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Asthma & COPD

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I have no financial disclosures to report.

If not otherwise indicated, recommendations come from GINA for asthma and GOLD for COPD.

I will use some abbreviations:

SABA:	short-acting β-agonist i.e. albuterol	LABA:	long-acting β-agonist e.g. formoterol, olodaterol
SAMA:	short-acting muscarinic antagonist i.e. ipratropium	LAMA:	long-acting muscarinic antagonist e.g. tiotropium
		ICS:	inhaled corticosteroid

Learning objectives

Asthma:

- How to diagnose
- Use SMART* therapy when possible
- Medium-dose ICS is enough
- Review biologics

COPD:

- Pulmonary rehab
- Limit ICS
- New medications
- Who benefits from oxygen

*(S)MART: (single) maintenance and reliever therapy

Diagnosis of asthma: consistent symptoms + variable expiratory airflow

No single diagnostic test

Commonly over-diagnosed[1]

- 50% with “asthma” not tested
- 33% with “asthma” did not have asthma on testing

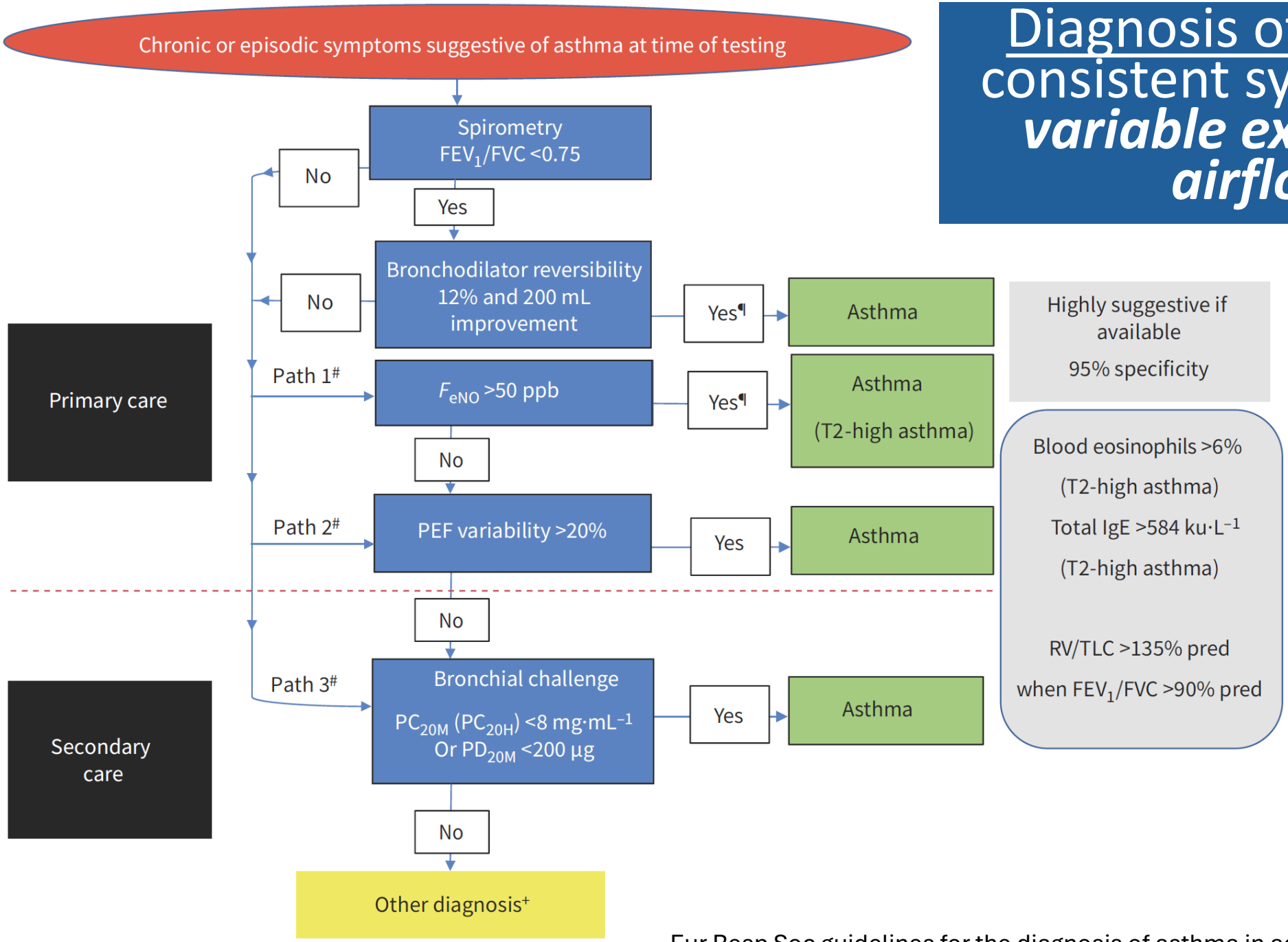
Commonly under-diagnosed[2]

- General population screening, 10% had symptoms of asthma &/or rhinitis
- Half confirmed to have asthma
- 2/3 of these previously undiagnosed

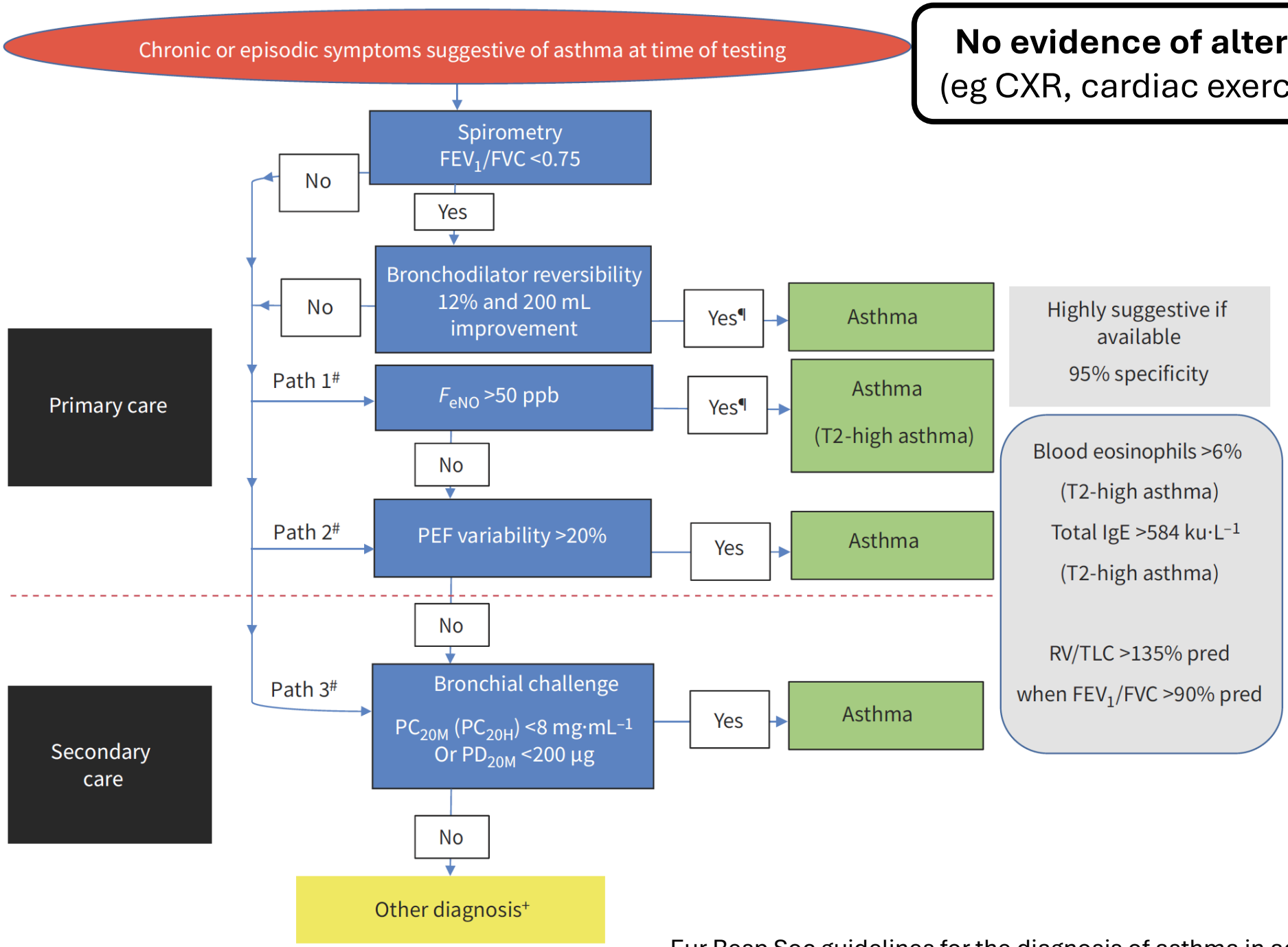
1. Aaron SD et al. JAMA 2017;317:279

2. Nolte H et al. Respir Med. 2006;100:354

Diagnosis of asthma: consistent symptoms + *variable expiratory airflow*



Eur Resp Soc guidelines for the diagnosis of asthma in adults. ERJ. 2022;60:2101585.



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DIAGNOSING ASTHMA: Peak Flows

Serial Peak Expiratory Flow Rate (PEFR) Monitoring

Record values twice daily x 14 days

- Record the best of 3 attempts (highest PEFR)
- Once in the morning, once in the evening

$$\text{Daily PEFR Variability} = \frac{\text{(Highest Value - Lowest value)}}{\text{(Mean Value)}}$$

- Average PEFR variability >10% (GINA) } consistent with asthma
  >20% (ERS) }

Global Initiative for Asthma (GINA) Guidelines. 2021.

53 y.o. man with asthma routine appointment.

Reports he's "not great"
Takes medium dose LABA/ICS
BID + PRN using 4-8 puffs daily
Waking at night
Hard to keep up with kids

Avoiding known triggers
Unremarkable exam
Resting O_2 saturation 98%
Vaccinations up to date
PFTs: moderate obstruction with normalization post-bronchodilator

You should (choose all that apply):

1) Add LAMA
2) Check inhaler technique
3) Increase to high-dose LABA/ICS
4) Refer to pulmonary
5) Review refill history

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You should (choose all that apply):

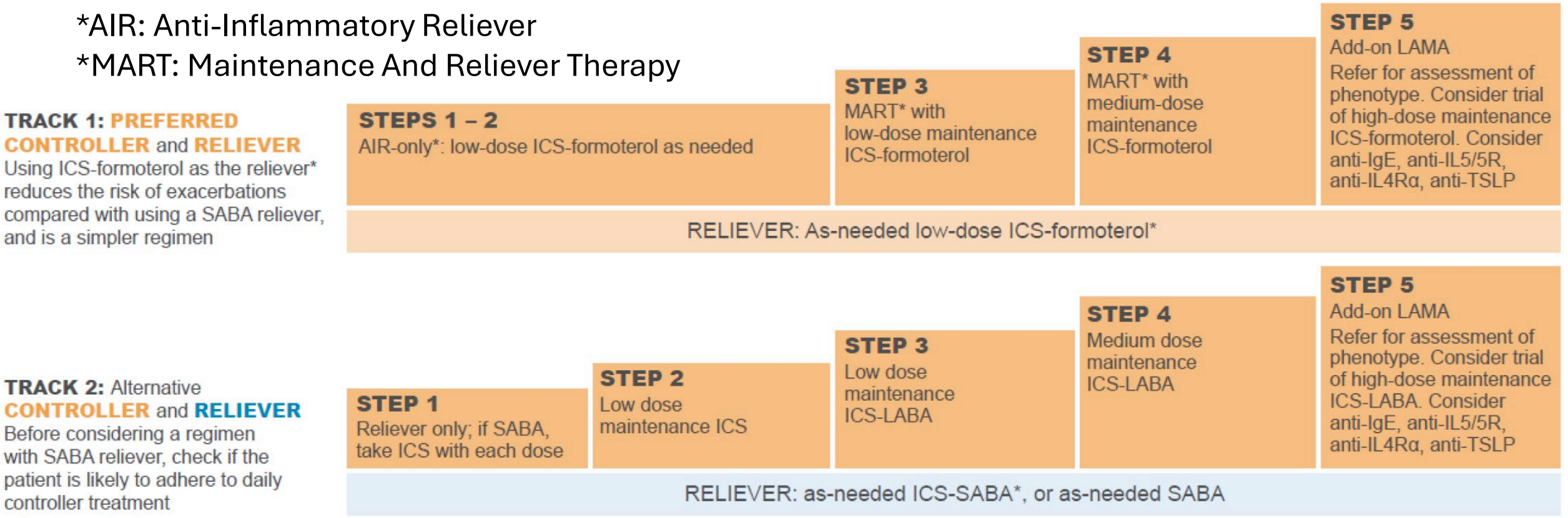
1) Add LAMA
2) Check inhaler technique
3) Increase to high-dose LABA/ICS
4) Refer to pulmonary
5) Review refill history

All reasonable choices but
I recommend:
First, review refill history &
check inhaler technique
Then, add LAMA & refer to
pulm to consider biologic

GINA 2025 – Adults & adolescents 12+ years

*AIR: Anti-Inflammatory Reliever

*MART: Maintenance And Reliever Therapy



GINA 2025 – Adults & adolescents 12+ years

*AIR: Anti-Inflammatory Reliever
*MART: Maintenance And Reliever Therapy

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
AIR-only*: low-dose ICS-formoterol as needed

STEP 3
MART* with low-dose maintenance ICS-formoterol

STEP 4
MART* with medium-dose maintenance ICS-formoterol

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

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

Why formoterol?
- only LABA studied for MART
- Faster onset than other LABAs

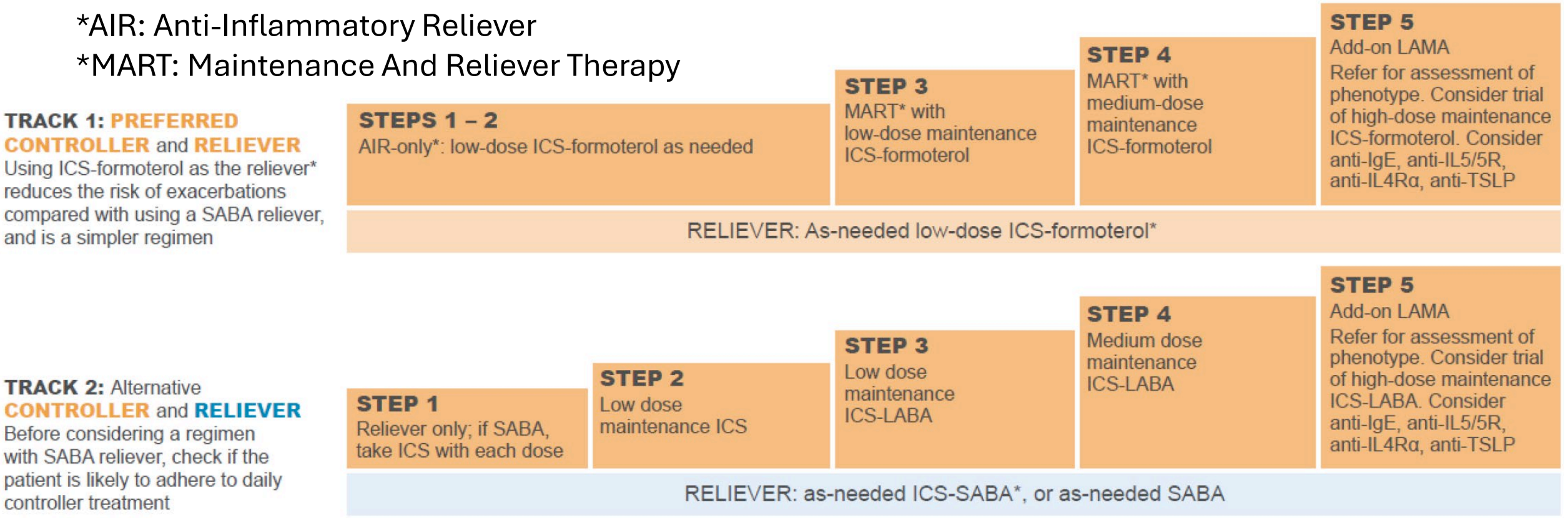
How to prescribe ICS-formoterol for MART?
- ➢ 2 puffs BID + PRN up to 12 puffs/day SO:
- ➢ 2 puff BID + 2 puffs PRN 4 more times/day

But I can't rinse my mouth during day when I use PRN ICS!
- ❖ Probably OK not to rinse after PRN doses of ICS-formoterol
- ❖ No increased oral candidiasis in MART studies (mouth rinsing not required)

GINA 2025 – Adults & adolescents 12+ years

*AIR: Anti-Inflammatory Reliever

*MART: Maintenance And Reliever Therapy



Non-inhaled medications can be considered:

- Sublingual allergen immunotherapy for house dust mites (if FEV1 > 70%)
- Leukotriene receptor antagonists (LTRAs): less effective than ICS

NAEPP 2020 Focused Update

Treatment	Intermittent Asthma	Management of Persistent Asthma in Individuals Ages 12+ Years				
	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6 ■
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA or PRN concomitant ICS and SABA▲	Daily and PRN combination low-dose ICS-formoterol▲	Daily and PRN combination medium-dose ICS-formoterol▲	Daily medium-high dose ICS-LABA + LAMA and PRN SABA▲	Daily high-dose ICS-LABA + oral systemic corticosteroids + PRN SABA
Alternative		Daily LTRA* and PRN SABA or Cromolyn,* or Nedocromil,* or Zileuton,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LAMA,▲ or daily low-dose ICS + LTRA,* and PRN SABA or Daily low-dose ICS + Theophylline* or Zileuton,* and PRN SABA	Daily medium-dose ICS-LABA or daily medium-dose ICS + LAMA, and PRN SABA▲ or Daily medium-dose ICS + LTRA,* or daily medium-dose ICS + Theophylline,* or daily medium-dose ICS + Zileuton,* and PRN SABA	Daily medium-high dose ICS-LABA or daily high-dose ICS + LTRA,* and PRN SABA	

NAEPP 2020 Focused Update

~~Intermittent Asthma~~

Management of Persistent Asthma in Individuals Ages 12+ Years

Treatment	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6 ■
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Alternative			Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LAMA,▲ or daily low-dose ICS + LTRA,* and PRN SABA or Daily low-dose ICS + Theophylline* or Zileuton,* and PRN SABA	Daily medium-dose ICS-LABA or daily medium-dose ICS + LAMA, and PRN SABA▲ or Daily medium-dose ICS + LTRA,* or daily medium-dose ICS + Theophylline,* or daily medium-dose ICS + Zileuton,* and PRN SABA	Daily medium-high dose ICS-LABA or daily high-dose ICS + LTRA,* and PRN SABA	

GINA no longer refers to intermittent asthma. ICS ALWAYS indicated for asthma

Studies on ICS-formoterol for mild asthma had not been completed

BUT high-dose ICS does not prevent exacerbations better than medium-dose ICS*

*Parvord et al. J Allergy Clin Imm In Prac. 2023;2:544

Asthma Action Plan

For: _____ Doctor: _____ Date: _____

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

PEFR: 80 - 100%

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: _____

Take th… Medici… …n to take it

Continue maintenance therapy

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

PEFR: 50-80%

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)

First

Second

Increase ICS
+ add prednisone if not improving

If your symptoms (and peak flow, if used) do not return to GREEN ZONE

❒ Take: _____ ❒ 2 or ❒ 4
(short-acting beta$_2$-agonist)

❒ Add: _____ mg per day
(oral steroid)

❒ Call the doctor ❒ before/ ❒ within _____ hours after taking the oral ster…

PEFR: <50%

RED ZONE

Medical Alert!

- Very short of breath, or
- Quick-relief medicines have not helped, or
- 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 th…

❒ _____

❒ _____

Take prednisone AND
contact provider / go to ED or UC

Then ca… …

- 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**

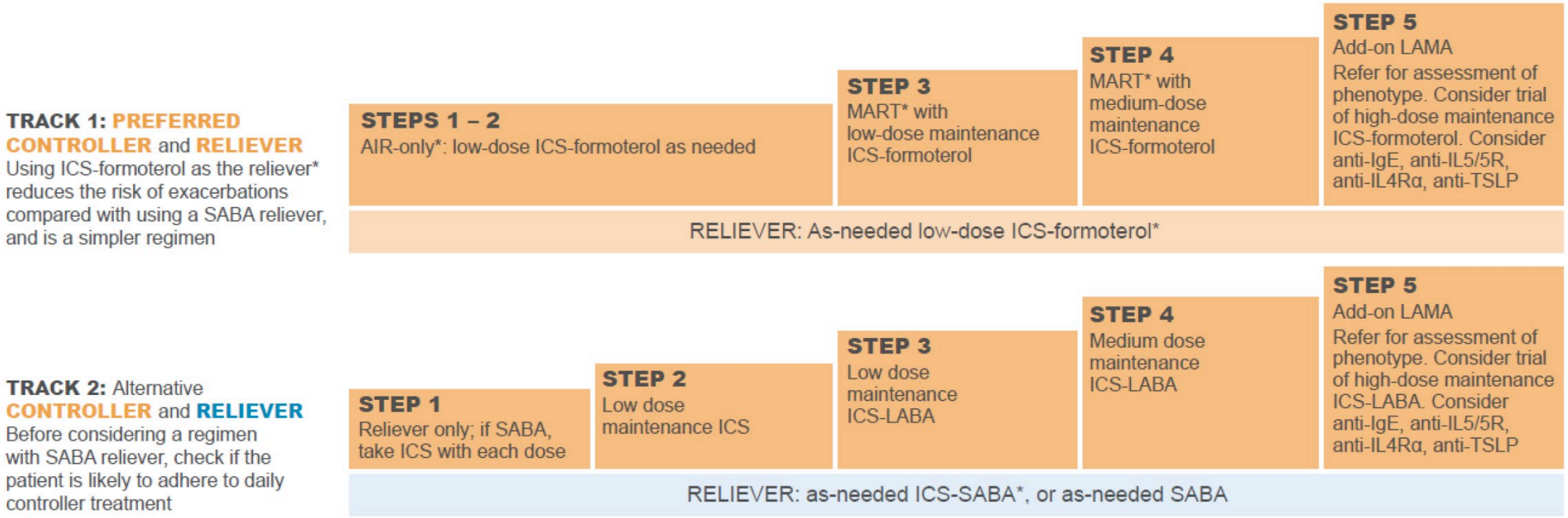
- **Take ❒ 4 or ❒ 6 puffs of your quick-relief medicine AND**
- **Go to the hospital or call for an ambulance _____ NOW!**
(phone)

Classification of Asthma Severity (Youths ≥12 years of age and adults)

Components of Severity		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment **Normal FEV_1/FVC:** **8–19 yr 85%** **20 –39 yr 80%** **40 –59 yr 75%** **60 –80 yr 70%**	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting $beta_2$-agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not >1x/day	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
	Lung function	• Normal FEV_1 between exacerbations • FEV_1 >80% predicted • FEV_1/FVC normal	• FEV_1 ≥80% predicted • FEV_1/FVC normal	• FEV_1 >60% but <80% predicted • FEV_1/FVC reduced 5%	• FEV_1 <60% predicted • FEV_1/FVC reduced >5%
Risk	**Exacerbations requiring oral systemic corticosteroids**	0–1/year (see note)	≥2/year (see note) →		
		← Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time for patients in any severity category. →			
		Relative annual risk of exacerbations may be related to FEV_1			

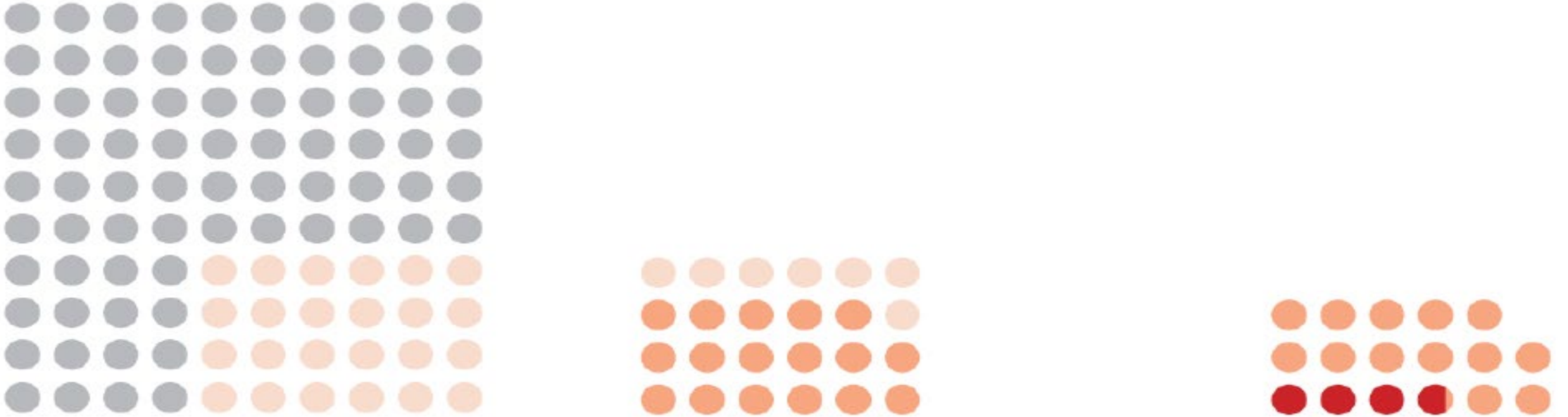
NAEPP EPR3 2007

Severity	Estimated retrospectively by minimum level of treatment required to control symptoms and exacerbations		
	Mild Steps 1 & 2	Moderate Step 3	Severe Steps 4 & 5



GINA 2025

Of patients with asthma, only ~3.7% have severe asthma with good adherence & inhaler technique



24% GINA step 4-5

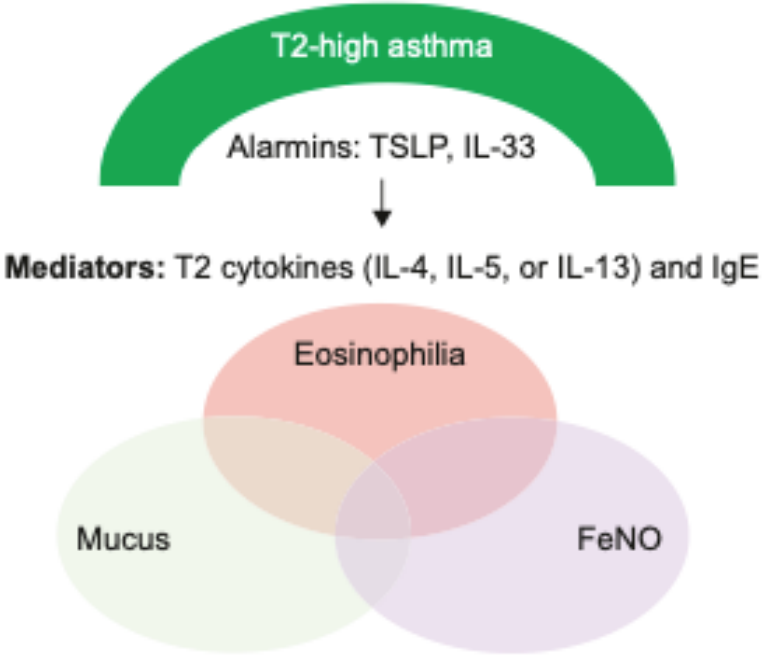
27% GINA step 4-5
+ poor Sx control

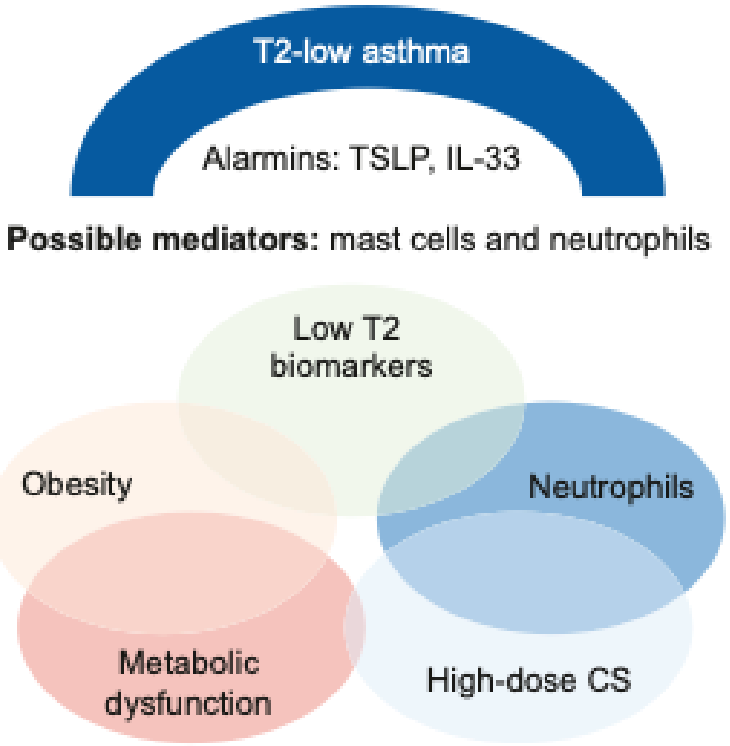
3.7% GINA step 4-5
+ poor Sx control
+ good adherence & inhaler technique

Image from GINA 2015. Data from Hekking et al. 2015

Asthma Phenotype and Endotype: Eos, IgE, FeNO

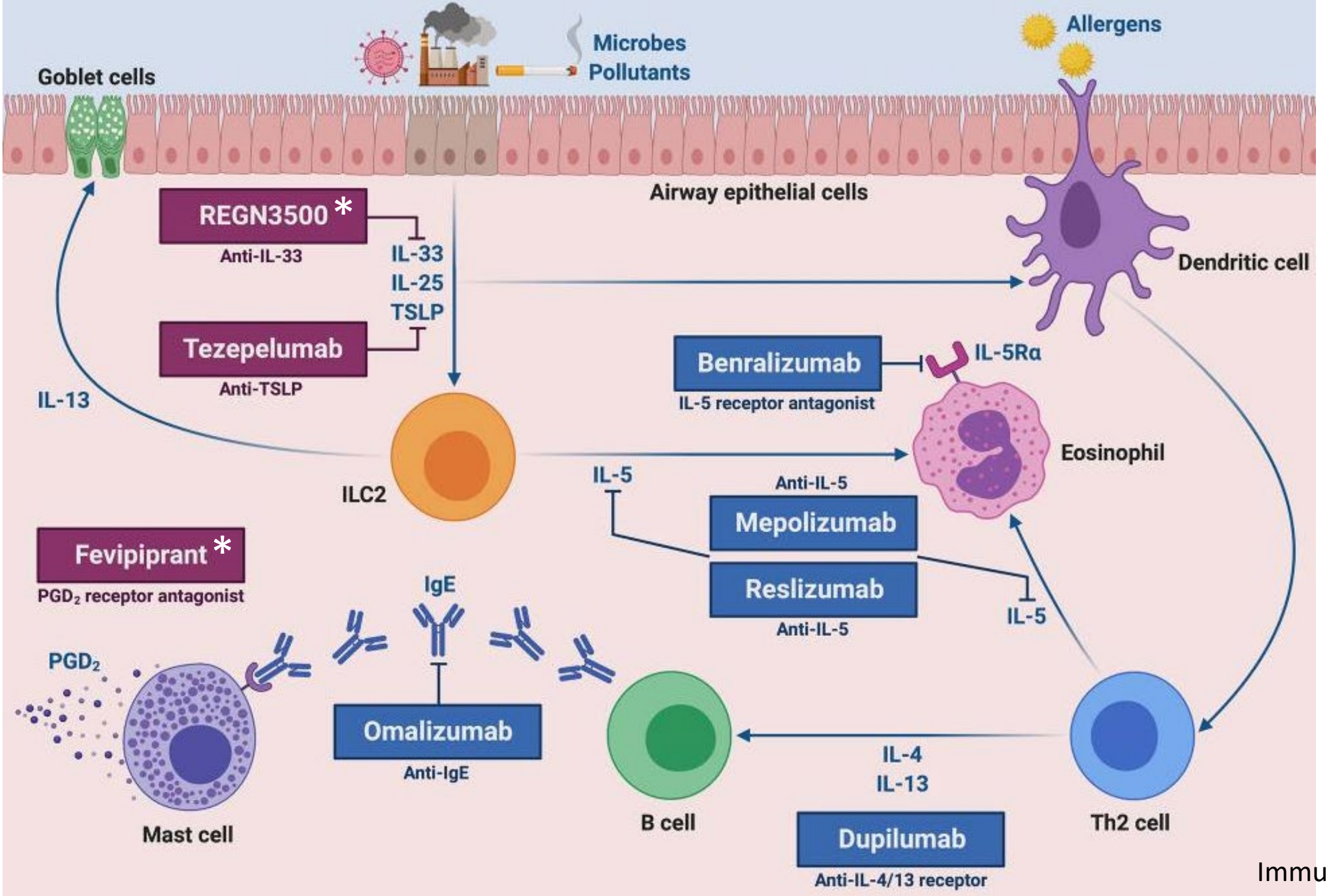
Phenotype	Observable characteristics that result from a combination of hereditary and environmental influences
Endotype	Subtype of a condition that is defined by a distinct functional or pathophysiological mechanism
Biomarker	Measurable indicator of presence of severity of a disease state





Bourdin A. et al. J Allergy Clin Immunol Pract 2024;12:809-23.

Biologic therapies for asthma and their targets



*investigational

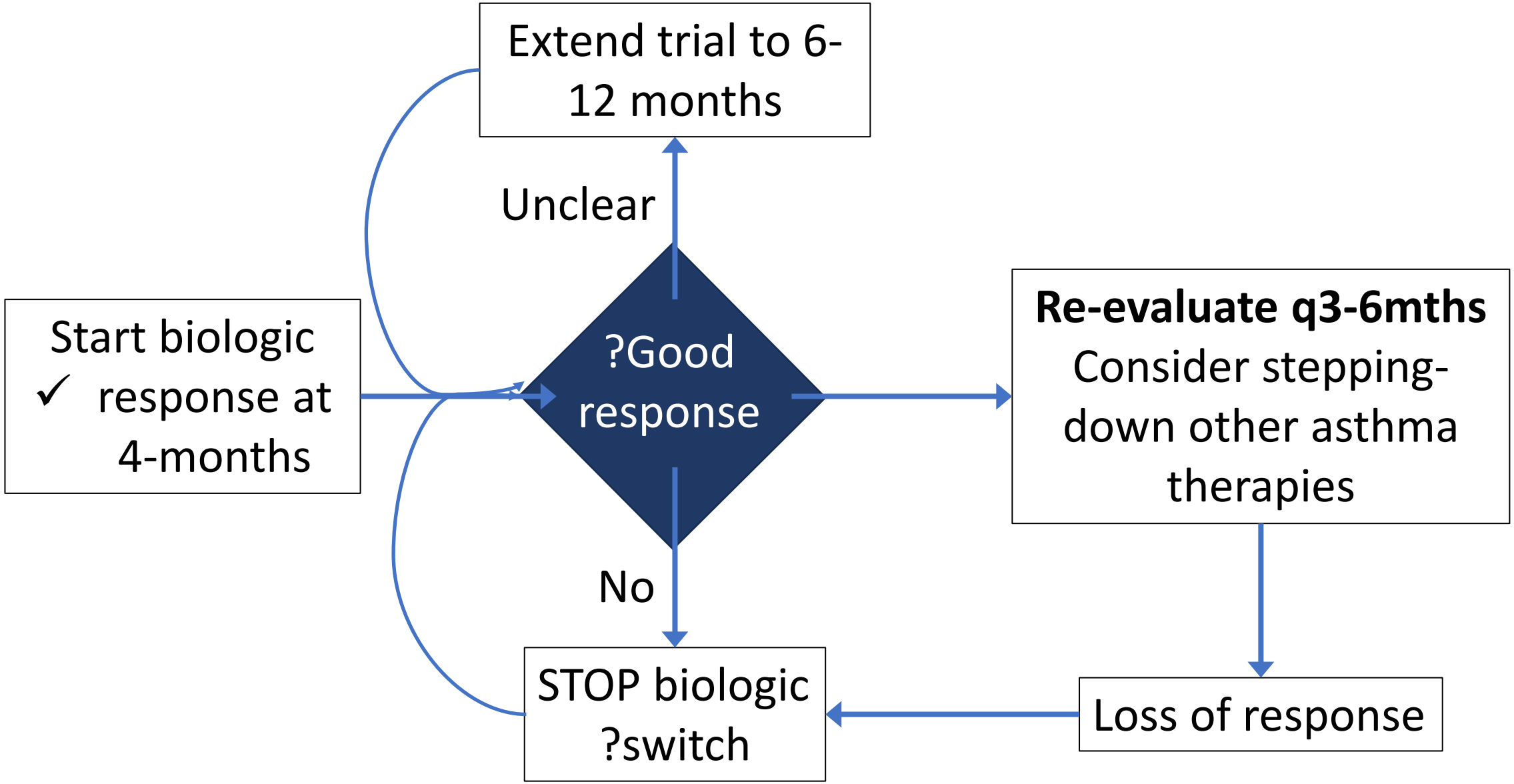
TSLP: Thymic Stromal Lymphopoeitin

Pelaia et al. Front Immunol. 2020;11:603312

	Omalizumab	Mepolizumab	Reslizumab	Benralizumab	Dupilumab	Tezepelumab
Target	IgE	IL-5	IL-5	IL-5 Receptor	IL4-Rα (IL-4/IL-13)	TSLP
Indication	IgE 30-700 IU/mL, perennial allergen	BEC ≥ 150 uL	BEC ≥ 400 uL	BEC ≥ 150 uL	BEC ≥ 150 uL	No additional requirements
Biomarkers modulated by therapy	IgE FeNO	BEC Sputum eosinophil	BEC	BEC	FeNO IgE	BEC FeNO IgE
Other conditions	CRSwNP Chronic urticaria IgE mediated food allergy	CRSwNP HES EGPA			CRSwNP, AD, EoE, Prurigo nodularis	
OCS sparing		Yes		Yes	Yes	
Administration	Home after In-office	Home	Medical setting	Home	Home	Home
Route	SC	SC	IV	SC	SC	SC
Dosing interval	q2-4 weeks	Monthly	Monthly	Monthly × 3 then q8 weeks	q2 weeks	Monthly

IgE: immunoglobulin E. IL: interleukin. TSLP: thymic stromal lymphopoietin. BEC: blood eosinophil count. HES: hypereosinophilic syndrome. CRSwNP: chronic rhinosinusitis with nasal polyps. EoE: eosinophilic esophagitis. AD: atopic dermatitis. SC: subcutaneous. IV: intravenous.

Rogers L, et al. Respiratory Medicine 218 (2023) 107414; Brusselle GG et al. NEJM 2022;386:157-71.


Extend trial to 6-12 months
Unclear
Start biologic
✓ response at 4-months
?Good response
Re-evaluate q3-6mths
Consider stepping-down other asthma therapies
No
STOP biologic
?switch
Loss of response

GINA 2025

Interim Summary

Asthma:

- Diagnosis: Consistent symptoms + ***variable expiratory airflow***
- Always Rx ICS
- Use SMART* therapy when possible
- Write asthma action plans
- Biologics are effective, reduce OCS & ICS, shouldn't be stopped
- Refer to pulmonary if considering biologic or ?not asthma

*(S)MART: (single) maintenance and reliever therapy

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COPD:

- Pulmonary rehab
- Limit ICS
- New medications
- Who benefits from oxygen

*(S)MART: (single) maintenance and reliever therapy

73 y.o. woman with COPD (FEV_1 38% pred.) routine appointment.

Reports she's "doing well"
Takes olodaterol/tiotropium once daily + albuterol prn
Can walk up 1 flight of stairs
Last prednisone 2 years ago
FEV_1 1.5L, 43% pred, z-score -2.3

Quit smoking 25 years ago
No ankle swelling
Resting O_2 saturation 95%
Exercise nadir O_2 saturation 87%
Recent labs: Hb 14 g/dL, bicarb 26
Vaccinations up to date

You should:

1) Check arterial blood gas
2) Add inhaled corticosteroid
3) Prescribe oxygen on exertion
4) Refer for pulmonary rehabilitation

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COPD checklists

Diagnosis:

- ✓History consistent
- ✓Spirometry shows obstruction
- ✓CXR does not show ILD / pulmonary edema

COPD checklists

Diagnosis:

- ✓History consistent
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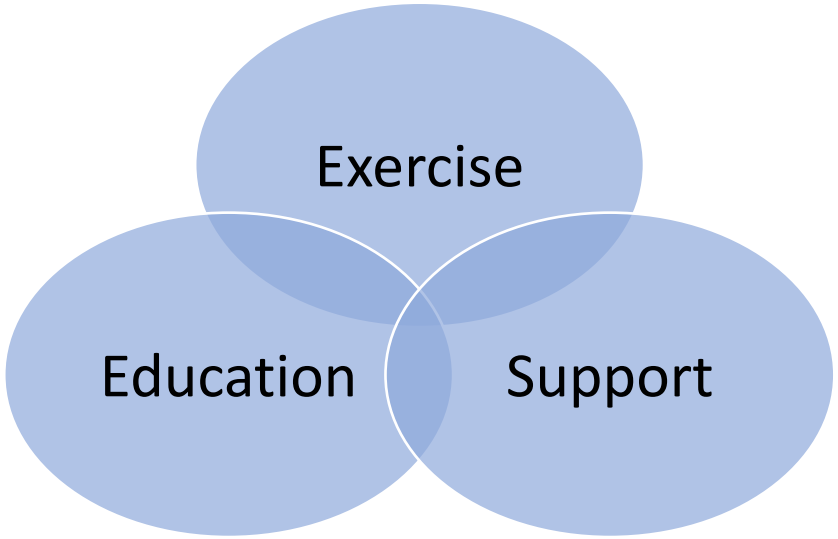
Management:

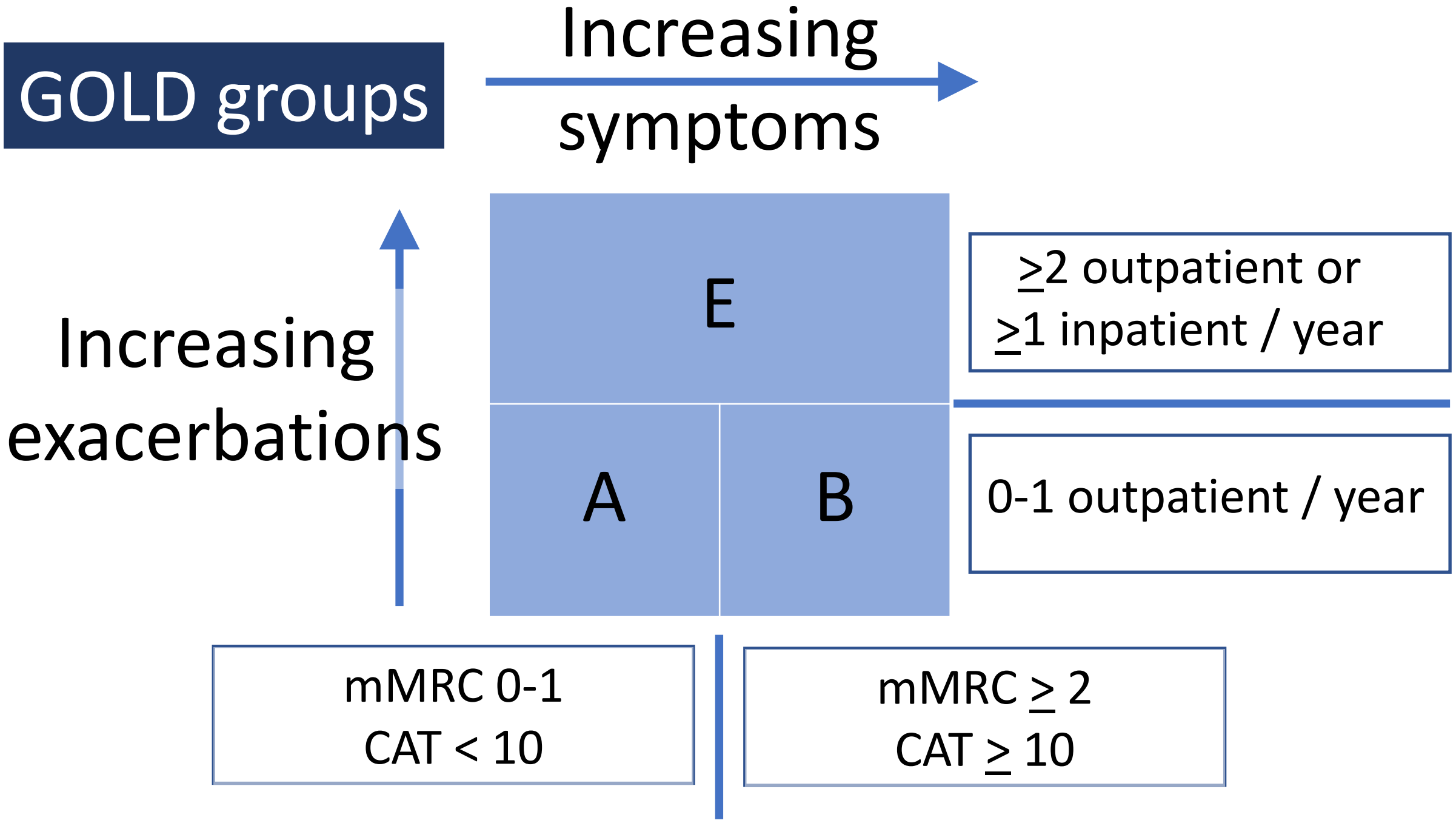
- ❑Smoking cessation
- ❑Inhaler technique
- ❑Pulmonary rehab (& still exercising)
- ❑Appropriate medications for group
- ❑Vaccinations up to date
- ❑?Oxygen therapy
- ❑?Advanced therapies (refer to pulm)

Pulmonary rehab improves QOL, dyspnea, reduces exacerbations & mortality

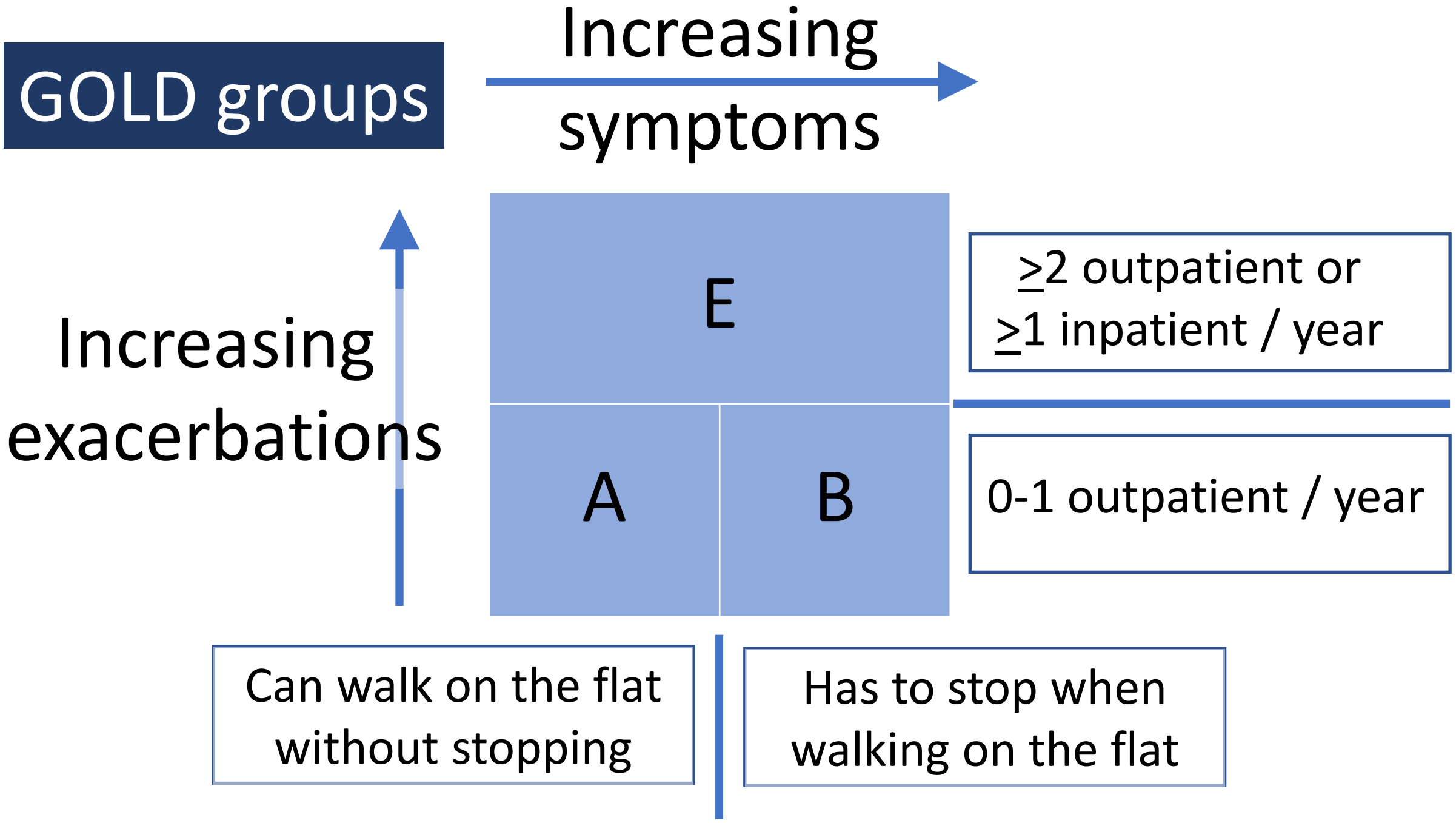
- 8 week course
- 2 sessions per week
- Plus one education session



McCarthy et al. Cochrane Database Syst Rev 2015;2 & GOLD 2025


GOLD groups
Increasing symptoms
Increasing exacerbations
E
A
B
≥2 outpatient or
≥1 inpatient / year
0-1 outpatient / year
mMRC 0-1
CAT < 10
mMRC ≥ 2
CAT ≥ 10

GOLD groups


Increasing symptoms
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A
B
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0-1 outpatient / year
Can walk on the flat without stopping
Has to stop when walking on the flat

COPD initial inhaler therapy

Increasing symptoms →

Exacerbations ↑

	Can walk on the flat without stopping	Has to stop when walking on the flat
≥2 outpatient or ≥1 inpatient / year	E: LABA + LAMA Consider LABA+LAMA+ICS if blood eos ≥ 300	
0-1 outpatient / year	A: A bronchodilator	B: LABA + LAMA

ICS in COPD: Increases risk of PNA (NNH 17)*

Strongly consider ICS if

- Actually asthma +COPD
- Hospitalized for COPD
- ≥2 outpatient exacerbations/yr
- Blood eosinophils ≥300

Don't use ICS if

- Frequent pneumonia
- Blood eosinophils <100
- Mycobacterial infection

Stopping ICS:

- Try at 6-12 months after last qualifying exacerbation
- Can typically stop ICS without a taper

*Pneumonia Risk in COPD patients receiving inhaled corticosteroids alone or in combination: TORCH study results. ERJ 2009; 34: 641-647

DYSPNEA

LABA or LAMA

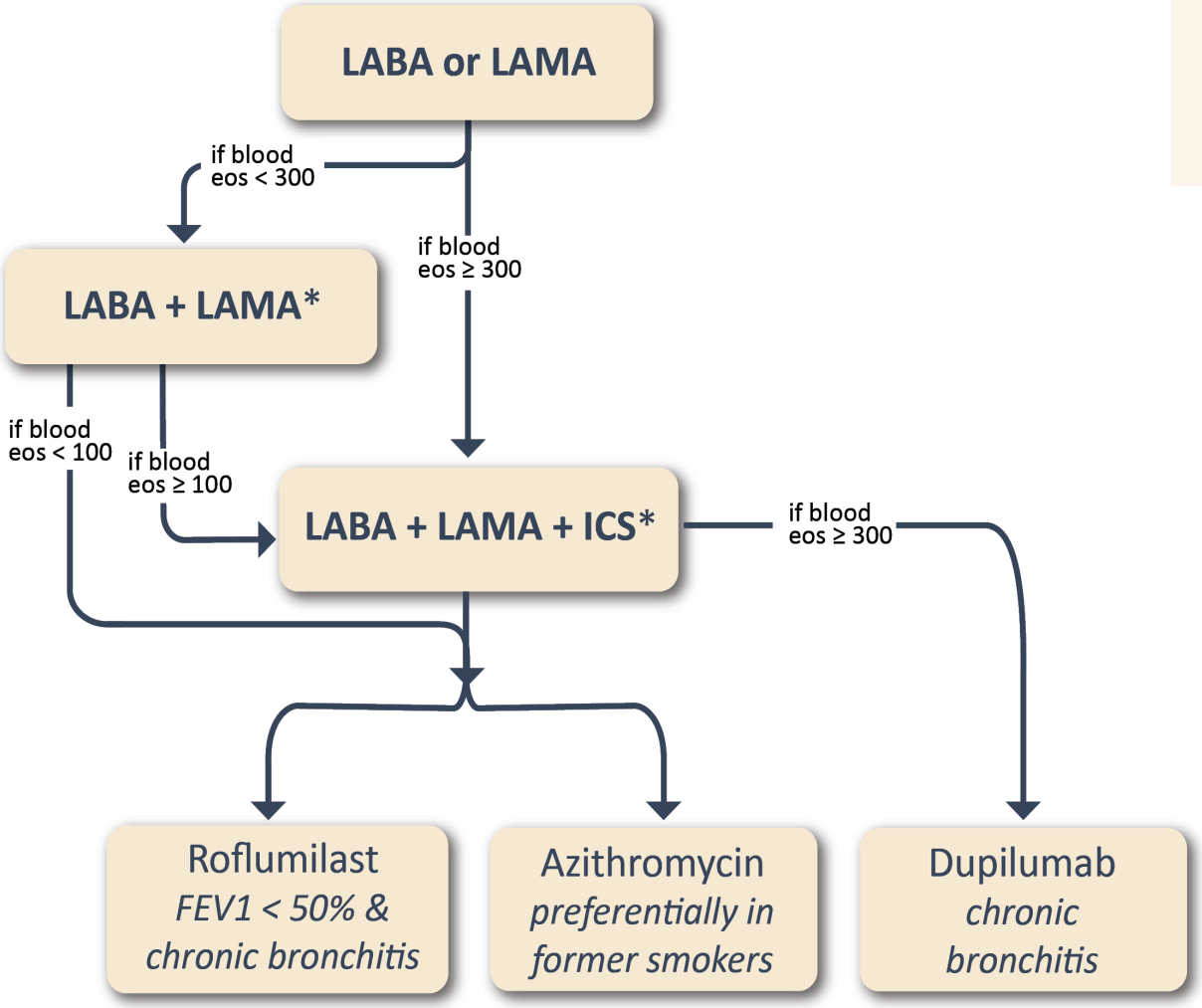
↓

LABA + LAMA*

↓

- Consider switching inhaler device or molecules
- Implement or escalate non-pharmacological treatment(s)
- Consider adding ensifentrine
- Investigate (and treat) other causes of dyspnea

EXACERBATIONS



GLOBAL INITIATIVE FOR CHRONIC OBSTRUCTIVE LUNG DISEASE™

2025

DYSPNEA

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LABA + LAMA*

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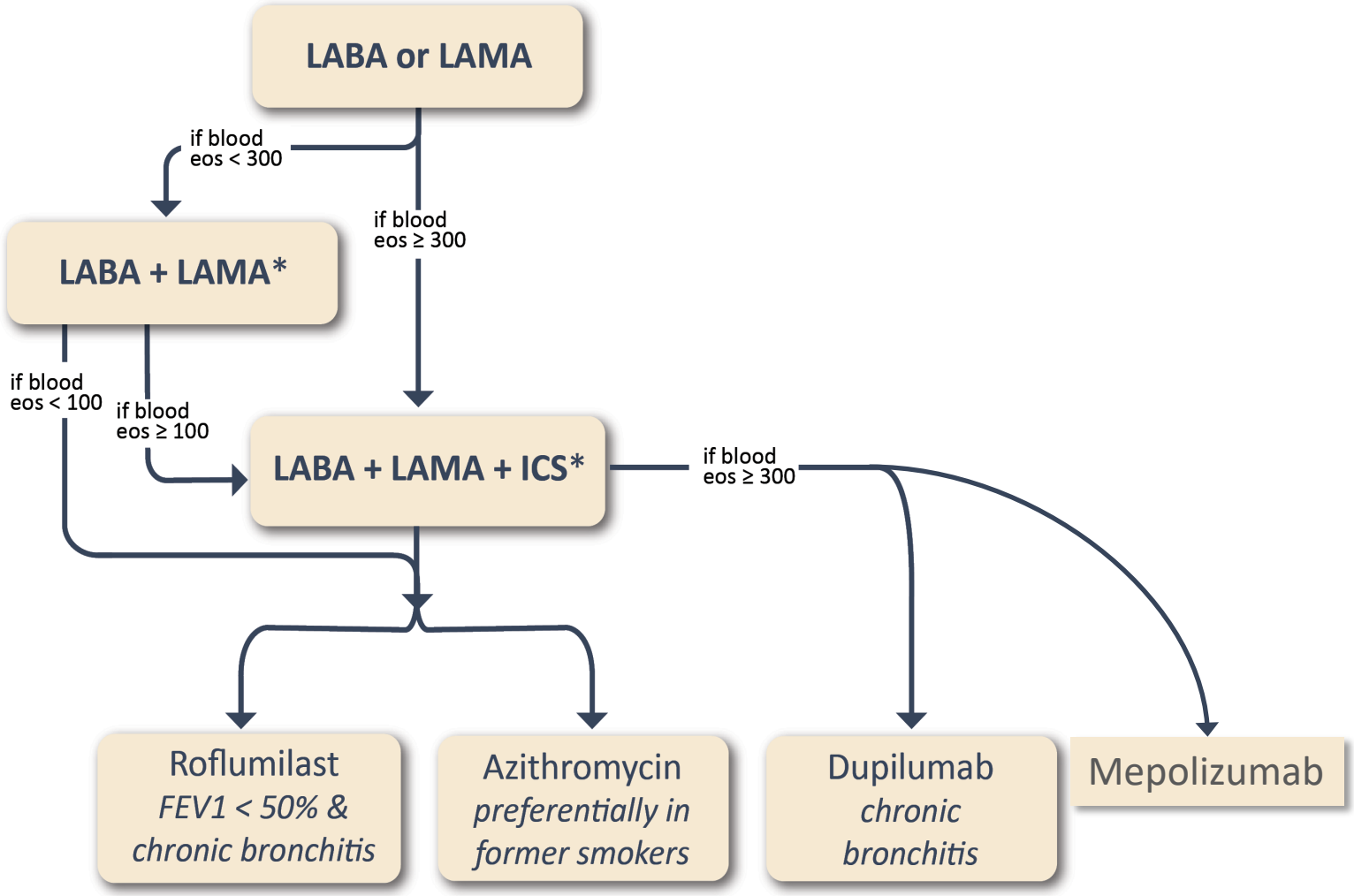
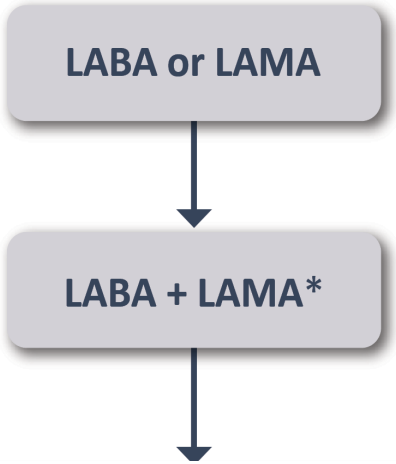


DYSPNEA



PULMONARY REHAB!!!

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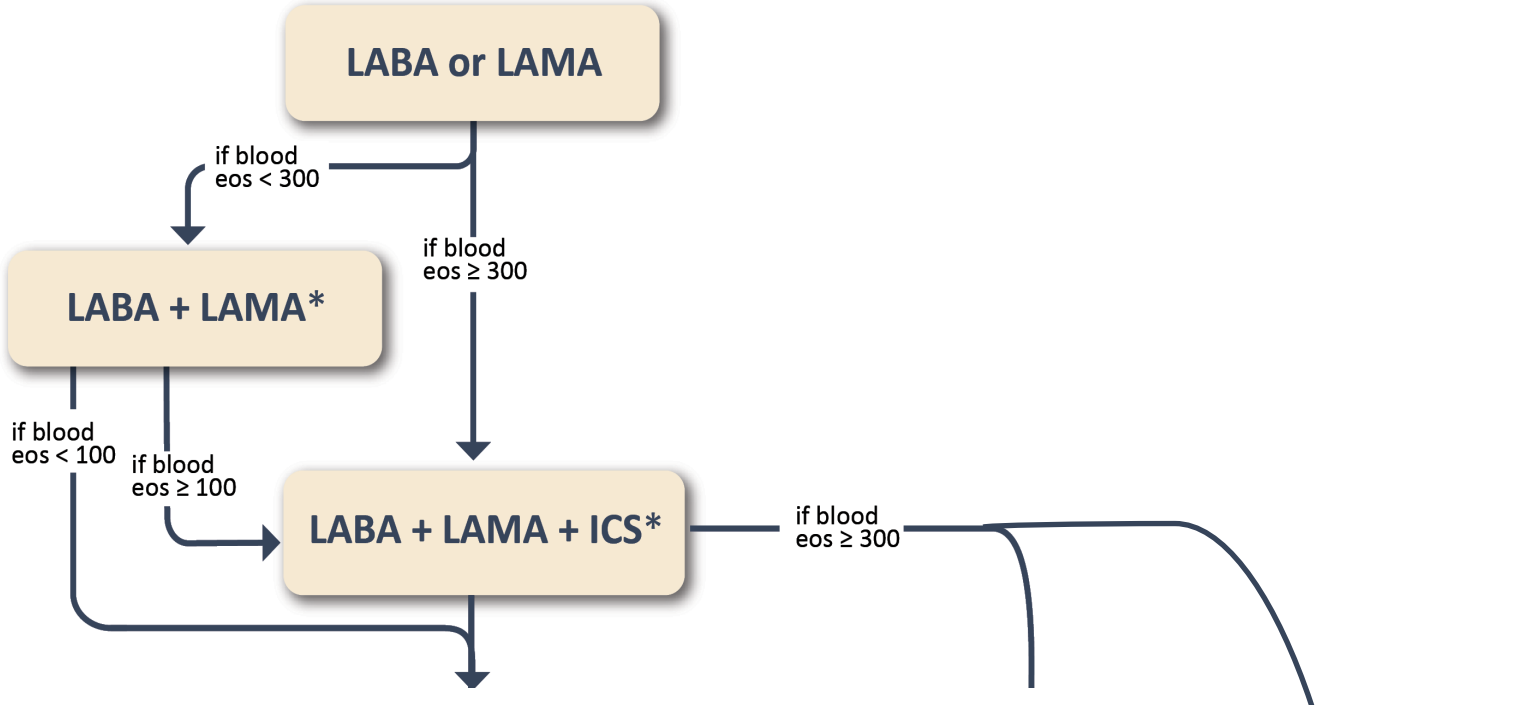
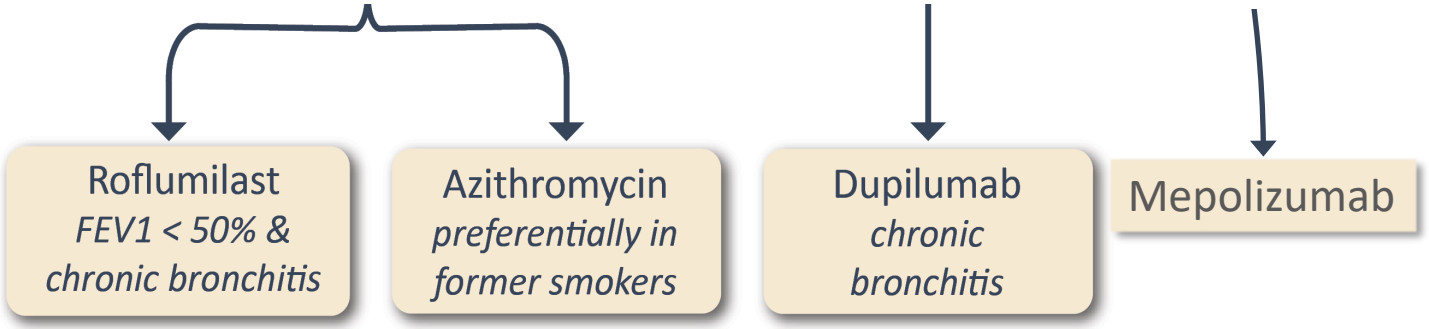
EXACERBATIONS



PULMONARY REHAB!!!



Azithromycin

- Macrolide antibiotic, acting as anti-inflammatory (dosed TIW)
- Reduces AECOPD in patients with severe – very severe COPD and a history of exacerbations
  - *Less evidence for benefit in those currently smoking*
- Risks
  - Bacterial resistance
  - Increased cardiovascular mortality
  - Hearing loss

Roflumilast

- PDE4 inhibitor, tablet
- Reduces moderate-severe AECOPD in patients with severe – very severe COPD and a history of exacerbations *AND chronic bronchitis*
- Adverse effects:
  - Suicidality
  - Significant GI toxicity (reduced by starting at half dose for 2 weeks)
  - Weight loss

Ensifentrine (Ohtuvayre)

- Nebulized PDE3,4 inhibitor
- Reduces moderate-severe AECOPD in patients with COPD taking LAMA or LABA +/- ICS
- Costs a lot:
  - Current maintenance therapy $3,500/yr (eg LAMA/LABA/ICS)
  - Pulmonary rehab $2,000-10,000
  - Ensifentrine $18,000/yr

Dupilumab

- IL-4 receptor antibody
- Injection q2 weeks (at home)

Mepolizumab

- IL-5 receptor antibody
- Injection q month (at home)
- Reduce AECOPD in patients with COPD on triple inhaled therapy with BEC>300

COPD checklists

Diagnosis:

- ✓History consistent
- ✓Spirometry shows obstruction
- ✓CXR does not show ILD / pulmonary edema

Management:

- ❑Smoking cessation
- ❑Inhaler technique
- ❑Pulmonary rehab (& still exercising)
- ❑Appropriate medications for group
- ❑Vaccinations up to date
- ❑?Oxygen therapy
- ❑?Advanced therapies (refer to pulm)

COPD: Supplemental oxygen therapy

Mortality benefit from >15hrs/day for patients with SEVERE hypoxemia (resting sat <89%)[1,2]

NO benefit for patients with moderate resting hypoxemia (sat 88-93%) or exertional desat[3]

1. NOTT Ann Intern Med 1980;93:391-8
2. MRC Lancet 1981;1:681-6
3. LOTT NEJM 2016;375:1617

COPD: Supplemental oxygen therapy

Increased mortality associated with hyperoxia (O_2 sat >92%) in patients with acute exacerbations of COPD[1]

1. Austin et al. BMJ 2010;341:c5462

COPD: prescribe oxygen for patients

With resting sat <89%

Titrated to sat of > 90%
(and probably < 95%)

COPD checklists

Diagnosis:

- ✓History consistent
- ✓Spirometry shows obstruction
- ✓CXR does not show ILD / pulmonary edema

Management:

- ❑Smoking cessation
- ❑Inhaler technique
- ❑Pulmonary rehab (& still exercising)
- ❑Appropriate medications for group
- ❑Vaccinations up to date
- ❑?Oxygen therapy
- ❑?Advanced therapies (refer to pulm)

Advanced therapies for COPD

- **Lung volume reduction surgery (LVRS)**
- **Endobronchial valves aka Bronchoscopic LVRS (BLVRS)**
- **Lung transplantation**

Indications:

- Relatively few comorbidities
- Quit smoking
- Completed pulmonary rehab

For LVRS:

- Specific PFT findings (hyperinflation++)
- Specific imaging findings (upper lobe emphysema)
- No / mild pulmonary hypertension

For transplant:

- Support person / caregiver; psychologically strong

COPD:

- Pulmonary rehab is The Best
- Limit ICS
- Consider roflumilast, chronic azithromycin if ↑exacerbations on LABA/LAMA/ICS
- New meds are expensive
- Supplemental O_2 truly beneficial only for resting hypoxemia
- Vaccinations & smoking cessation save lives
- Refer to pulm if ?advanced therapies

Asthma:

- Diagnosis: Consistent symptoms + ***variable expiratory airflow***
- Always Rx ICS
- Use SMART* therapy when possible
- Write asthma action plans
- Biologics are effective, reduce OCS & ICS, shouldn't be stopped
- Refer to pulmonary if considering biologic or ?not asthma

COPD:

- Pulmonary rehab is The Best
- Limit ICS
- Consider roflumilast, chronic azithromycin if ↑exacerbations on LABA/LAMA/ICS
- New meds are expensive
- Supplemental O_2 truly beneficial only for resting hypoxemia
- Vaccinations & smoking cessation save lives
- Refer to pulm if ?advanced therapies

*(S)MART: (single) maintenance and reliever therapy

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Thank you.
Questions?

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