Asthma Case Studies: Keeping Guidelines in Mind 2025

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Disclosures

- I do non-branded speeches on behalf of Sanofi/Regeneron. This conflict is not be relevant to the cases or ideas discussed today.

Goal: To use cases to highlight aspects of asthma management based on guidelines

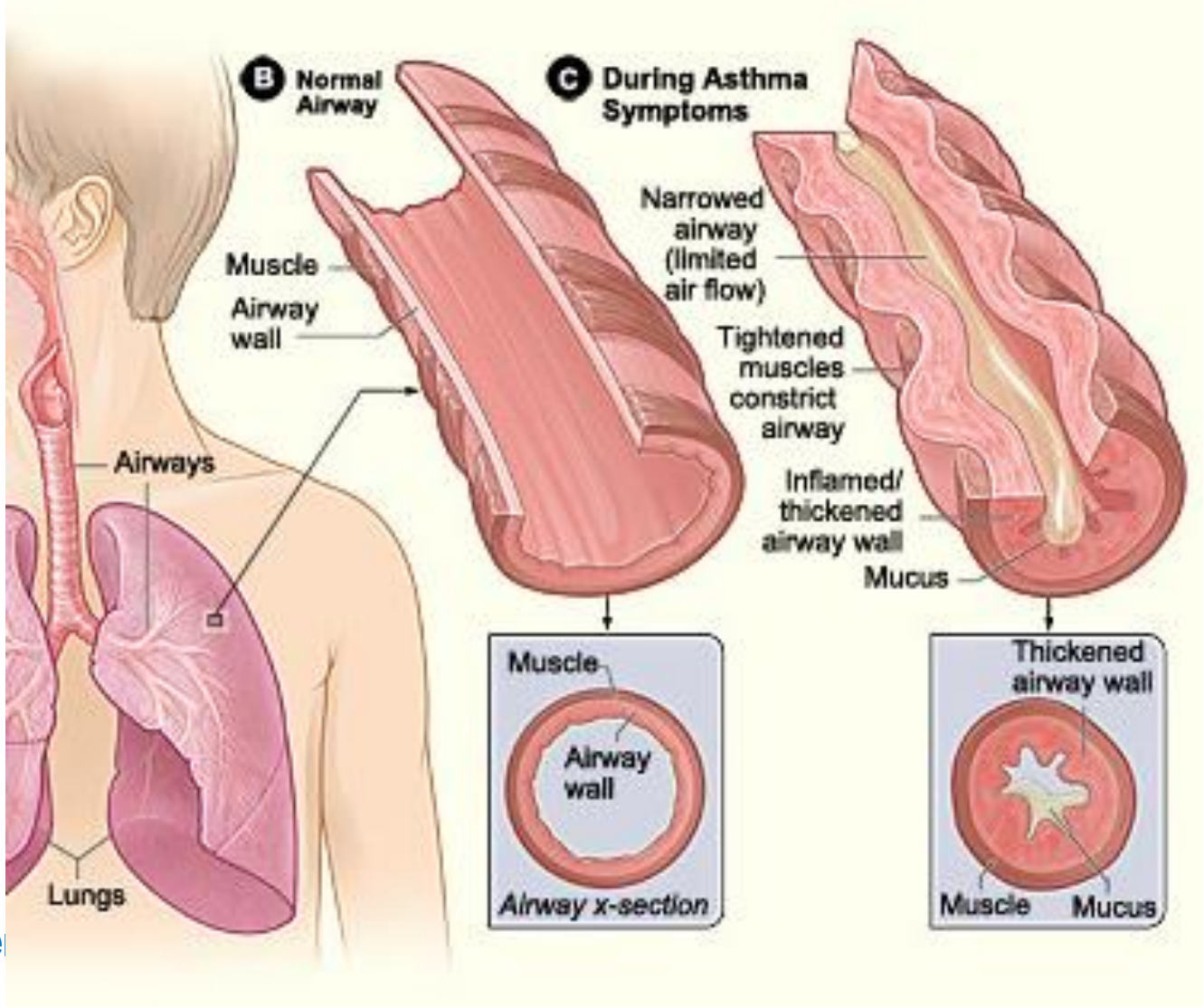
Objectives: By the end of this activity the participants will:

- Review and Determine how to implement GINA guideline doses in 6-11 year olds.
- Discuss and decide if Beta Agonists should be used before exercise.
- Contemplate when and if albuterol should be prescribed without anti-inflammatory medications.

Forget everything you thought you knew.

As you get older, three things happen.
The first is your memory goes.
I don’t remember the other two.

What is Asthma?



Cleveland Clinic Childre

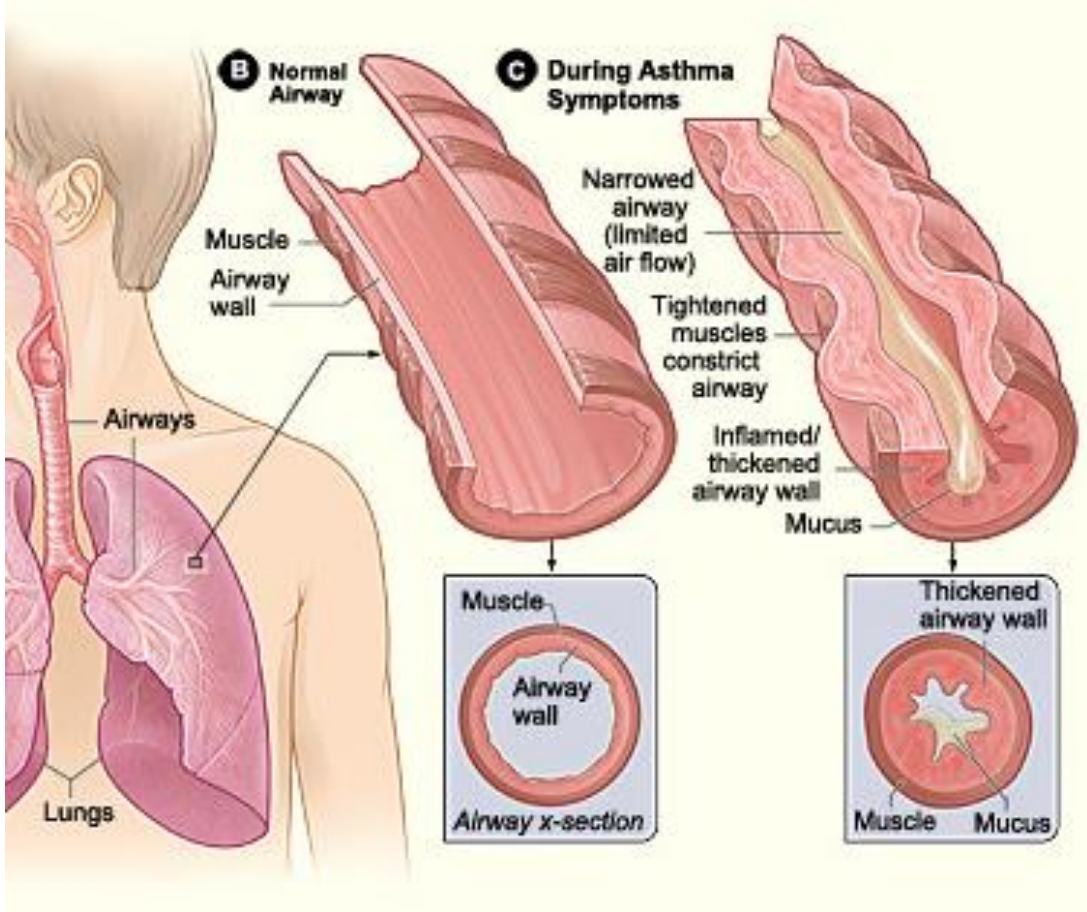
Picture from Open Access Photos- Source NIH

What is Asthma?

Symptoms:

- Adults: Cough, tightness, wheezing noises in chest, SOB
- Kids: Cough, Tachypnea, Parents cannot sleep

Variable airway obstruction



Picture from Open Access Photos- Source NIH

Triggers of Asthma Symptoms:

- Viruses
- Allergens
- Irritants
- Laughing
- Cold air exposure
- Exercise

Case: 8-year-old with rhinitis

- Collateral history:
  - Mild eczema
  - Cough with exercise during pollen season, oral steroid use 1-2 times per year typically during seasons. Given by PCP
- SPT: Positive to cat, dog, dust mites, tree, grass, weed.

Case: 8-year-old with rhinitis

- Cough + Allergies= Asthma
- Reversible airway obstruction
- (Picture of pre post bronchodilator)

Case: 8-year-old with allergic rhinitis

- Over last four weeks:
  - Coughing 3 times per week during day during exercise
  - Coughing keeping him up at night once per week.
  - Uses Albuterol without a spacer.
  - Wants oral steroids at home.
- Severity? Risk? Control?

Case: 8-year-old with allergic rhinitis

At this time:

Write down or think about what therapy you would start this patient on?

Save this for later.

Case: 8-year-old with allergic rhinitis

- Severity? Risk? Control?
  - Severity: Moderate persistent
  - Control: Uncontrolled
  - Risk- High

Case: 8-year-old with cough
What is GINA?

- Global Initiative for Asthma
- International Guidelines
- Updated yearly
- Based on studies from 1 year before.
- Major change in 2019- SMART

Case: 8-year-old with cough
Why use GINA?

- GINA 2024 freely available
- GINA 2025 available now.
- Last NAEPP update- 2020
- EPR-4 used data from before 10/18
- EPR-5???

Case: 8-year-old with cough What does GINA 2024 say?

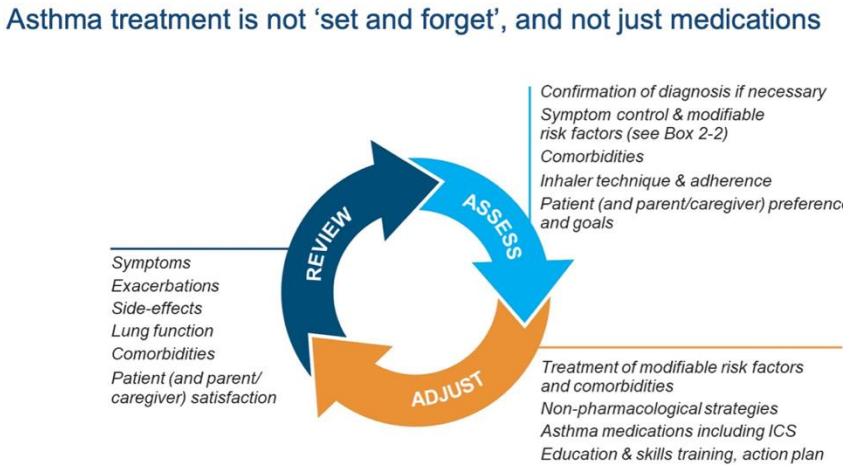
- Characterize control and risk.
- GINA emphasizes step therapy needed for control.
- Can only determine severity retrospectively.
- High Risk: Defined use of oral steroids >1/year, high use of SABA, previous morbidity, biomarkers.

Case: 8-year-old with cough What does GINA 2024/25 say?

- Asthma ≠ Intermittent disease
- Asthma can be severe even if intermittent
- Atopy increases risk for asthma.

Case: 8 year old with cough What does GINA 2024/25 say?

- Need to teach patients how to treat
  - When to stop treatment
  - When to restart treatment
- Discuss risk of oral steroids
- SABA treats symptoms, not inflammation



Case: 8 year old with cough What does GINA 2024/25 say?

- Home Nebulization of SABA not recommended.
  - Increased risk of severe exacerbations
  - Increased risk of mortality
  - Transmits viruses
  - SABA MDI faster, less risk.

Case: 8 year old with cough What does GINA 2024/25 say?

- High Doses of ICS should be limited to 3-6 months.

Fluticasone Propionate MDI Low/Medium/High Dose 6-11 yo

LOW DOSE: 50-100

MEDIUM DOSE: 100-200

HIGH DOSE: >200

Inhaled corticosteroid (alone or in combination with LABA)	Total daily ICS dose (mcg) – see notes above		
	Low	Medium	High
Adults and adolescents (12 years and older)			
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 11-3, p.195			
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

Case: 8 year old with cough What does GINA 2024/25 say?

- Goals of therapy:
  - Reduce symptoms
  - Reduce exacerbations
    - ED
    - Hospitalizations
    - Oral Steroid Use (And cumulative risk of these meds)
    - Reduce morbidity/mortality

What therapies achieve those goals? >12 year old

- ICS/LABA vs SABA
  - ↓ Severe exacerbations 60-64%.(Sygma 1, Novel START)
- PRN ICS/LABA vs ICS Daily + SABA
  - Risk of exacerbation similar
  - Patients used as needed inhaler 30% of days vs daily ICS
  - Patients preferred as needed ICS/LABA over daily ICS (Baggott 2020 and 2022, Foster 2020 and 2022)

Goals:

↓ symptoms↓ exacerbations

↓ ED

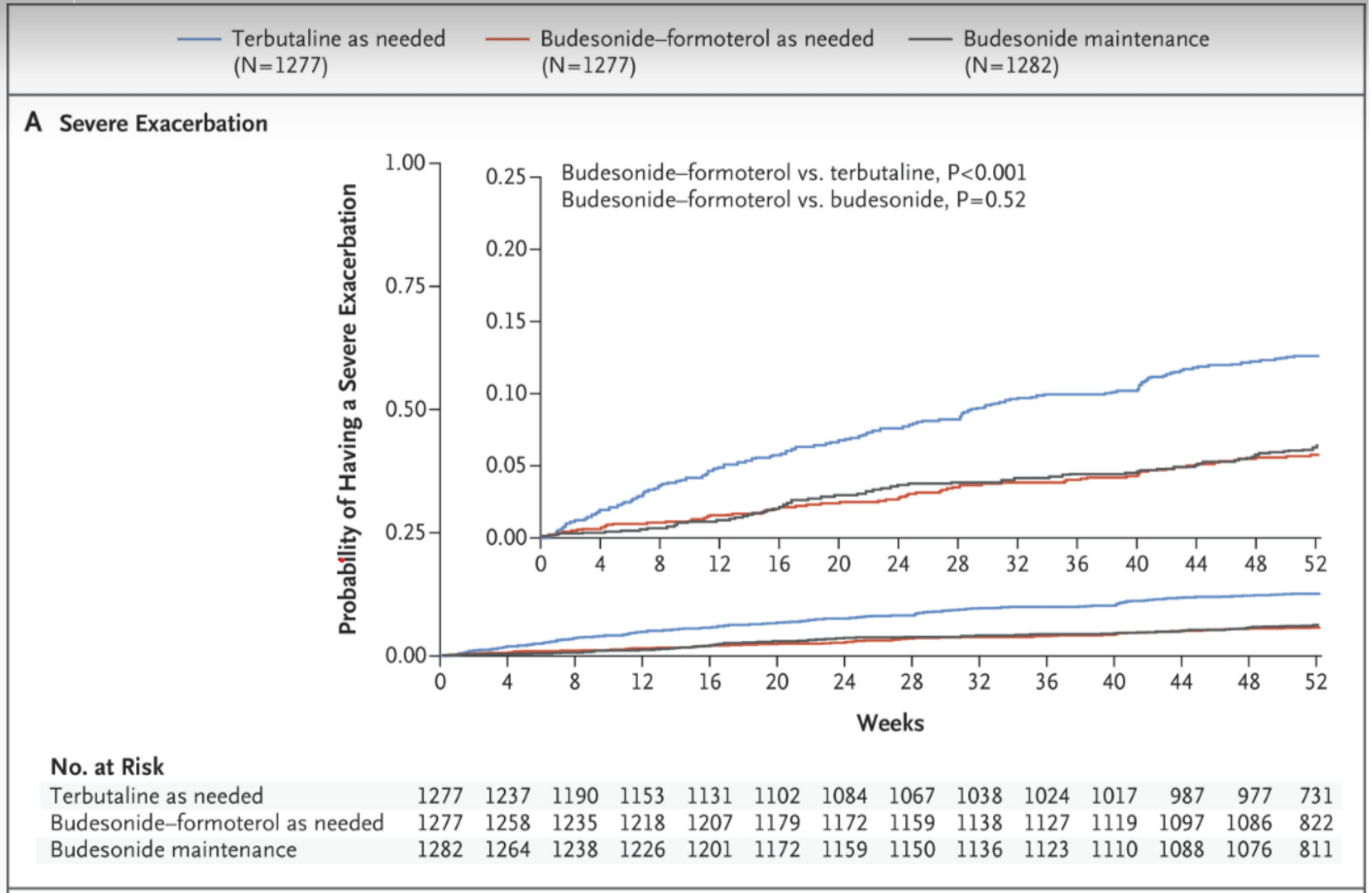
↓ Hospitalizations

↓ Oral Steroid Use

↓ morbidity/mortality

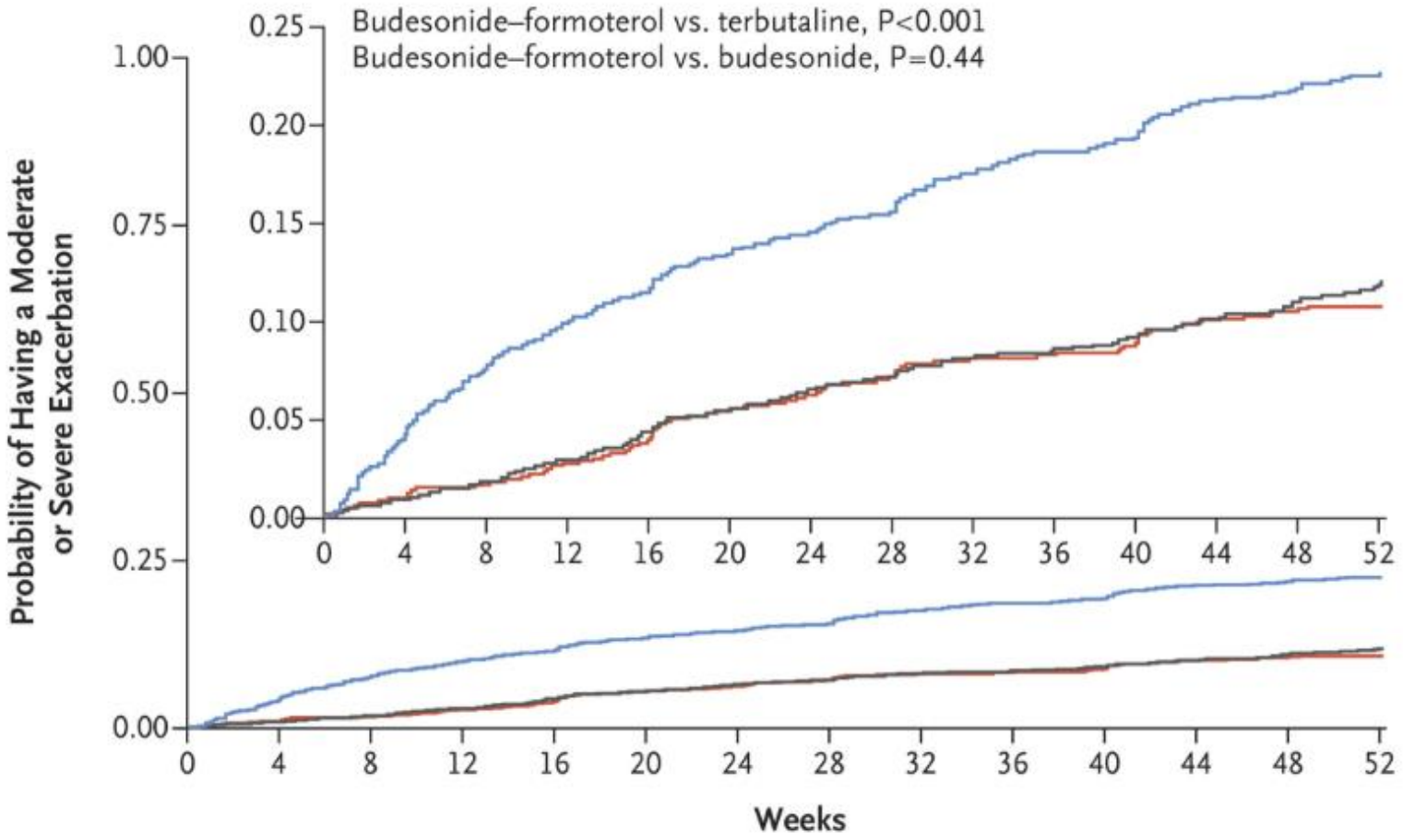
FIGURE 3

Time to First Exacerbation.



O'Byrne, Paul M et al. "Inhaled Combined Budesonide–Formoterol as Needed in Mild Asthma." *The New England journal of medicine* 378.20 (2018): 1865–1876

B Moderate or Severe Exacerbation



No. at Risk

Terbutaline as needed	1277	1210	1143	1098	1069	1031	1010	990	955	934	923	888	877	660
Budesonide–formoterol as needed	1277	1252	1227	1204	1184	1142	1130	1116	1089	1078	1067	1040	1028	778
Budesonide maintenance	1282	1257	1224	1206	1175	1143	1125	1111	1089	1074	1057	1031	1017	763

O'Byrne, Paul M et al. "Inhaled Combined Budesonide–Formoterol as Needed in Mild Asthma." *The New England journal of medicine* 378.20 (2018): 1865–1876

What therapies achieve those goals?

- MART: ICS/LABA Reduces
  - Severe exacerbations requiring oral steroids.(Sobieraj JAMA 2018, Cates et al, Cochrane 2013)
  - MART more Effective than ICS/LABA + SABA irrespective of eosinophilic and non eosinophilic asthma (Brusselle, et al ERJ 2021)
  - Not just an anti-inflammatory effect- LABA reduced exacerbations vs SABA but greater effect if ICS/LABA (Rabe, Lancet 2006)
  - (Rabe, Lancet 2006)

Goals:

↓ symptoms↓ exacerbations

↓ ED

↓ Hospitalizations

↓ Oral Steroid Use

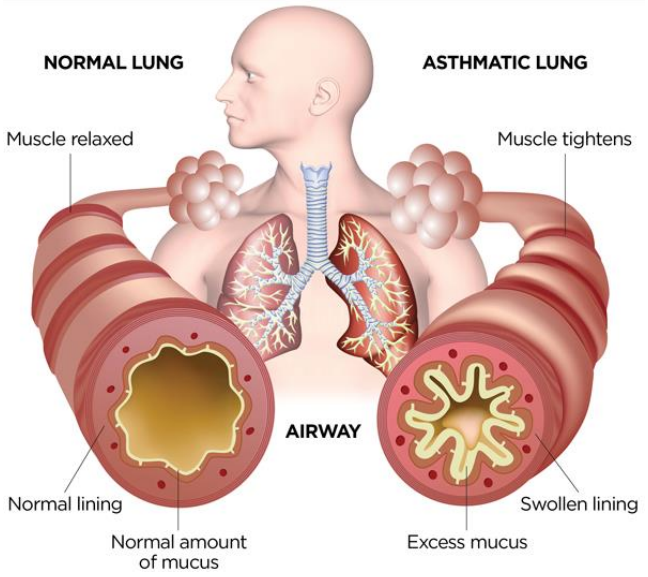
↓ morbidity/mortality

Case: 7 year old with eczema and peanut allergy, cough during exercise

- Comes to you for peanut allergy after moving to area.
- Parents complain he is coughing when he exercises.

Asthma is NOT treated by Albuterol

- Albuterol is not a controller medication.
  - EIB- need to be prevented.
  - There is no recommendation to use SABA before symptoms occur.



Why not Treat with SABA Alone?

What does GINA say?

- 27% of asthma deaths are pts with occasional symptoms (Bergstrom, 2008)
- Triggers unpredictable
- 4-5 lifetime OCS Courses increase risk:
  - Osteoporosis
  - Diabetes
  - Cataracts
  - Heart failure
  - Pneumonia (Price et al. J Asthma Allerg 2018)

- Regular use of SABA even for 1-2 weeks is associated with: (Cockcroft, 2006)
  - Increased AHR
  - Tachyphylaxis (Reduced bronchodilator effect)
  - ↑ Allergic response
  - ↑ Eosinophils
- Using SABA trains patients to use it as their MAIN asthma therapy
- ICS/LABA is more effective and safer than SABA alone or ICS + SABA

Cockcroft, D. W. (2006). "Clinical concerns with inhaled beta2-agonists: adult asthma." *Clinical Reviews in Allergy & Immunology, 31*(2-3), 197–208.

GINA 2024 – 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 including ICS
Education & skills training

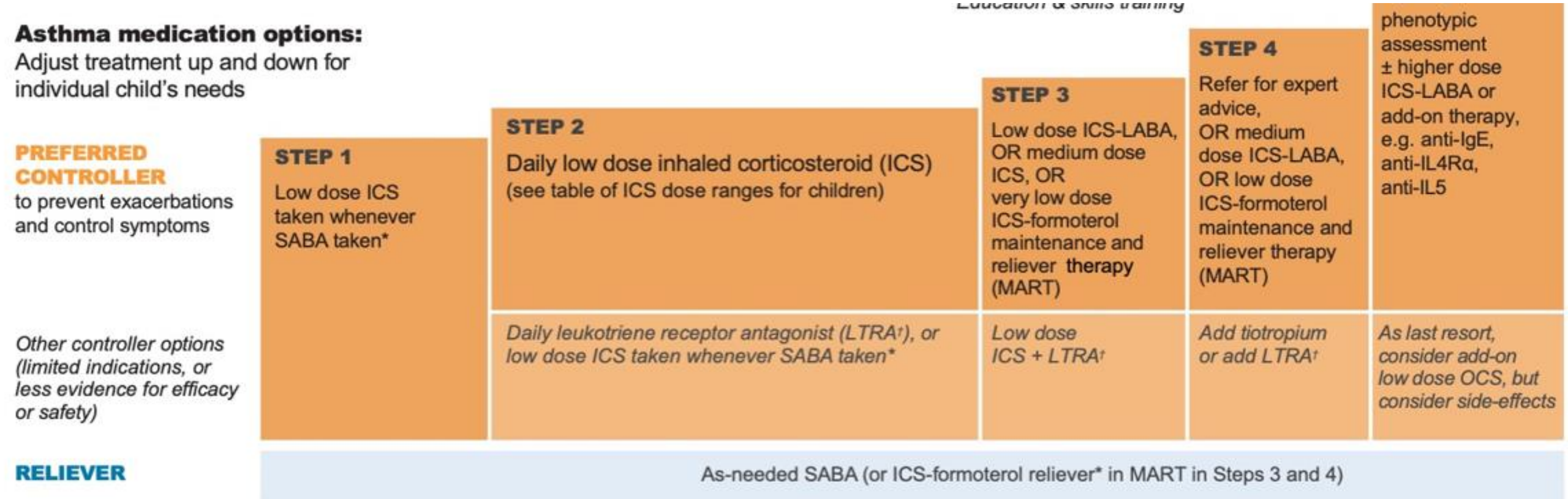
Asthma medication options:
Adjust treatment up and down for individual child's needs

	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 therapy (MART)	Refer for expert advice, OR medium dose ICS-LABA, OR low dose ICS-formoterol maintenance and reliever therapy (MART)	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)		*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 reliever; †advise about risk of neuropsychiatric adverse effects

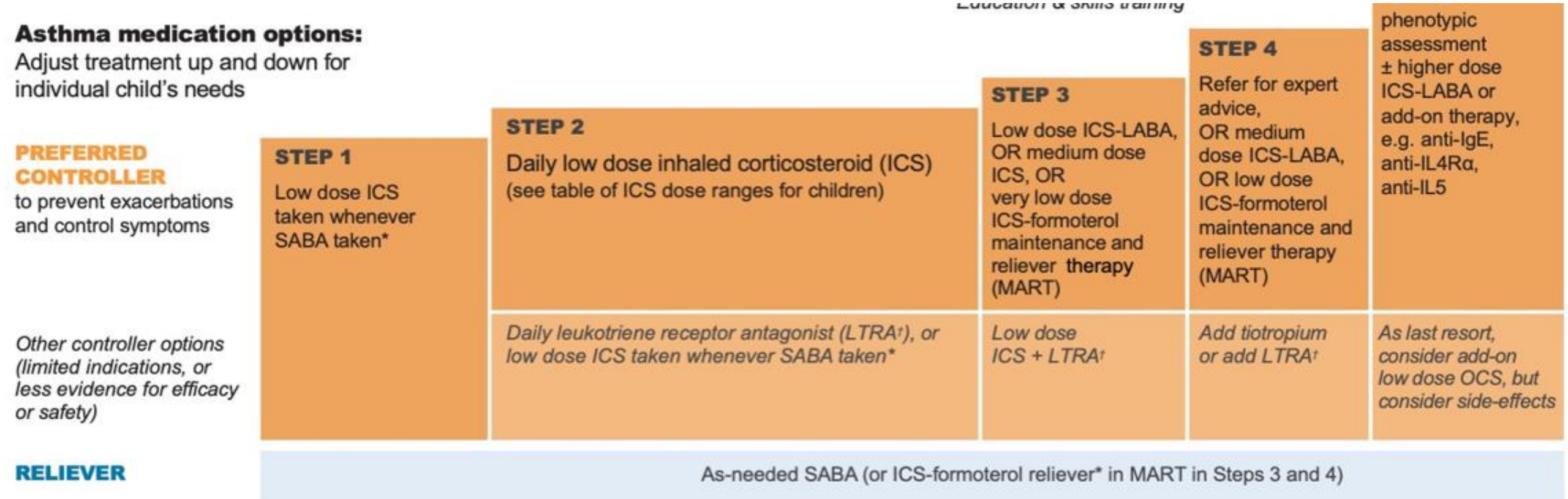
GINA 2024 Children 6-11

- How many different inhalers to do step 1-3?



GINA 2024 Children 6-11

What does VERY LOW DOSE ICS/LABA MART MEAN?



GINA 2024 Children 6-11

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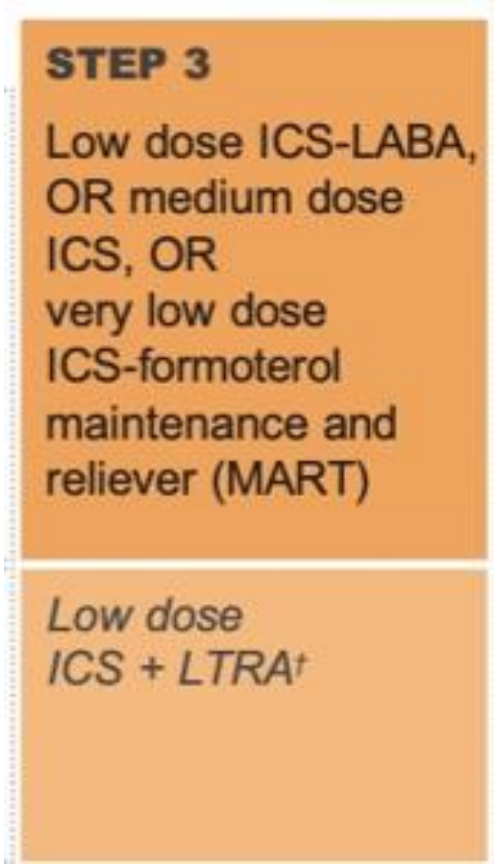
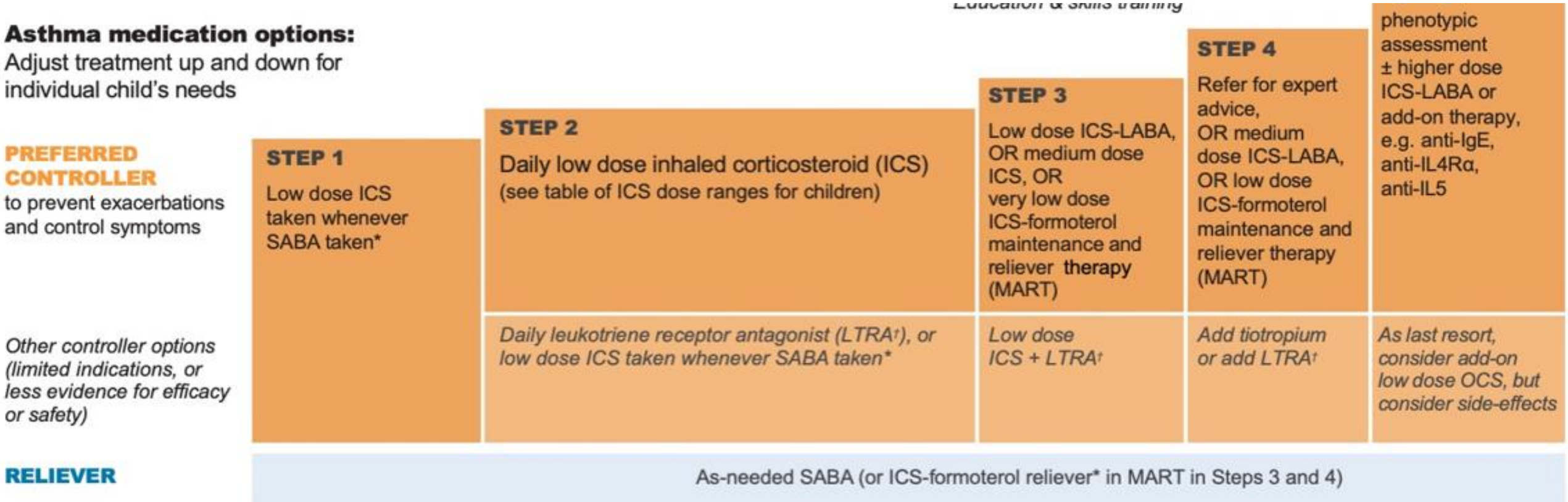


- ICS/LABA is Budesonide/Formoterol MDI 80/4.5mcg
  - VERY LOW DOSE MAINTENANCE IS:
    - ONE Puff ONCE per day
  - Rescue doses are:
    - ONE puff up to SEVEN more times per day
    - 6-11 max doses per day is 8 puffs
    - Note: patients very rarely need this much

GINA 2024 Children 6-11

What does LOW DOSE ICS/LABA MART MEAN?



GINA 2024 Children 6-11

What does VERY LOW DOSE ICS/LABA MART MEAN?

STEP 4

Refer for expert advice, OR medium dose ICS-LABA, OR low dose ICS-formoterol maintenance and reliever therapy (MART)

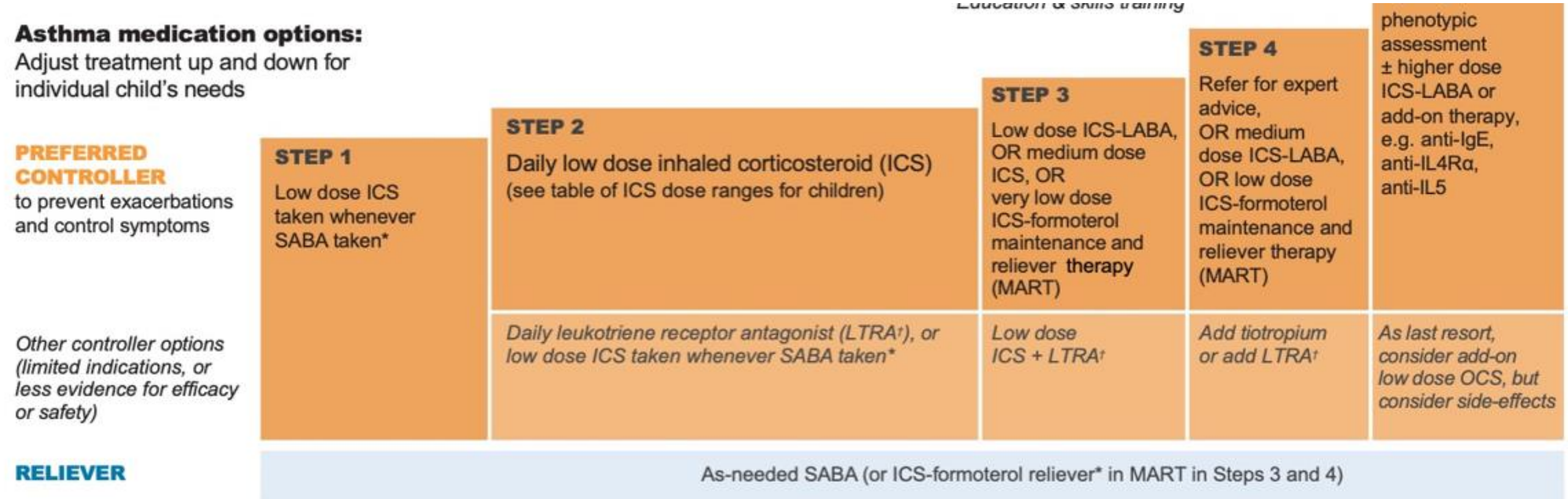
Add tiotropium or add LTRA†

- ICS/LABA is Budesonide/Formoterol MDI 80/4.5mcg
  - LOW DOSE MAINTENANCE IS:
    - ONE Puff TWICE per day
  - Rescue doses are:
    - ONE puff up to SIX more times per day
    - 6-11 Y/O max doses per day is 8 puffs
    - Note: patients very rarely need this much

Oh my, good lord!
Someone pour me up a double shot of …

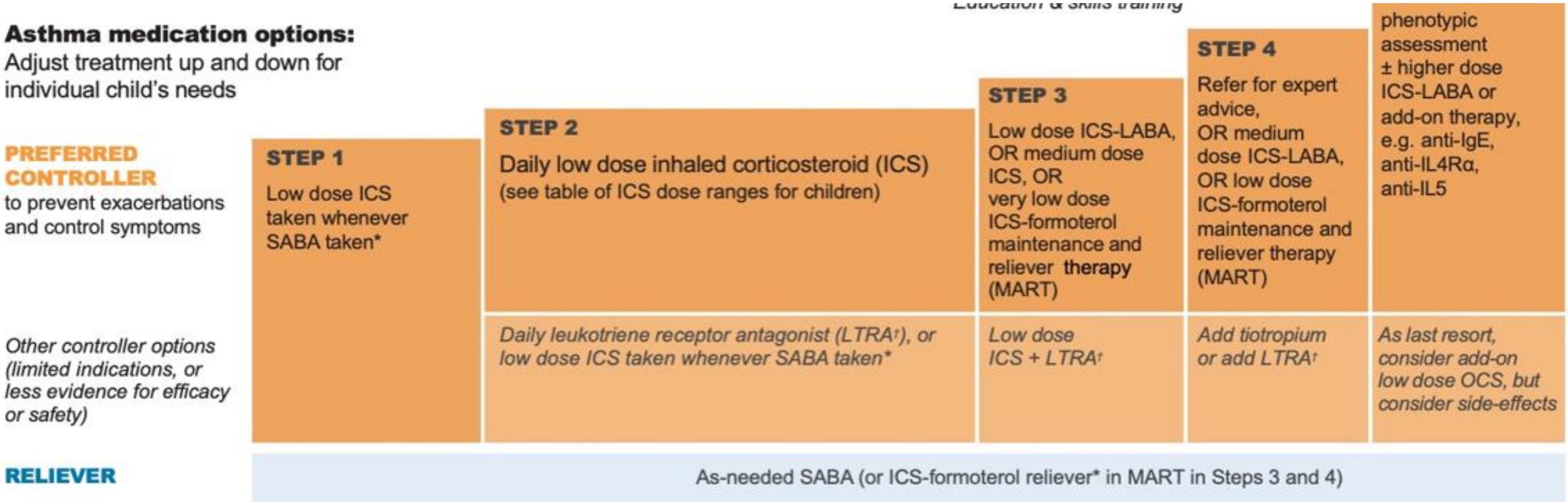
(Shaboozey et al. *A bar song.* Where I've been isn't where I am going. 2024.)

- How many different inhalers to do step 1-3?



GINA 2024 Children 6-11: WWBSP

ICS/LABA PRN for step 1-4.



Case Again (Finally): 8-year-old with allergic rhinitis

- Over last four weeks:
  - Coughing 3 times per week during day during exercise
  - Coughing keeping him up at night once per week.
  - Uses Albuterol without a spacer.
  - Wants oral steroids at home.
- Now what?

Case: 8-year-old with allergic rhinitis

At this time:

Based on what we just reviewed?

Write down or think about what therapy you would start this patient on?

Compare to previous answer.

8 year old with asthma: Exercise induced symptoms

- Tells you that the previous doc told them to use albuterol before exercise as he had exercise induced asthma?
- Asks you what to do before exercise?

What is exercise induced asthma?

- Is it different than regular asthma?
- What is exercise induced Bronchospasm?

- Write down or think to yourself ?
  - How do you currently treat exercise induced asthma?

What is exercise induced asthma?

- Is it different than regular asthma?
- What is exercise induced Bronchospasm?

- Write down or think to yourself ?
  - How do you currently treat exercise induced asthma?

Is it okay to use albtuerol before exercise?

- How often do kids exercise?
- What are the risks?
- Would you call this rescue therapy or controller therapy?
- Is Albuterol an asthma controller?

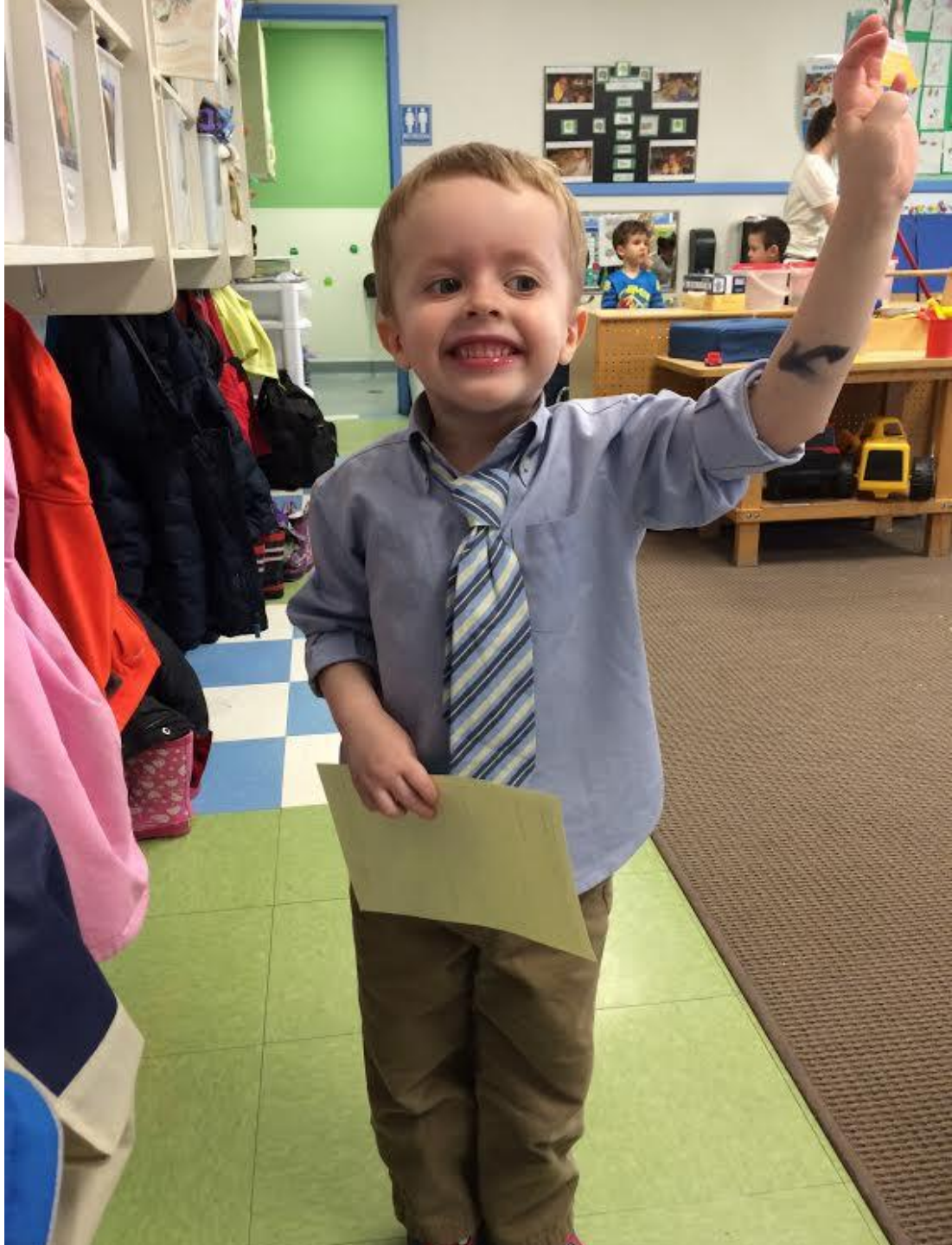
Finally…What is the role of Albuterol?

- Studies being done on PRN ICS or PRN ICS/LABA in 6-11 and 0-5 age range.
- How does the lag in studies in pediatrics affect our patients day to day?
- What studies do we have about using albuterol alone?

"Skate to where the puck is going, not where it has been”
- Wayne Gretsky

- Do we have to wait for studies to implement AIR or MART in practice.

What Questions Do You Have?



ASAP Conference slides end here.

Stepping down EPR-4: 4-11 Years

	Intermittent Asthma	Management of Persistent Asthma In Individuals Ages 5–11 Years				
Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA	Daily and PRN combination low-dose ICS-formoterol▲	Daily and PRN combination medium-dose ICS-formoterol▲	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA
Alternative		Daily LTRA,* or Cromolyn,* or Nedocromil,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LTRA,* or daily low-dose ICS +Theophylline,* and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA or Daily medium-dose ICS + LTRA* or daily medium-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* or daily high-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* + oral systemic corticosteroid or daily high-dose ICS + Theophylline* + oral systemic corticosteroid, and PRN SABA

Stepping down EPR-4: Step 3- Step2
5-11 Year-olds

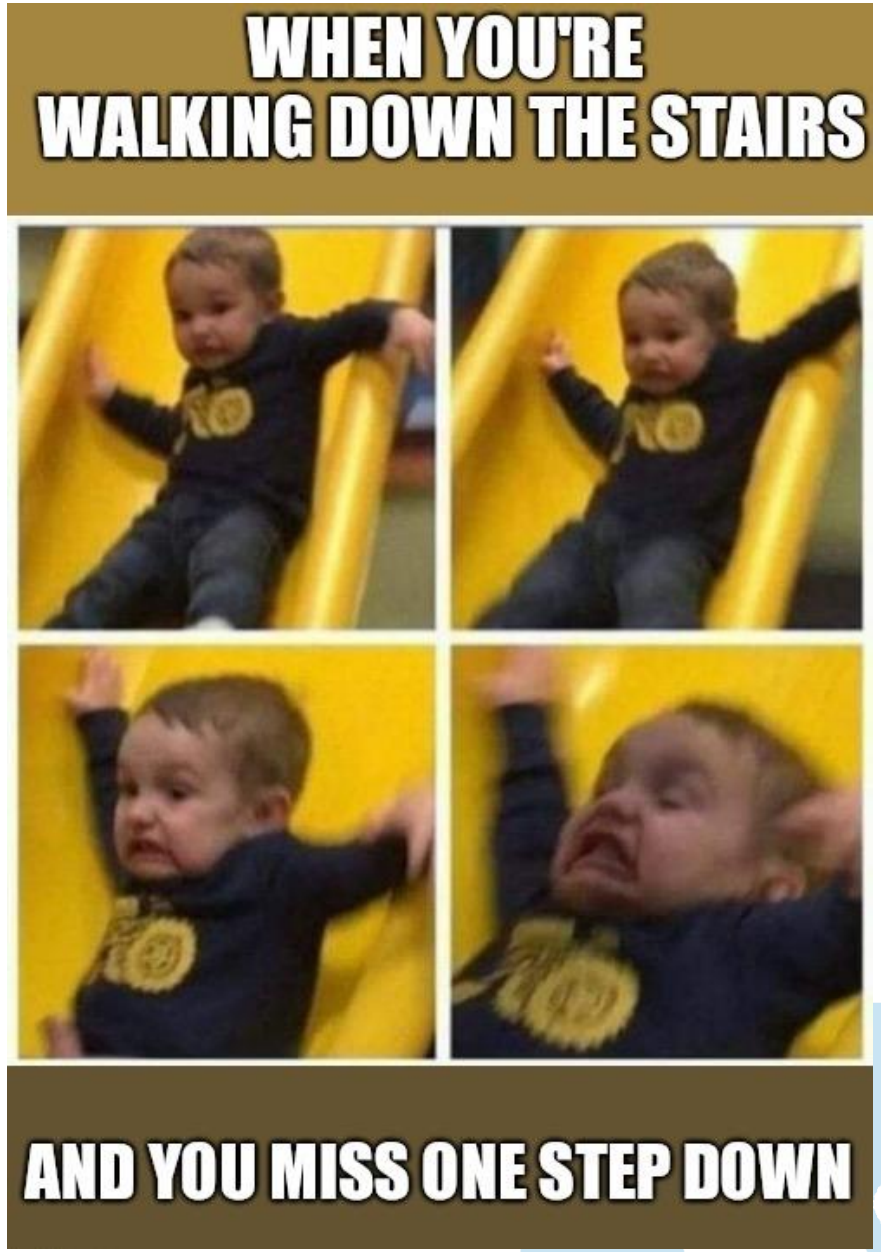
- Preferred Option 1:
  - low dose ICS
  - PRN SABA

Treatment	STEP 2	STEP 3
Preferred	Daily low-dose ICS and PRN SABA	Daily and PRN combination low-dose ICS-formoterol▲
Alternative	Daily LTRA,* or Cromolyn,* or Nedocromil,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LTRA,* or daily low-dose ICS +Theophylline,* and PRN SABA

Stepping down EPR-4: Step 2- Step 1
4-11 Year-olds

- Option 1:
  - PRN SABA!?!

Treatment	STEP 1	STEP 2
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA
Alternative		Daily LTRA,* or Cromolyn,* or Nedocromil,* or Theophylline,* and PRN SABA


WHEN YOU'RE
WALKING DOWN THE STAIRS
AND YOU MISS ONE STEP DOWN

ASTHMA ACTION PLAN

For: _____ Doctor: _____ Date: _____

Doctor's Phone Number: _____ Hospital/Emergency Department Phone Number: _____

GREEN ZONE

DOING WELL

- No cough, wheeze, chest tightness, or shortness of breath during the day or night
- Can do usual activities

And, if a peak flow meter is used,

Peak flow: more than _____
(80 percent or more of my best peak flow)

My best peak flow is: _____

Daily Medications

Medicine	How much to take	When to take it

Before exercise	☐ _____	☐ 2 or ☐ 4 puffs	5 minutes before exercise

YELLOW ZONE

ASTHMA IS GETTING WORSE

- Cough, wheeze, chest tightness, or shortness of breath, or
- Waking at night due to asthma, or
- Can do some, but not all, usual activities

–Or–

Peak flow: _____ to _____
(50 to 79 percent of my best peak flow)

1st

Add: quick-relief medicine—and keep taking your GREEN ZONE medicine.

_____ (quick-relief medicine) _____ Number of puffs **or** ☐ Nebulizer, once

Can repeat every _____ minutes up to maximum of _____ doses

2nd

If your symptoms (and peak flow, if used) return to GREEN ZONE after 1 hour of above treatment:

☐ Continue monitoring to be sure you stay in the green zone.

–Or–

If your symptoms (and peak flow, if used) do not return to GREEN ZONE after 1 hour of above treatment:

☐ Take: _____ (quick-relief medicine) _____ Number of puffs **or** ☐ Nebulizer

☐ Add: _____ (oral steroid) mg per day For _____ (3–10) days

☐ Call the doctor ☐ before/ ☐ within _____ hours after taking the oral steroid.

RED ZONE

MEDICAL ALERT!

- Very short of breath, or
- Quick-relief medicines have not helped,
- Cannot do usual activities, or
- Symptoms are same or get worse after 24 hours in Yellow Zone

–Or–

Peak flow: less than _____
(50 percent of my best peak flow)

Take this medicine:

☐ _____ (quick-relief medicine) _____ Number of puffs **or** ☐ Nebulizer

☐ _____ (oral steroid) mg

Then call your doctor NOW. Go to the hospital or call an ambulance if:

- You are still in the red zone after 15 minutes AND
- You have not reached your doctor.

DANGER SIGNS

- **Trouble walking and talking due to shortness of breath**
- **Lips or fingernails are blue**

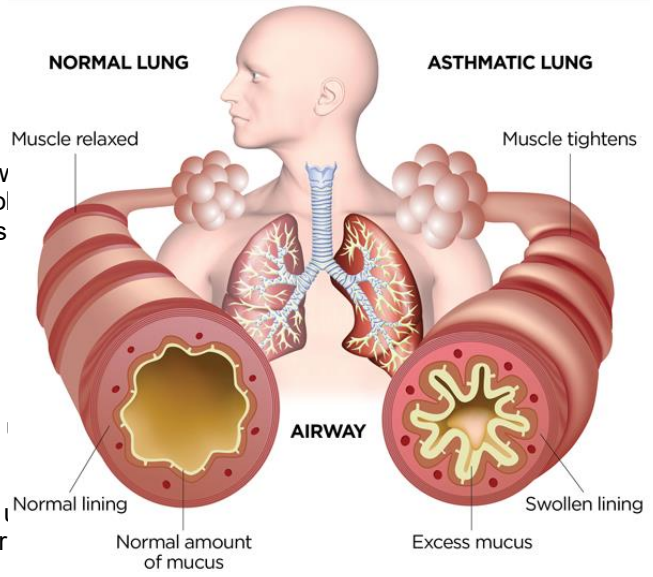
- **Take _____ puffs of _____ (quick relief medicine) AND**
- **Go to the hospital or call for an ambulance _____ (phone) NOW!**

Ted Lasso (Not Walt Whitman)

https://www.snopes.com/fact-check/be-curious-not-judgmental-walt-whitman/

Does it make sense to treat patients with asthma using albuterol alone?

- Albuterol is not a controller medication.
  - EIB- need to be prevented.
  - There is no recommendation to use SABA before symptoms occur.



Short answer:

Using albuterol before exercise is using this medication as a prevention medication. Albuterol is a rescue medication covers up symptoms if they w going to occur during exercise. In that case it becomes harder to recognize when the asthma has become uncontrolled and a step up in contro medication is necessary. The medications that are recommended to prevent asthma symptoms when exercising are the controller medications someone is using albuterol before exercise, then they may not start asthma prevention/controller medications before an asthma exacerbation occurs.

Exercise does not "cause" asthma. It triggers the bronchoconstriction which is occurring due to the inflammation in the bronchial tubes. Therefore, albuterol alone is not treating asthma. It is covering up the symptoms of uncontrolled inflammation.

Using AIR (Anti-inflammatory Rescue) medications before exercise has not been studied. Nor has albuterol use. However, if someone is routinely AIR therapy before exercise, they would be getting anti-inflammatory controller type of medications along with the beta agonist medication to tr symptoms. This means that using the medication before exercise is being treated with a controller medication and the inflammation is being addressed.

Longer answer with references:

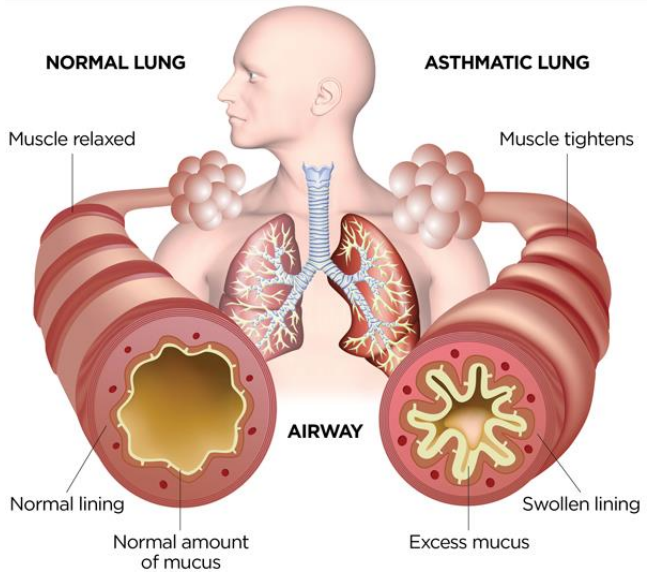
Using albuterol to "prevent" symptoms does not control the underlying disease; it merely masks symptoms. Albuterol does not treat inflammation. It helps relieve bronchoconstriction. Using albuterol before exercise makes it difficult for both patients and clinicians to assess whether asthma is well-controlled.

Guideline Recommendations:

The 2020 EPR-4 guidelines state that asthma symptoms triggered by allergens, infections, irritants, or exercise indicate uncontrolled asthma and warrant controller therapy.

What are the potential harms of using SABA (albuterol) without ICS before exercise?

There are direct and indirect harms when using SABA without ICS.



Direct Medical Side effects of SABA use are:

- Tachycardia
- Agitation
- Tremor
- Palpitations

Less Common or More Severe Side Effects

- **Hypokalemia** – beta-2 agonists drive potassium into cells, lowering serum potassium
- **Hyperglycemia** – from glycogenolysis and gluconeogenesis
- **Chest pain** – particularly in those with underlying cardiac disease
- **Hypertension or hypotension** – due to vascular effects

Indirect Side effects:

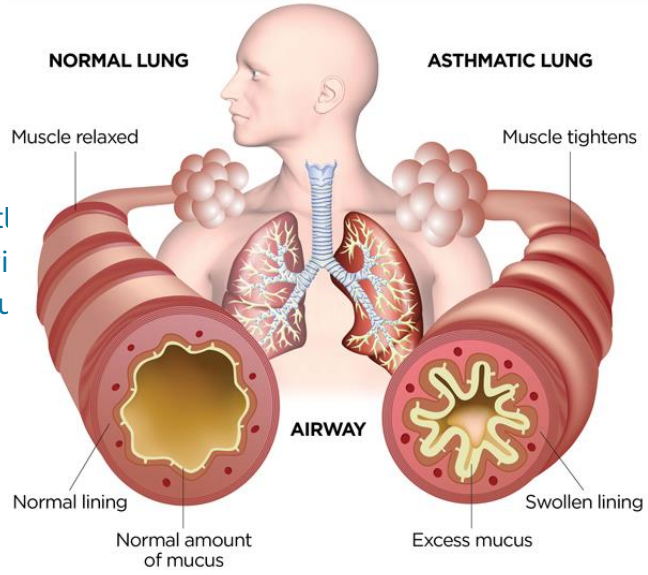
- **Tachyphylaxis: Overuse** can lead to **decreased effectiveness** and increased **airway hyperresponsiveness**.
- **Increased Risk of Death due to uncontrolled asthma: Frequent use (e.g., >2 days/week)** can signal **poor asthma control** and the need to step up controller therapy (like inhaled corticosteroids).
    - Risk factors for death from asthma include use of more than one cannister of albuterol per month. (Suissa S, Ernst P, Boivin JF, Horwitz RI, Habbick B, Cockroft D, Blais L, McNutt M, Buist AS, Spitzer WO. A cohort analysis of excess mortality in asthma and the use of inhaled beta-agonists. Am J Respir Crit Care Med. 1994 Mar;149(3 Pt 1):604-10. PMID: 8118625.)
    - Each albuterol cannister comes with 200 puffs. That is 100 typical doses of two puffs per month.
    - Well controlled asthma is when rescue medications are used less than twice per week. Two doses of albuterol per week is 4 puffs per week. With 52

What is the role of preventative treatment when exercise is the primary trigger?

Answer: There is significant confusion surrounding the concept of "exercise-induced asthma." The term implies that exercise causes asthma, which is incorrect. According to the UpToDate article on Exercise-Induced Bronchoconstriction (EIB) accessed on March 12, 2025, written by Paul O'Byrne, MD, with section editors Peter Barnes, MD, and Robert Wood, MD (Literature review updated February 2025, topic last updated November 25, 2025):

"Exercise-induced bronchoconstriction describes the acute onset of bronchoconstriction occurring during, or more frequentl minutes after exercise. The term 'exercise-induced asthma' is often used to describe episodic bronchoconstriction followi exercise. However, this wording is potentially misleading because exercise is not an independent risk factor for asthma, bu rather a trigger of bronchoconstriction in patients with underlying asthma."

Reference: Storms WW. Asthma associated with exercise. Immunol Allergy Clin North Am. 2005 Feb;25(1):31-43. doi: 10.1016/j.iac.2004.09.007. PMID: 15579363.



Key Points:

1. **There is no such thing as "exercise-induced asthma."** Asthma is an inflammatory condition triggered by various factors, including viral infections, allergens, cold air, laughter, and exercise. Inflammatory asthma is not "caused" by exercise but rather triggered by it.
2. **Exercise-Induced Bronchoconstriction (EIB) is distinct from asthma.** True non-inflammatory EIB is not asthma and has its own practice parameters established by the AAAAI in 2016.
    1. *"EIB is frequently documented with asthma and reflects insufficient control of underlying asthma. Elite athletes have a*