique when prescribing a device, to ensure that inhaler technique is adequate and re-check at each visit that patients continue to use their inhaler correctly.

- Inhaler technique (and adherence to therapy) should be assessed before concluding that the current therapy requires modification.

# COPD

- For patients with **features of both** asthma and COPD:
- **TREAT AS ASTHMA**
  - Inhaled steroid therapy is important to reduce the risk of severe exacerbations and death (asthma).

- COPD:
  - **Initial treatment:**
    - **LAMA and/or LABA**
      - **with as-needed SABA**

  - Add ICS for patients with: (sick)
    - Hospitalizations
    - ≥ 2 exacerbations/year requiring oral steroids
    - blood eosinophils ≥300/mcL

# How do we know it’s COPD?

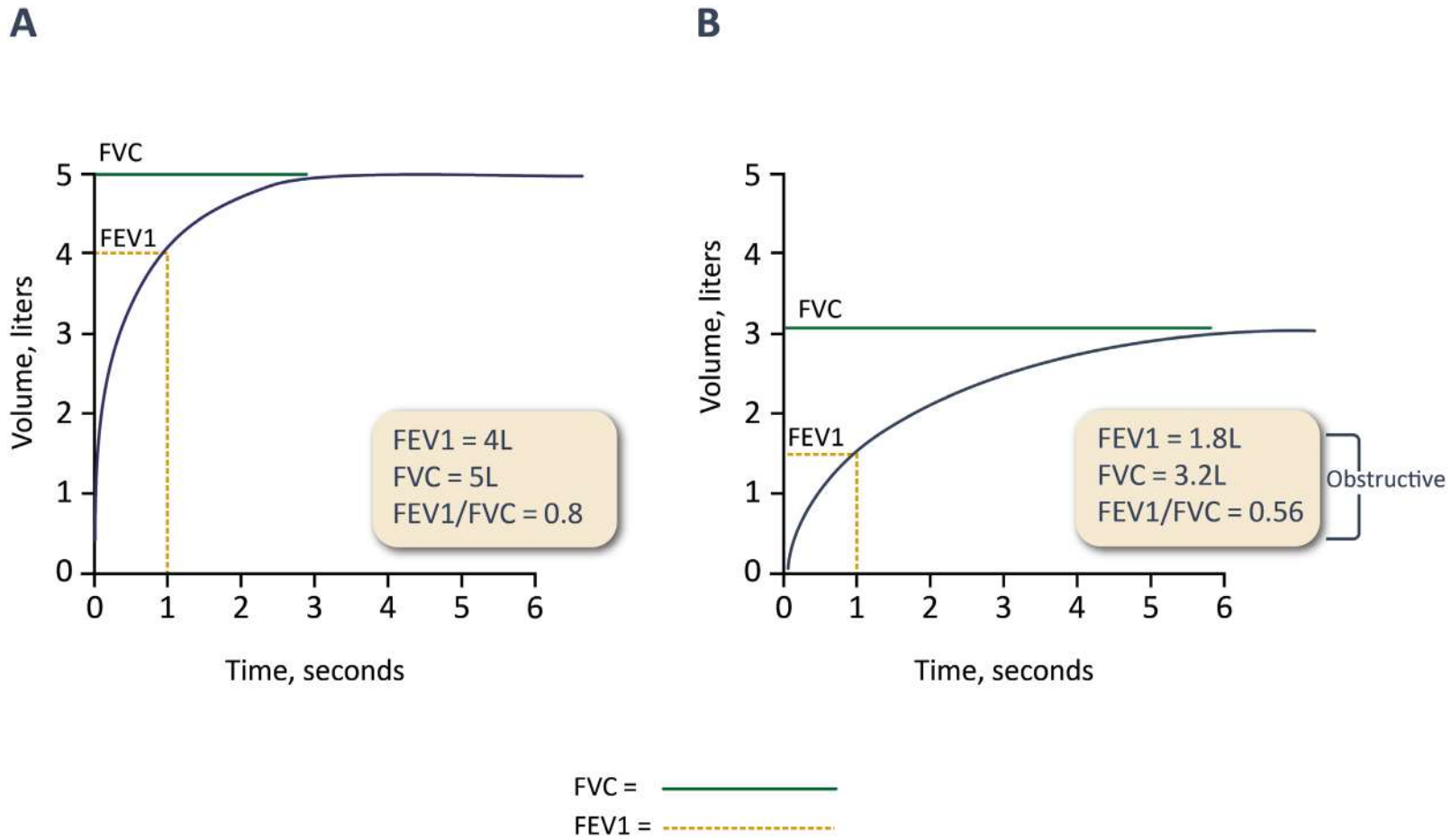
- Not everyone who smokes gets COPD.
- Not every cough is COPD.
- This is obstruction and we figure that out with:

- **Spirometry**

- We need to start suspecting this in patients less than 60 years of age.

# A. Spirometry - Normal Trace B. Spirometry - Airflow Obstruction

Figure 2.1

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Forced spirometry showing the presence of a post-bronchodilator **FEV1/FVC < 0.7 is mandatory to establish the diagnosis of COPD**

**Less than 70%**

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## GOLD Grades and Severity of Airflow Obstruction in COPD (based on post-bronchodilator FEV1)

Table 2.6

**In COPD patients (FEV1/FVC < 0.7):**

| | | |
|---|---|---|
| **GOLD 1:** | Mild | FEV1 ≥ 80% predicted |
| **GOLD 2:** | Moderate | 50% ≤ FEV1 < 80% predicted |
| **GOLD 3:** | Severe | 30% ≤ FEV1 < 50% predicted |
| **GOLD 4:** | Very Severe | FEV1 < 30% predicted |

# Two Steps for COPD Assessment

- **Step 1**: Use one of the **scoring tools** to grade a patient's COPD
  - mMRC
  - CAT
- **Step 2**: Determine severity of COPD based on **exacerbations** (per year) and symptoms

Together this gives you a "GROUP" that guides medication therapy.

# Modified MRC Dyspnea Scale

Table 2.7

**PLEASE TICK IN THE BOX THAT APPLIES TO YOU | ONE BOX ONLY | Grades 0 - 4**

| mMRC Grade 0 | mMRC Grade 1 | mMRC Grade 2 | mMRC Grade 3 | mMRC Grade 4 |
|---|---|---|---|---|
| I only get breathless with strenuous exercise | I get short of breath when hurrying on the level or walking up a slight hill | I walk slower than people of the same age on the level because of breathlessness, or I have to stop for breath when walking on my own pace on the level | I stop for breath after walking about 100 meters or after a few minutes on the level | I am too breathless to leave the house or I am breathless when dressing or undressing |
| ☐ | ☐ | ☐ | ☐ | ☐ |

Reference: ATS (1982) Am Rev Respir Dis. Nov;126(5):952-6.

# CAT™ Assessment

Figure 2.2

**For each item below, place a mark (x) in the box that best describes you currently.**
**Be sure to only select one response for each question.**

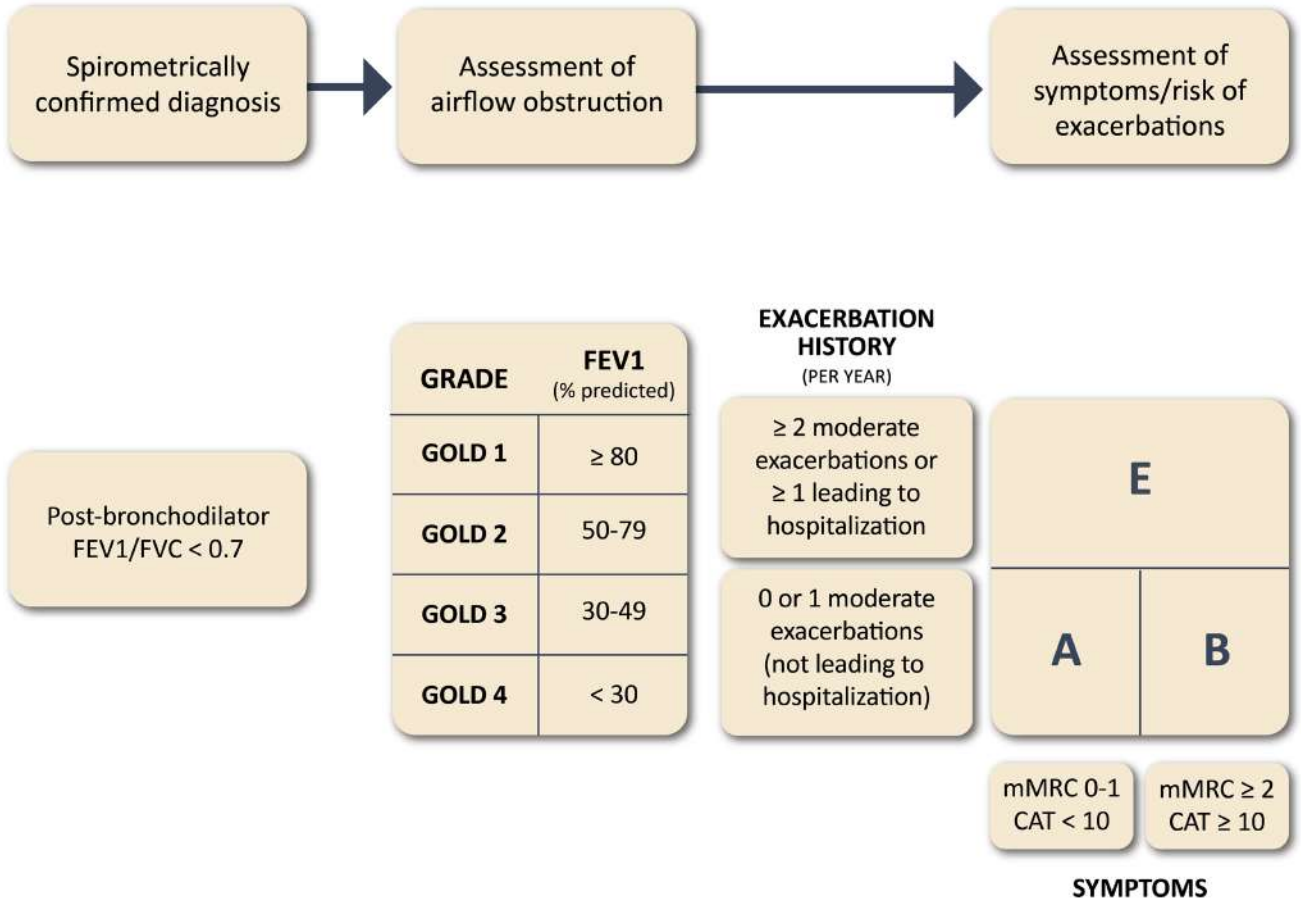
| EXAMPLE: I am very happy | 0 X 2 3 4 5 | I am very sad | Score |
|---|---|---|---|
| I never cough | 0 1 2 3 4 5 | I cough all the time | |
| I have no phlegm (mucus) in my chest at all | 0 1 2 3 4 5 | My chest is completely full of phlegm (mucus) | |
| My chest does not feel tight at all | 0 1 2 3 4 5 | My chest feels very tight | |
| When I walk up a hill or one flight of stairs I am not breathless | 0 1 2 3 4 5 | When I walk up a hill or one flight of stairs I am very breathless | |
| I am not limited doing any activities at home | 0 1 2 3 4 5 | I am very limited doing activities at home | |
| I am confident leaving my home despite my lung condition | 0 1 2 3 4 5 | I am not at all confident leaving my home because of my lung condition | |
| I sleep soundly | 0 1 2 3 4 5 | I don‘t sleep soundly because of my lung condition | |
| I have lots of energy | 0 1 2 3 4 5 | I have no energy at all | |

Reference: Jones et al. ERJ 2009; 34 (3); 648-54.

**TOTAL SCORE:** ☐

## GOLD ABE Assessment Tool

Figure 2.3



## Initial Pharmacological Treatment

Figure 4.2

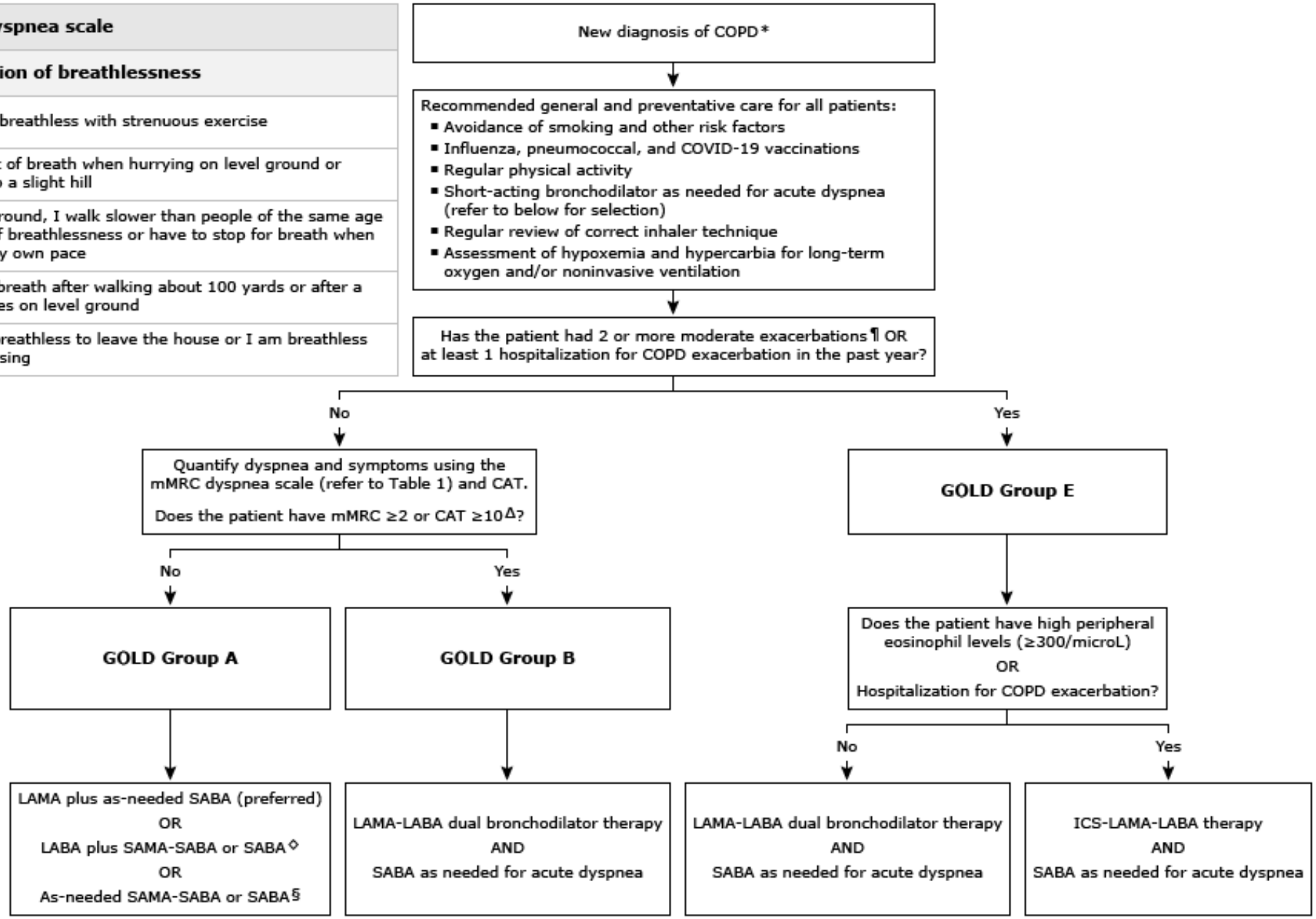

*single inhaler therapy may be more convenient and effective than multiple inhalers
Exacerbations refers to the number of exacerbations per year

Initial pharmacological treatment. mMRC: modified Medical Research Dyspnoea Questionnaire. CAT: COPD Assessment Test. LAMA: long-acting anti-muscarinic antagonist; LABA: long-acting β2 receptor agonist; ICS: inhaled corticosteroid; eos: eosinophils

# New diagnosis of COPD

UpToDate

| Table 1: mMRC dyspnea scale | |
|---|---|
| **Grade** | **Description of breathlessness** |
| 0 | I only get breathless with strenuous exercise |
| 1 | I get short of breath when hurrying on level ground or walking up a slight hill |
| 2 | On level ground, I walk slower than people of the same age because of breathlessness or have to stop for breath when walking my own pace |
| 3 | I stop for breath after walking about 100 yards or after a few minutes on level ground |
| 4 | I am too breathless to leave the house or I am breathless when dressing |

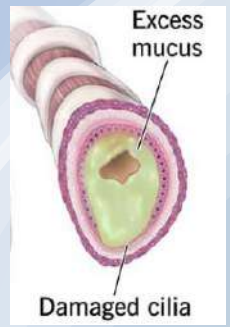


# Appropriate use of inhalers is essential

- Because inhaled therapy is the cornerstone of COPD treatment, the appropriate use of these devices (irrespective of the molecule(s) contained in them) is essential to optimize their therapeutic effect.

**Box 1:** Basic principles for appropriate inhalation device choice (from reference [1])

- Availability of the drug in the device.
- Patients' beliefs, satisfaction with current and previous devices and preferences need to be assessed and considered.
- The number of different device types should be minimized for each patient. Ideally, only one device type should be used.
- Device type should not be switched in the absence of clinical justification nor without proper information, education, and medical follow-up.
- Shared decision making is the most appropriate strategy for inhalation device choice.
- Patient's cognition, dexterity and strength must be taken into account.
- Patient's ability to perform the correct specific inhalation manoeuvre for the device must be assessed:
  - Dry powder inhalers (DPI) are appropriate only if the patient can make a forceful and deep inhalation. Check visually that the patient can inhale forcefully through the device - if there is doubt assess objectively or chose alternative device.
  - Metered-dose inhalers (MDI) and, to a lesser extent, slow mist inhalers (SMI) require coordination between device triggering and inhalation and patients need to be able to perform a slow and deep inhalation. Check visually that the patient can inhale slowly and deeply from the device - if there is doubt consider adding a spacer or chose alternative device.
  - For patients unable to use an MDI (with or without spacer), SMI or DPI a nebulizer should be considered.
- Other factors to consider include size, portability, cost.
- Smart inhalers may be useful if there are issues with adherence/persistence or inhalation technique (for devices that can check it)
- Physicians should prescribe only devices they (and the other members of the caring team) know how to use.




# Bronchodilators


M

## MUSCARINIC ANTAGONISTS (ANTICHOLINERGIC)

relieve cough, sputum production, wheeze and chest tightness associated with chronic lung diseases

SHORT-ACTING

**Atrovent® HFA**
17 mcg
*ipratropium bromide*
HFA C

LONG-ACTING

**Incruse® Ellipta®**
62.5 mcg
*umeclidinium inhalation powder*
DPI C

**Ipratropium Bromide Inhalation Solution**
0.5, 2.5 mg; 2.5 mL
C G N

**Spiriva® HandiHaler®**
18 mcg
*tiotropium bromide inhalation powder*
C

**Spiriva® Respimat®**
1.25, 2.5 mcg
*tiotropium bromide*
HFA A C

**Tudorza™ Pressair™**
400 mcg
*aclidinium bromide inhalation powder*
DPI C

**Yupelri®**
175 mcg; 3 mL
*revefenacin inhalation solution*
C N

B

## SHORT-ACTING BETA$_2$-AGONIST BRONCHODILATORS

relax tight muscles in airways and offer quick relief of symptoms such as coughing, wheezing and shortness of breath for 3-6 hours

**Albuterol Sulfate Inhalation Solution**
0.63, 1.5, 2.5 mg; 3 mL
G N

**ProAir® Digihaler™**
90 mcg
*albuterol sulfate inhalation powder*
DPI A

**ProAir RespiClick®**
90 mcg
*albuterol sulfate inhalation powder*
DPI A

**Proventil® HFA**
90 mcg
*albuterol sulfate*
HFA A G

**Ventolin® HFA**
90 mcg
*albuterol sulfate*
HFA A G

**Xopenex®**
0.31, 0.63, 1.25 mg; 3 mL
*levalbuterol hydrochloride inhalation solution*
A G N

**Xopenex HFA®**
45 mcg
*levalbuterol tartrate*
A G

## LONG-ACTING BETA$_2$-AGONIST BRONCHODILATORS

relax tight muscles in airways and offer lasting relief of symptoms such as coughing, wheezing and shortness of breath for at least 12 hours

**Brovana®**
15 mg; 2 mL
*arformoterol tartrate inhalation solution*
C N

**Perforomist®**
20 mcg; 2 mL
*formoterol fumarate inhalation solution*
C N

**Serevent® Diskus®**
50 mcg
*salmeterol xinafoate inhalation powder*
DPI A C

**Striverdi® Respimat®**
2.5 mcg
*olodaterol hydrochloride*
SMI C

# Combination Bronchodilators

## LABA+LAMA


## SABA+SAMA

Combivent or DuoNeb

# Short-acting bronchodilators

B

## Short-acting beta agonists (SABA)



Albuterol solution

M

## Short-acting muscarinic-antagonist (SAMA)


**Atrovent HFA**/ipratropium


**Atrovent**/ipratropium solution


B

M

**Combivent Respimat**

ipratropium/albuterol


# LAMA

| Agent | Brand name | Dosing |
|---|---|---|
| Aclidinium | Tudorza Pressair (United States) | DPI:* 1 inhalation (400 mcg/actuation) twice daily |
| | Tudorza Genuair (Canada) | |
| Glycopyrrolate (known as glycopyrronium in Canada and Europe)¶ | Seebri Breezhaler (Canada) | DPI:* Inhale contents of 1 capsule (50 mcg/capsule$^{\Delta}$) once daily |
| | Lonhala Magnair (United States) | Solution for nebulization: Inhale contents of 1 vial (25 mcg/1 mL) twice daily via specialized Magnair device |
| Tiotropium¶ | Spiriva HandiHaler (United States), Spiriva (Canada) | DPI:* Inhale contents of 1 capsule (18 mcg/capsule) once daily |
| | Spiriva Respimat (United States, Canada) | SMI:◇ 2 inhalations (2.5 mcg/actuation) once daily |
| Umeclidinium | Incruse Ellipta (United States, Canada) | DPI:* 1 inhalation (62.5 mcg/actuation) once daily |
| Revefenacin§ | Yupelri (United States) | Solution for nebulization: Inhale contents of 1 vial (175 mcg/3 mL) once daily via standard jet nebulizer¥ |


**Spiriva Handihaler**
tiotropium bromide

**Spiriva Respimat**
tiotropium bromide


**Lonhala Magnair**
glycopyrrolate


**Seebri Neohaler**
glycopyrrolate


**Incruse Ellipta**
umeclidiunium

**Tudorza Pressair**
aclidinum


**Yulperi**/revefenacin


# LABA


Severvent / salmeterol

Striverdi / olodaterol



Perforomist / formoterol


Brovana / arformoterol

**Combination long-acting muscarinic antagonist/long-acting beta agonist inhalers for COPD**

| Agents | Brand names | Dosing |
|---|---|---|
| **Combination long-acting muscarinic antagonist/long-acting beta agonist inhalers** | | |
| Aclidinium 400 mcg/formoterol 12 mcg | Duaklir Genuair (Canada)<br>Duaklir Pressair (United States) | 1 inhalation twice daily; DPI |
| Glycopyrrolate 9 mcg/formoterol 4.8 mcg | Bevespi Aerosphere (United States) | 2 inhalations twice daily; pMDI |
| Tiotropium 2.5 mcg/olodaterol 2.5 mcg per actuation | Stiolto Respimat (United States)<br>Inspiolto Respimat (Canada) | 2 inhalations once daily; SMI |
| Umeclidinium 62.5 mcg/vilanterol 25 mcg | Anoro Ellipta (United States and Canada) | 1 inhalation once daily; DPI |

# LAMA + LABA


**Anoro Ellipta**
umeclidinium/
vilanterol


**Bevespi Aerosphere**
glycopyrrolate/
formoterol


**Stiolto Respimat**
tiotropium/olodaterol


**Duaklir**
aclidinium / formoterol

## Initial Pharmacological Treatment

Figure 4.2


*single inhaler therapy may be more convenient and effective than multiple inhalers
Exacerbations refers to the number of exacerbations per year

Initial pharmacological treatment. mMRC: modified Medical Research Dyspnoea Questionnaire. CAT: COPD Assessment Test. LAMA: long-acting anti-muscarinic antagonist; LABA: long-acting β2 receptor agonist; ICS: inhaled corticosteroid; eos: eosinophils

# Follow-up pharmacological treatment

- GOLD 2023 continues to recommend that follow-up treatment be based on:

❖Dyspnea and exacerbations

✓Critical to check inhaler technique

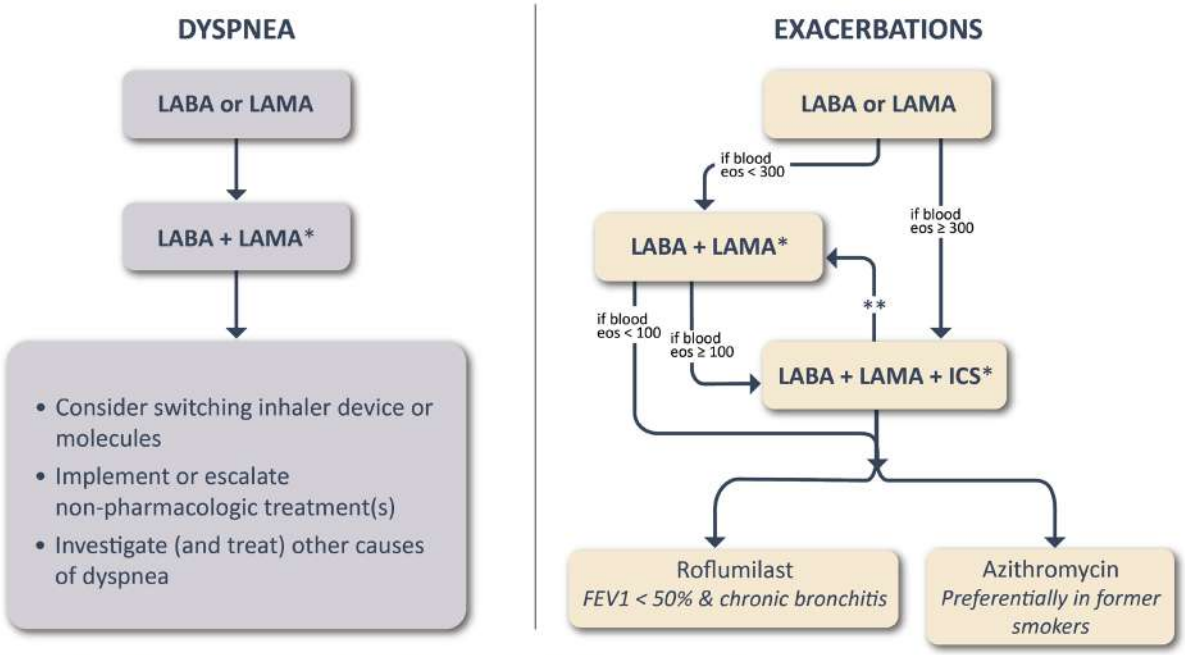
✓Consider switching inhaler devices or molecules

✓Escalate to LABA+LAMA

# Follow-up Pharmacological Treatment

Figure 4.4

1. **IF RESPONSE TO INITIAL TREATMENT IS APPROPRIATE, MAINTAIN IT.**
2. **IF NOT:**
   - Check adherence, inhaler technique and possible interfering comorbidities
   - Consider the predominant treatable trait to target (dyspnea or exacerbations)
     - Use exacerbation pathway if both exacerbations and dyspnea need to be targeted
   - Place patient in box corresponding to current treatment & follow indications
   - Assess response, adjust and review
   - These recommendations do not depend on the ABE assessment at diagnosis




*Single inhaler therapy may be more convenient and effective than multiple inhalers

**Consider de-escalation of ICS if pneumonia or other considerable side-effects. In case of blood eos ≥ 300 cells/µl de-escalation is more likely to be associated with the development of exacerbations

Exacerbations refers to the number of exacerbations per year

**Roflumilast (Daliresp):**
PDE4 inhibitor
anti-inflammatory not a bronchodilator

2023
Teaching
Slide Set

## Skipping:

Management Cycle
Non-Pharmacologic Management of COPD
Prescription of Supplemental Oxygen to COPD Patients
Management of the hospitalized patient
Management with COVID-19
Surgical therapy

# Summary

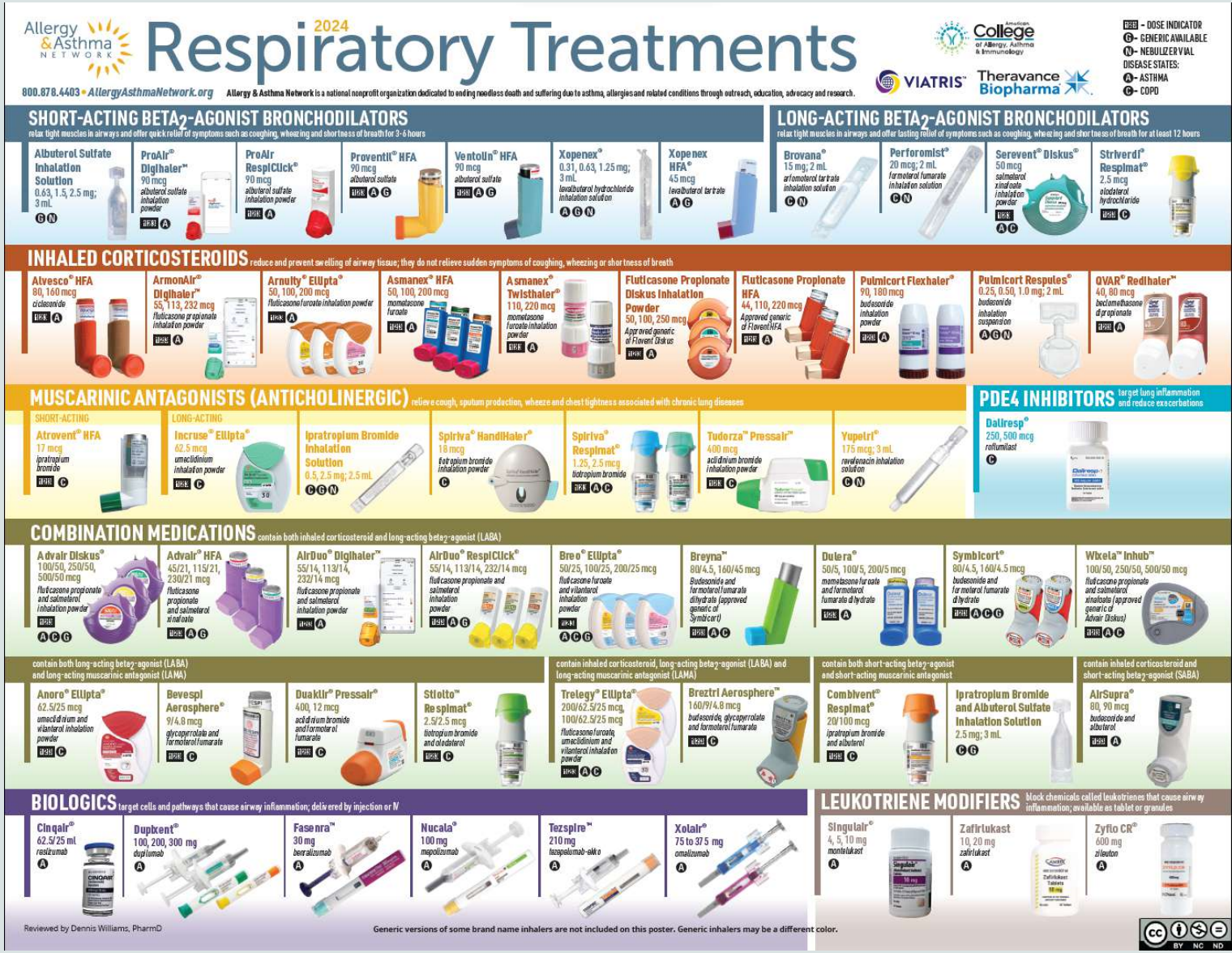
- COPD is common. Environmental factors other than smoking can contribute to COPD.
- COPD can start early in life. Spirometry can identify young adults.
- Smoking cessation, long-term oxygen therapy, non-invasive positive pressure ventilation, and lung volume reduction surgery have now been shown to reduce mortality.

**Box 2.** Key headlines for GOLD pharmacological treatment recommendations of COPD (www.goldcopd.org)

- For symptomatic patients, a LABA-LAMA therapy in a single inhaler is recommended as initial therapy.
- The combination of LABA-ICS is no longer recommended in patients with COPD.
- Triple therapy (LABA-LAMA-ICS) is recommended in COPD patients who still suffer exacerbations of the disease despite LABA-LAMA therapy, if blood Eosinophil levels are higher than 100 cells/µl.
- ICS are not recommended in patients with <100 Eos/µL.
- Pharmacologic tratement must always be combined with non-pharmacologic treatment (including adequate treatment compliance, smoking cessation, physical activity and appropriate vaccination), and consideration of coexistent comorbidities.

# Thank you


- Tom Simpson, PharmD., RPh
- simpson@plu.edu

# Albuterol alone is discouraged

- **Overuse** of SABA = dispensing **3 or more** canisters per year (200/doses canister).
  - Equals average use of – more than daily

- Associated with an increased risk of severe exacerbations and, in one study, increased mortality, even in patients also taking ICS-containing treatment.

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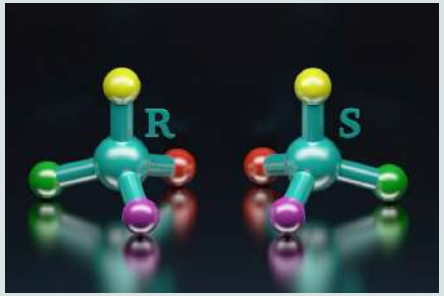
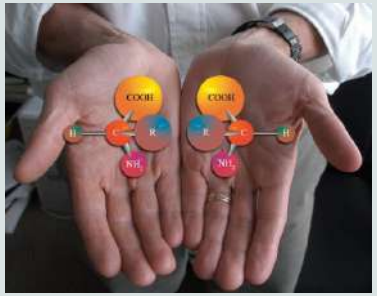
# Chirality and Advertising

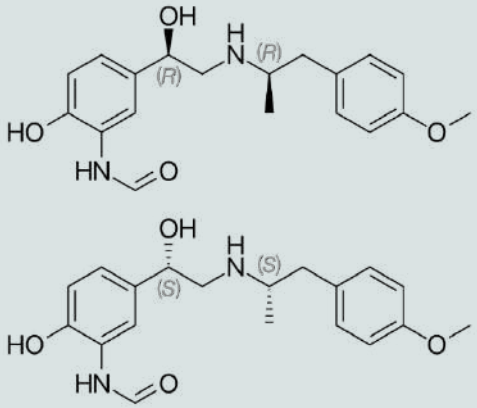
- Levalbuterol (Xopenex vs Proventil)
- Esomeprazole (Nexium vs Prilosec)
- Escitalopram (Lexapro vs Celexa)
- Dextroamphetamine
- What is Racemic Epinephrine?










Formoterol & Arfomoterol (LABA)