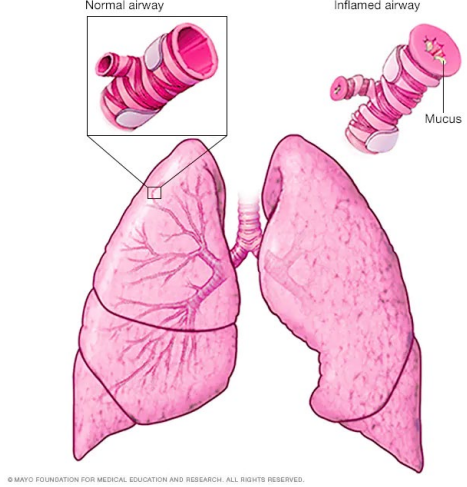


GLOBAL INITIATIVE FOR ASTHMA
1993-2023

• *Proud to be celebrating the 30th year of GINA* •

Asthma Management Updates for Respiratory Therapists

Khalid Al Efraij, MBBS, FRCPC, ABIM

Internal Medicine and Pulmonary

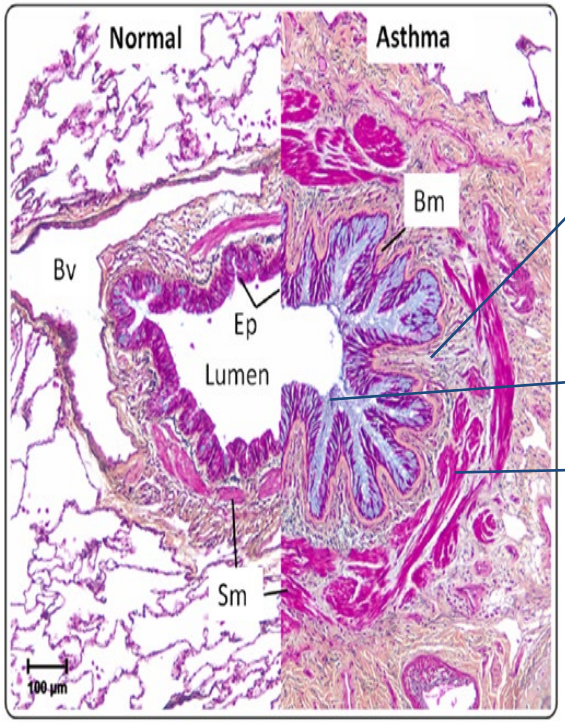
Definition

- A heterogeneous disease,
- Chronic airway inflammation.
- History of respiratory symptoms, such as wheeze, shortness of breath, chest tightness and cough, that vary over time and in intensity
- Variable expiratory airflow limitation. Airflow limitation may later become persistent.

Global Initiative for Asthma, GINA (2023)

Asthma is a chronic inflammatory disease; inflammation is central to exacerbations[1]

Healthy vs. severe asthmatic

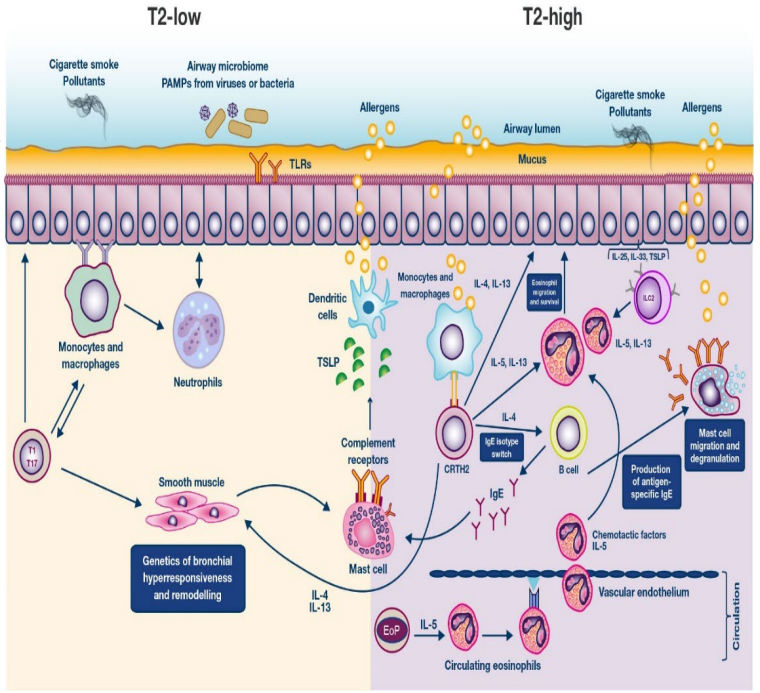


INFLAMMATION

Mucus hypersecretion

Smooth muscle thickened

Key inflammatory pathways in asthma[3–5]



Bm = basement membrane; Bv = blood vessel; CRTH2 = chemoattractant receptor-homologous molecule expressed on Th2 cells; EoP = eosinophilopoiesis; EOS = eosinophils; Ep = epithelium; IgE = immunoglobulin E; IL = interleukin; ILC2 = type 2 innate lymphoid cells; PAMP = pathogen-associated molecular pattern; SM = smooth muscle; T1 = Type 1 cell; T2 = Type 2 cell; T17 = Type 17 cell; TLR = toll-like receptor; TSLP = thymic stromal lymphopoietin.

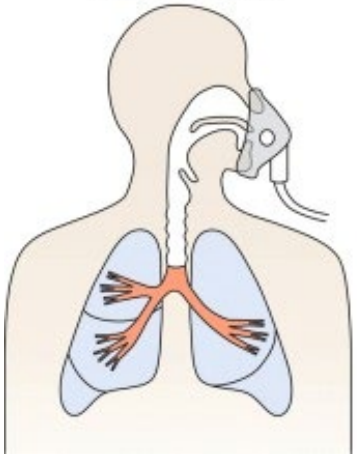
1. Global Initiative for Asthma. Updated 2018. www.ginasthma.org. Accessed March 2019; 2. Holgate ST et al. *Nat Rev Dis Primers.* 2015;1:15025; 3. Wenzel SE. *Nat Med.* 2012;18:716-725; 4. Peters SP et al. *J Allergy Clin Immunol Pract.* 2017;5:S15-S24; 5. Mukherjee M et al. *World Allergy Organ J.* 2014;7:32.

Epidemiology

- 26 million people in the U.S.
- More in Black adults in the U.S.
- More common in female 9.7% vs 6.2% male

National Center for Health Statistics. (2022)

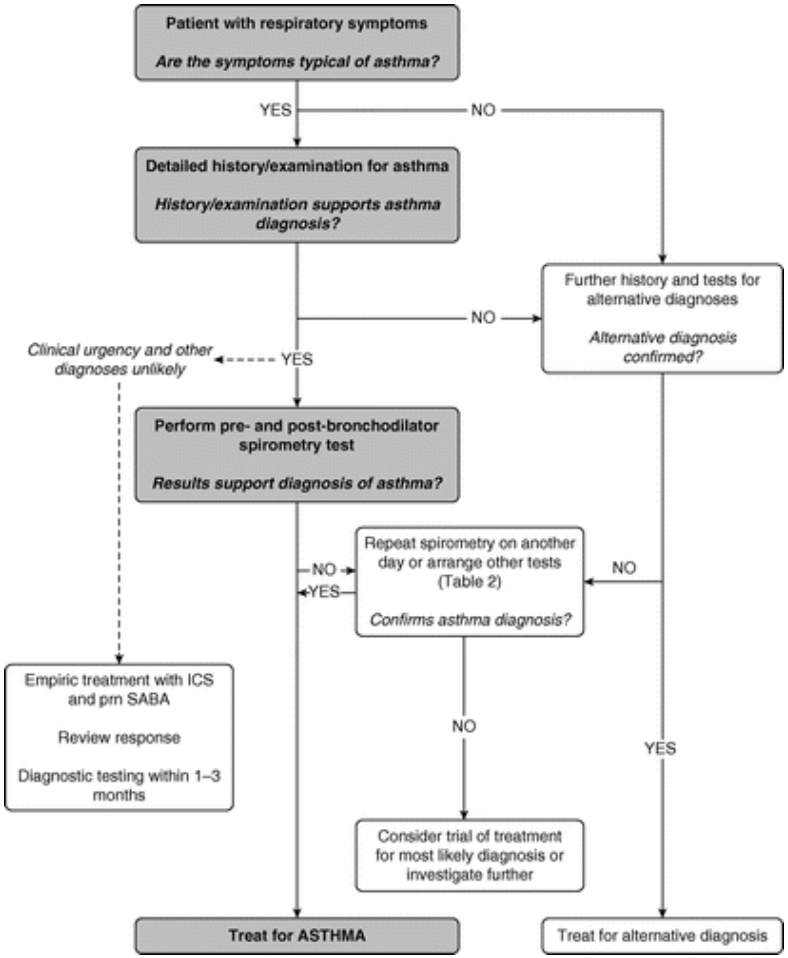
Induced sputum



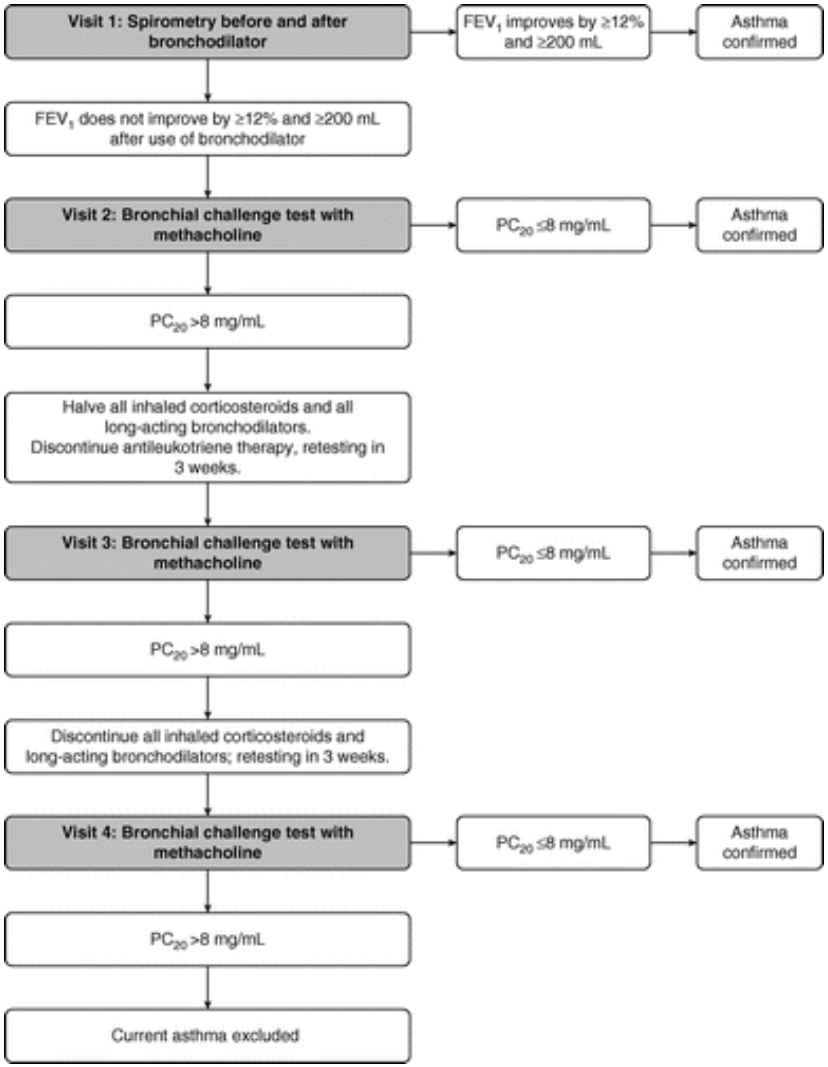
Diagnosis

2.2 Documented* excessive variability in lung function* (one or more of the following):
• Positive bronchodilator (BD) responsiveness (reversibility) test
• Excessive variability in twice-daily PEF over 2 weeks
• Significant increase in lung function after 4 weeks of anti-inflammatory treatment
• Positive exercise challenge test
• Positive bronchial challenge test (usually only for adults)
• Excessive variation in lung function between visits (good specificity but poor sensitivity)

Global Initiative for Asthma, GINA (2023)



Aaron et al. Am J Respir Crit Care Med (2018) 198, 8: 1012–1020



Am J Respir Crit Care Med Vol 198, Iss 8, pp 1012–1020, Oct 15, 2018

Change in BRD definition

EUROPEAN RESPIRATORY *journal*

FLAGSHIP SCIENTIFIC JOURNAL OF ERS

ERS/ATS technical standard on interpretive strategies for routine lung function tests

Sanja Stanojevic, David A. Kaminsky, Martin R. Miller, Bruce Thompson, Andrea Aliverti, Igor Barjaktarevic, Brendan G. Cooper, Bruce Culver, Eric Derom, Graham L. Hall, Teal S. Hallstrand, Joerg D. Leuppi, Neil MacIntyre, Meredith McCormack, Margaret Rosenfeld, Erik R. Swenson

European Respiratory Journal 2022 60: 2101499; **DOI:** 10.1183/13993003.01499-2021

Management

Goals of asthma treatment

- Few asthma symptoms
- No sleep disturbance
- No exercise limitation

} Symptom control (e.g. ACT, ACQ)

- Maintain normal lung function
- Prevent flare-ups (exacerbations)
- Prevent asthma deaths
- Minimize medication side-effects (including OCS)

} Risk reduction

- The patient's goals may be different
- Symptom control and risk may be discordant
  - Patients with few symptoms can still have severe exacerbations

ACQ: Asthma Control Questionnaire; ACT: Asthma Control Test; OCS: oral corticosteroids

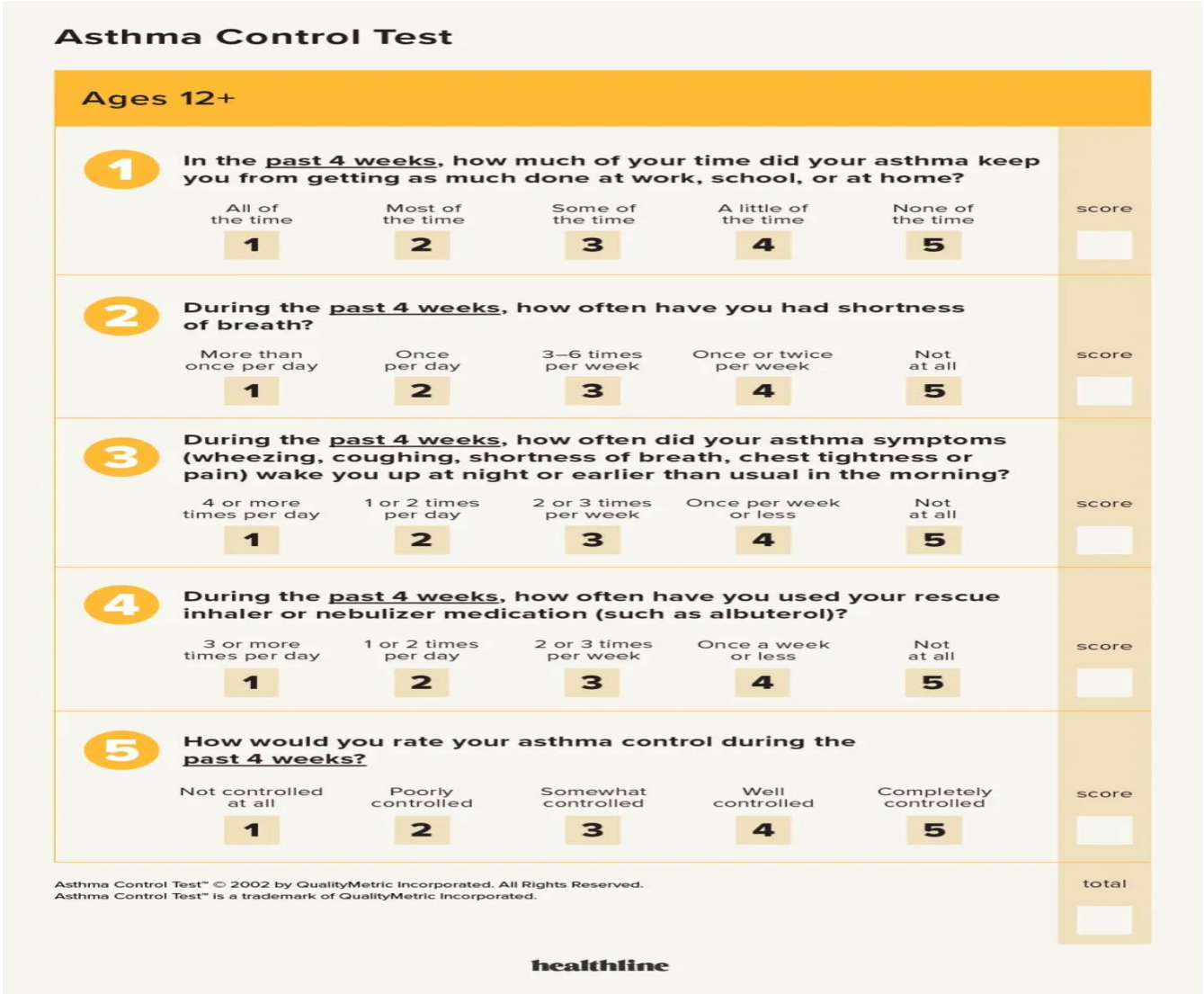
Asthma control

Box 2-2. GINA assessment of asthma control in adults, adolescents and children 6–11 years

A. Asthma symptom control

In the past 4 weeks, has the patient had:		Well controlled	Partly controlled	Uncontrolled
• Daytime asthma symptoms more than twice/week?	Yes☐ No☐	None of these	1–2 of these	3–4 of these
• Any night waking due to asthma?	Yes☐ No☐			
• SABA* reliever for symptoms more than twice/week?	Yes☐ No☐			
• Any activity limitation due to asthma?	Yes☐ No☐			

ACT



Asthma Control Test

Ages 12+

1 **In the past 4 weeks, how much of your time did your asthma keep you from getting as much done at work, school, or at home?**

All of the time	Most of the time	Some of the time	A little of the time	None of the time	score
1	2	3	4	5	

2 **During the past 4 weeks, how often have you had shortness of breath?**

More than once per day	Once per day	3–6 times per week	Once or twice per week	Not at all	score
1	2	3	4	5	

3 **During the past 4 weeks, how often did your asthma symptoms (wheezing, coughing, shortness of breath, chest tightness or pain) wake you up at night or earlier than usual in the morning?**

4 or more times per day	1 or 2 times per day	2 or 3 times per week	Once per week or less	Not at all	score
1	2	3	4	5	

4 **During the past 4 weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?**

3 or more times per day	1 or 2 times per day	2 or 3 times per week	Once a week or less	Not at all	score
1	2	3	4	5	

5 **How would you rate your asthma control during the past 4 weeks?**

Not controlled at all	Poorly controlled	Somewhat controlled	Well controlled	Completely controlled	score
1	2	3	4	5	

total

healthline

ACQ-5

Name: _____ Date: _____

Asthma Control Questionnaire – 5 (ACQ-5)

Q1) On average, during the past week, how often were you woken by your asthma during the night?

0 = never
1 = hardly ever
2 = a few times
3 = several times
4 = many times
5 = a great many times
6 = unable to sleep because of asthma

Response:

Q2) On average, during the past week, how bad were your asthma symptoms when you woke up in the morning?

0 = no symptoms
1 = very mild symptoms
2 = mild symptoms
3 = moderate symptoms
4 = quite severe symptoms
5 = severe symptoms
6 = very severe symptoms

Response:

Q3) In general, during the past week, how limited were you in your activities because of your asthma?

0 = not limited at all
1 = very slightly limited
2 = slightly limited
3 = moderately limited
4 = very limited
5 = extremely limited
6 = totally limited

Response:

Q4) In general, during the past week, how much shortness of breath did you experience because of your asthma?

0 = none
1 = very little
2 = a little
3 = a moderate amount
4 = quite a lot
5 = a great deal
6 = a very great deal

Response:

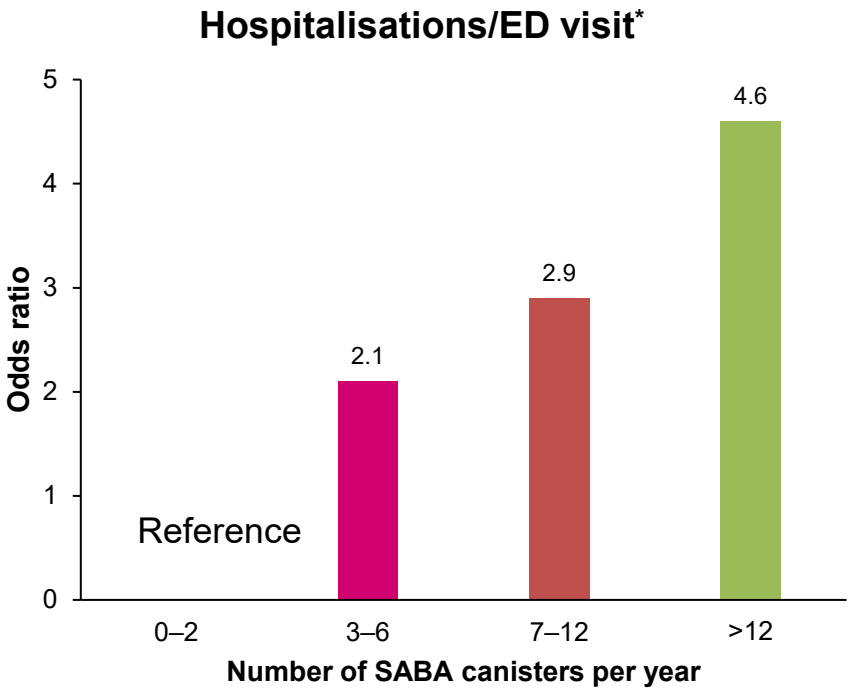
Q5) In general, during the past week, how much of the time did you wheeze?

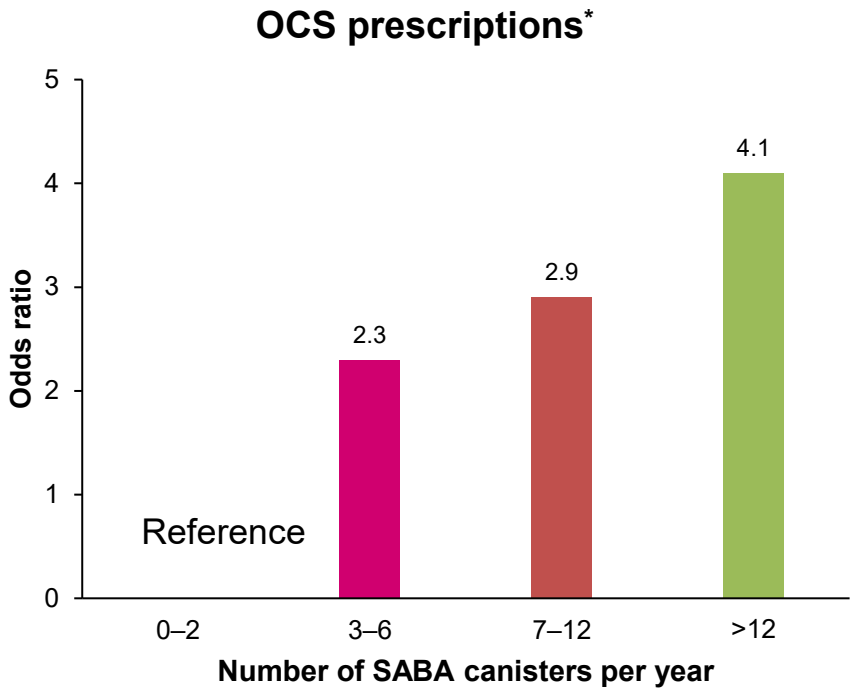
0 = not at all
1 = hardly any of the time
2 = a little of the time
3 = a moderate amount of the time
4 = a lot of the time
5 = most of the time
6 = all of the time

Response:

SABA use and need for future acute asthma health care

Patients prescribed ≥3 SABAS per year have an increased risk of hospitalisation/OCS prescriptions compared with patients prescribed 0–2 SABAs





*Adjusted for year 2002 use in the predictive validity cohort (n=62369)

Study based on survey of 2250 maintenance organisations members (construct validity sample) and predictive validity sample (n=62369) from the Southern California Kaiser Permanente asthma database.

Number of hospitalisations and ED visit were compared against SABA canisters dispensed in 12 months. Asthma ED visits and hospitalisations were combined into the single outcome of emergency hospital care for asthma, defined as at least one hospitalisation or ED visit for asthma

ED = emergency department; OCS = oral corticosteroid; SABA = short-acting β_2-agonist.

Schatz M et al. *J Allergy Clin Immunol.* 2006;117:995-1000.

Patients with mild asthma are at risk of exacerbations [1-6]

19–36% of patients with mild asthma experience a exacerbation every year[1–6]

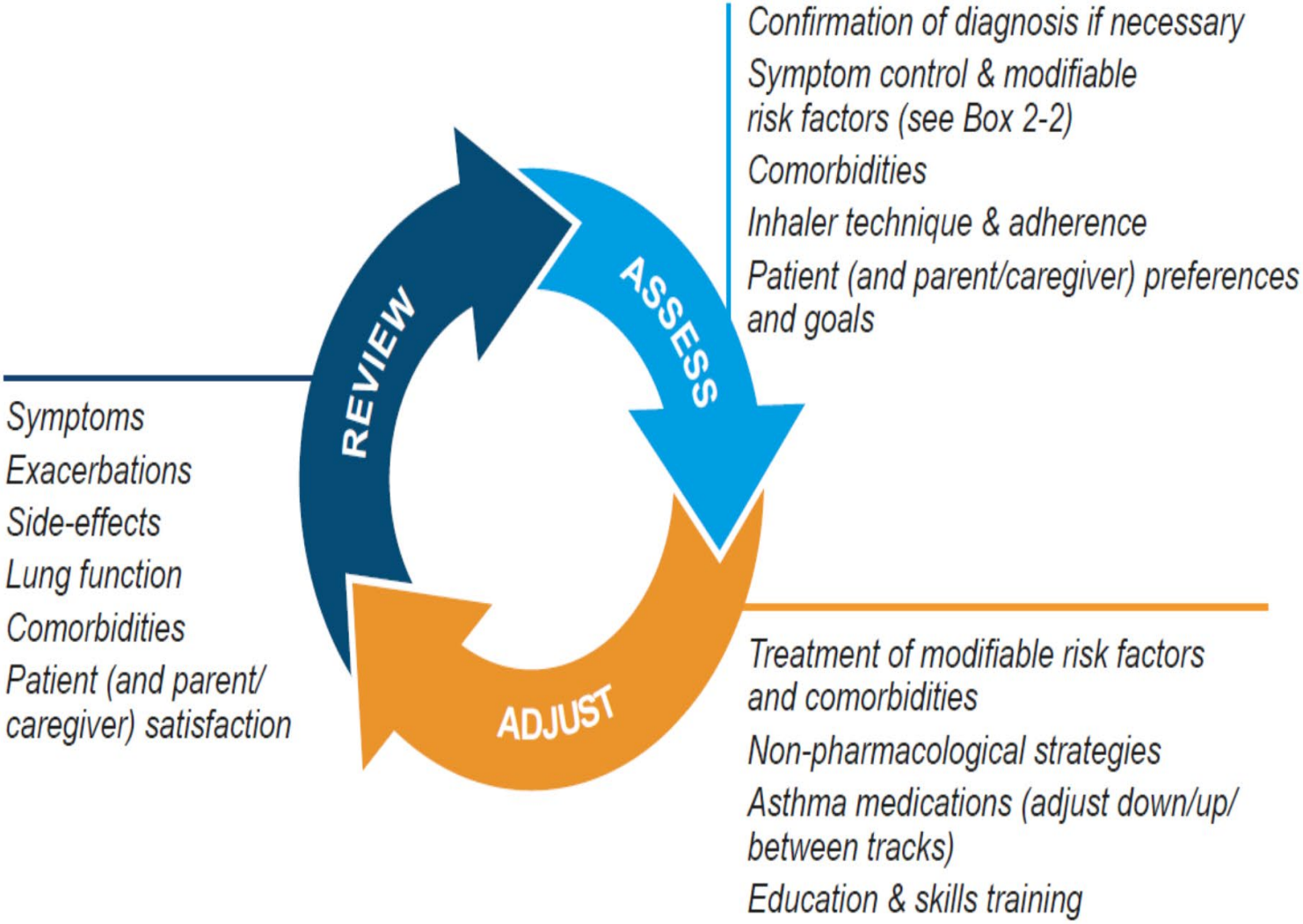
Study	Study type	Definition of exacerbation	Total number of patients	% experiencing an exacerbation within previous 12m
O'Byrne et al.[1] (OPTIMA)*	Randomised clinical trial	Severe exac: OCS use, hospitalisation/ emergency treatment, >25% decrease from baseline in morning PEF on 2 consecutive days	Group A (placebo) –237	**33.3**
			Group B (budesonide 200 µg) – 317	**33.8**
Price et al.[2] (REALISE)	Quantitative questionnaire	Acute exac: ≥1 course of OCS in the previous 12 months	Reliever only – 1419	**26.1**
			Single-drug preventer inhaler –1923	**29.2**
Ding et al.[3]	Observational survey	Physician confirmed worsening of symptoms	1115	**19**
Bloom et al.[4†]	Population-based cohort study	≤300 mg OCS, A&E visit or hospitalisation	BTS Step 1 – 86360	**31**
			BTS Step 2 – 54773	**36**
O'Byrne et al.[5] (SYGMA 1)	Randomised clinical trial	Severe exac: ≥3 days OCS use, hospitalisation or ED visit	3836	**19.7**
Bateman et al.[6] (SYGMA 2)	Randomised clinical trial	Severe exac: ≥3 days OCS use, hospitalisation or ED visit	4176	**22**

*Group A patients (n=698) were prescribed daily placebo, budesonide 200 µg or budesonide 200 µg + formoterol 9 µg. Group B patients (n=1272) were prescribed budesonide 200 µg with or without formoterol 9 µg, or budesonide 400 µg with or without formoterol 9 µg. The table presents the results for one group in each arm – Group A (placebo) and Group B (budesonide 200 µg).

†Patients were stratified according to age – <5 years, 5–17 years, 18–54 years and ≥55 years. The table reports the results for the 18–54 years group.

A&E = Accident & Emergency; ED = Emergency Department; exac = exacerbation; m= month; OCS = oral corticosteroid; PEF = peak expiratory flow

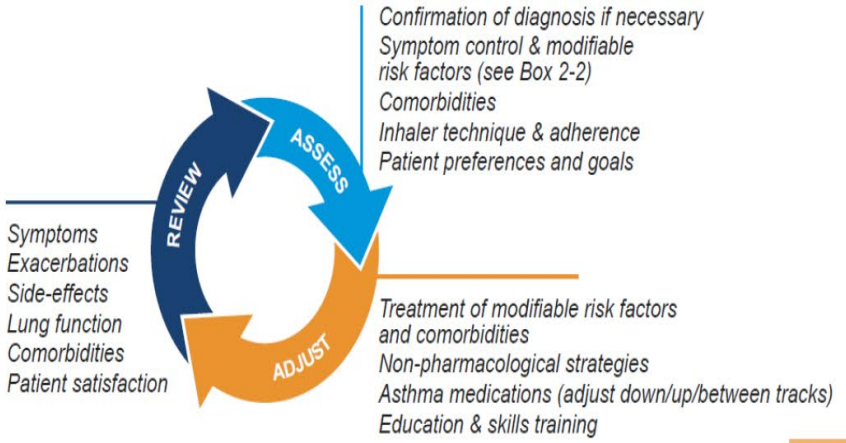
1. O'Byrne PM et al. *Am J Resp Crit Care Med.* 2001;164:1392-1397; 2. Price D et al. *NPJ Prim Care Resp Med.* 2014;24:14009; 3. Ding B et al. *Adv Ther.* 2017;34:1109-1127; 4. Bloom CI et al. *Thorax.* 2018;73:313-320; 5. O'Byrne PM et al. *N Engl J Med.* 2018;378:1865-1876; 6. Bateman ED et al. *N Engl J Med.* 2018;378:1877-1887.



GINA 2023 – Adults & adolescents 12+ years

Personalized asthma management

Assess, Adjust, Review
for individual patient needs



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*

See GINA severe asthma guide

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

STEP 1
Take ICS whenever SABA taken*

STEP 2
Low dose maintenance ICS

STEP 3
Low dose maintenance ICS-LABA

STEP 4
Medium/high dose maintenance ICS-LABA

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

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

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*

*Anti-inflammatory reliever (AIR)

Box 3-12

Reliever doses of ICS-formoterol - how much can be taken?

- For ICS-formoterol with 6 mcg (4.5 mcg delivered dose) of formoterol, take **1 inhalation** whenever needed for symptom relief
- Another inhalation can be taken after a few minutes if needed
- Maximum total number of inhalations in any single day (as-needed + maintenance)
  - **Budesonide-formoterol**: maximum 12 inhalations* for adults, 8 inhalations for children, based on extensive safety data *(Tattersfield et al, Lancet 2001; Pauwels et al, ERJ 2003)*
  - **Beclometasone-formoterol**: maximum total 8 inhalations in any day *(Papi et al, Lancet Respir Med 2013)*
- Emphasize that most patients need far fewer doses than this!

- For pMDIs containing 3 mcg formoterol (2.25 mcg delivered dose), take 2 inhalations each time

**For budesonide-formoterol 200/6 [delivered dose 160/4.5 mcg], 12 inhalations gives 72 mcg formoterol (54 mcg delivered dose)*

Respiratory Treatments

2021

Allergy & Asthma Network

AllergyAsthmaNetwork.org

800.878.4403

DPI = DOSE INDICATOR G = GENERIC AVAILABLE DISEASE STATES: A = ASTHMA C = COPD

American College of Allergy, Asthma & Immunology

CHEST FOUNDATION

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.

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

- **ProAir® Digihaler™** — 80 mcg albuterol sulfate inhalation powder — DPI A
- **ProAir® HFA** — 90 mcg albuterol sulfate — DPI A G
- **ProAir RespiClick®** — 90 mcg albuterol sulfate inhalation powder — DPI A
- **Proventil® HFA** — 90 mcg albuterol sulfate — DPI A G
- **Ventolin® HFA** — 90 mcg albuterol sulfate — DPI A G
- **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

- **Serevent® Diskus®** — 50 mcg salmeterol xinafoate inhalation powder — DPI A C
- **Striverdi® Respimat®** — 2.5 mcg olodaterol hydrochloride — DPI 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 — DPI 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 — DPI A
- **Asmanex® Twisthaler®** — 110, 220 mcg mometasone furoate inhalation powder — DPI A
- **Flovent® Diskus®** — 50, 100, 250 mcg fluticasone propionate inhalation powder — DPI A
- **Flovent® HFA** — 44, 110, 220 mcg fluticasone propionate — DPI A
- **Pulmicort Flexhaler®** — 90, 180 mcg budesonide inhalation powder — DPI A
- **QVAR® Redihaler™** — 40, 80 mcg beclomethasone dipropionate — DPI 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 — DPI C

Long-acting

- **Incruse® Ellipta®** — 62.5 mcg umeclidinium inhalation powder — DPI C
- **Spiriva® Handihaler®** — 18 mcg tiotropium bromide inhalation powder — C
- **Spiriva® Respimat®** — 1.25, 2.5 mcg tiotropium bromide — DPI A C
- **Tudorza™ Pressair™** — 400 mcg aclidinium bromide inhalation powder — DPI C

COMBINATION MEDICATIONS

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

- **Combivent® Respimat®** — 20/100 mcg ipratropium bromide and albuterol — DPI 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®** — 100/25, 200/25 mcg fluticasone furoate and vilanterol inhalation powder — DPI A C
- **Dulera®** — 50/5, 100/5, 200/5 mcg mometasone furoate and formoterol fumarate dihydrate — DPI 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 — DPI C
- **Duaklir® Pressair®** — 400, 12 mcg aclidinium bromide and formoterol fumarate — DPI C
- **Stiolto™ Respimat®** — 2.5/2.5 mcg tiotropium bromide and olodaterol — DPI 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 — C

BIOLOGICS

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

- **Cinqair®** — reslizumab — A
- **Dupixent®** — dupilumab — A
- **Fasenra™** — benralizumab — A
- **Nucala®** — mepolizumab — A
- **Xolair®** — omalizumab — A

BRONCHIAL THERMOPLASTY

A minimally invasive procedure that uses mild heat to reduce airway smooth muscle, leading to fewer severe asthma flares, ER visits, and days lost from activities. www.btforasthma.com — A

PDE4 INHIBITORS

ease lung inflammation and reduce exacerbations

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

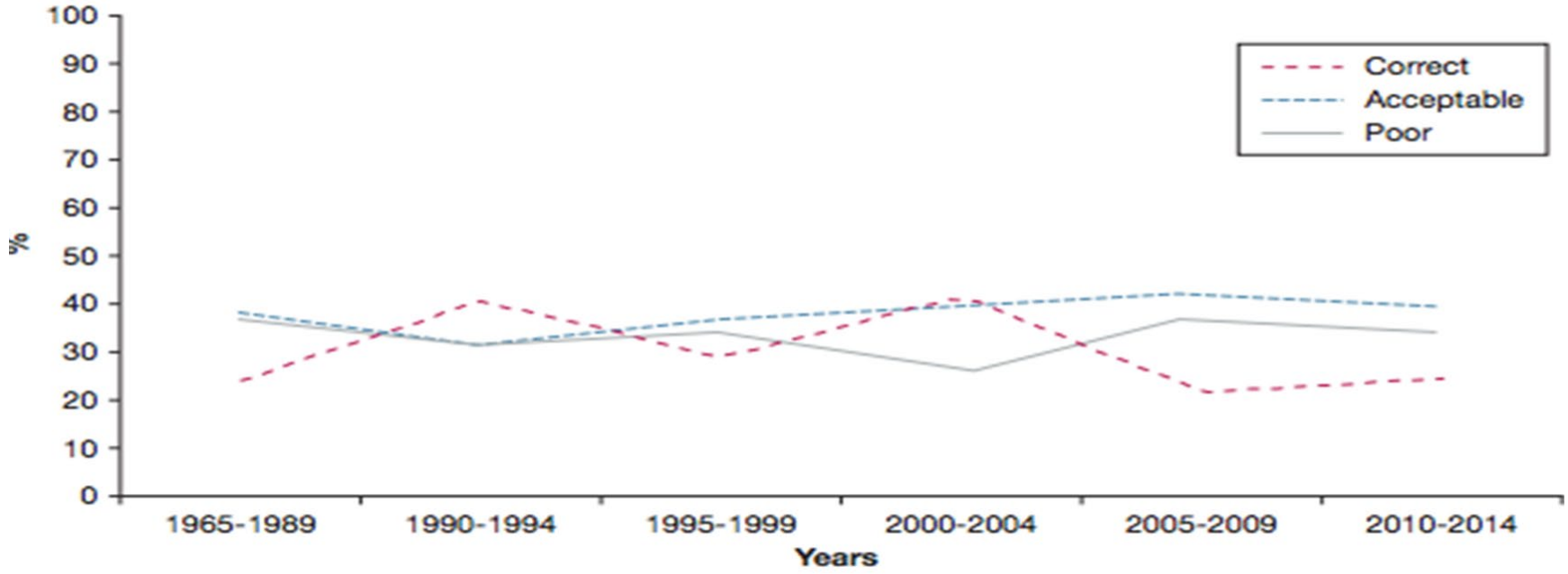
Reviewed by Dennis Williams, PharmD

Inhaler choice and environmental considerations

- Inhaled corticosteroids markedly reduce the risk of asthma exacerbations and death
  - But limited availability and access in low and middle income countries
- Many inhaler types available, with different techniques
- Some inhalers are not suitable for some patients. For example:
  - DPIs are not suitable for children ≤5 years and some elderly
  - pMDIs difficult for patients with arthritis or weak muscles
  - Capsule devices are difficult for patients with tremor
- Most patients don't use their inhaler correctly
  - More than one inhaler → more errors
- Incorrect technique → more symptoms → worse adherence → more exacerbations → higher environmental impact
- Propellants in current pMDIs have 25x global warming potential compared with dry powder inhalers
  - New propellants are being developed but not yet approved
- Choice of inhaler is important!


HOUSE
M.D.

Inhaler technique



Sanchis J. et al; Chest. 2016 Aug 1;150(2):394-406.

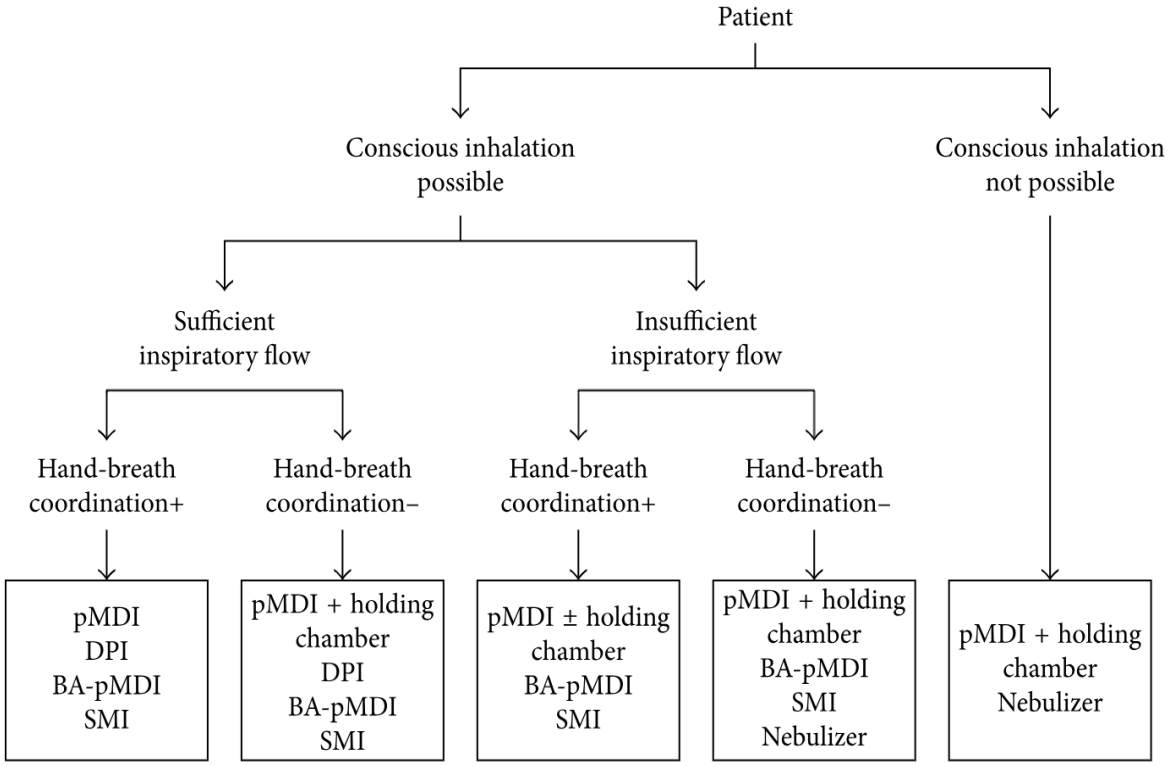
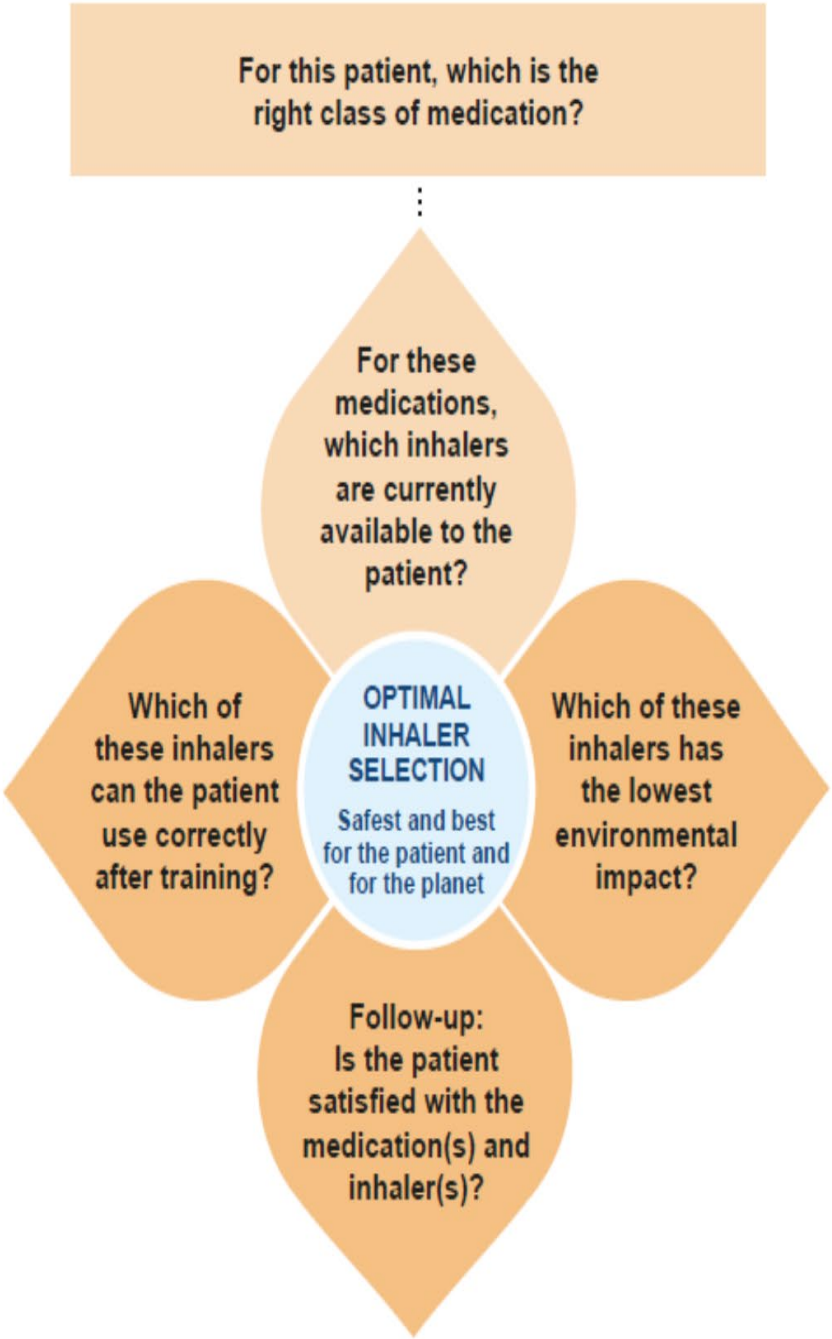


Figure 2: Device selection algorithm. Reproduced with permission from [28]. DPI, dry powder inhaler; pMDI, pressurized metered-dose inhaler; BA, breath-actuated; SMI, soft mist inhaler.

Kaplan A et al. Canadian Respiratory Journal, 2018, Article ID 9473051.

Inhaler choice and environmental considerations

- First, what is the right medication for this patient?
  - Control symptoms and reduce exacerbations
  - Urgent healthcare and hospitalization have a heavy environmental burden
- Which inhaler(s) can the patient access for this medication?
  - Low/middle income countries often have limited choice and access
  - Cost of inhalers is a major burden
- Which of these inhalers can the patient use correctly?
  - Incorrect technique → more exacerbations
- What are the environmental implications of these inhaler(s)?
  - Manufacture
  - Propellant (for pMDIs)
  - Recycling potential
- Is the patient satisfied with the treatment and the inhaler?
  - Consider the patient's environmental priorities
  - Avoid 'green guilt', which may contribute to poor adherence
  - Check inhaler technique frequently



Action plan for MART with ICS-formoterol

A Practical Guide to Implementing SMART in Asthma Management

Helen K. Reddel, MB, BS, PhD[a,*], Eric D. Bateman, MB, ChB, MD[b,*], Michael Schatz, MD, MS[c], Jerry A. Krishnan, MD, PhD[d], and Michelle M. Cloutier, MD[e] *Sydney, Australia; Cape Town, South Africa; Chicago, Ill; and Farmington, Conn*

Reddel et al, JACI in Practice 2022; 10: S31-s38

This article includes a writable action plan template
That can be modified for other combination ICS-formoterol inhalers, and for as-needed-only ICS-formoterol

For additional action plans with ICS-formoterol reliever, see National Asthma Council Australia Action plan library
www.nationalasthma.org.au/health-professionals/asthma-action-plans

My Asthma Action Plan

For Single Inhaler Maintenance and Reliever Therapy (SMART)
with budesonide/formoterol

Name: _____ Action plan provided by: _____

Date: _____ Doctor: _____

Usual best PEF: _____ L/min *(if used)* Doctor's phone: _____

Normal mode

My SMART Asthma Treatment is:

☐ budesonide/formoterol 160/4.5 (12 years or older)

☐ budesonide/formoterol 80/4.5 (4-11 years)

My Regular Treatment Every Day:

(Write in or circle the number of doses prescribed for this patient)

Take [1, 2] inhalation(s) in the morning

and [0, 1, 2] inhalation(s) in the evening, every day

Reliever

Use 1 inhalation of budesonide/formoterol whenever needed for relief of my asthma symptoms

I should always carry my budesonide/formoterol inhaler

My asthma is stable if:

- I can take part in normal physical activity without asthma symptoms

AND

- I do not wake up at night or in the morning because of asthma

Other Instructions

_____

_____

Asthma Flare-up

If over a Period of 2-3 Days:

- My asthma symptoms are getting worse **OR NOT** improving

OR

- I am using more than 6 budesonide/formoterol reliever inhalations a day (if aged 12 years or older) or more than 4 inhalations a day (if aged 4-11 years)

I should:

☒ Continue to use my regular everyday treatment **PLUS** 1 inhalation budesonide/formoterol whenever needed to relieve symptoms

☐ Start a course of prednisolone

☐ Contact my doctor

Course of Prednisolone Tablets:

Take _____mg prednisolone tablets

per day for _____days **OR**

_____

_____

If I need more than **12 budesonide/formoterol inhalations (total)** in any day (or more than 8 inhalations for children 4-11 years), I **MUST** see my doctor or go to the hospital the same day.

Asthma Emergency

Signs of an Asthma Emergency:

- Symptoms getting worse quickly
- Extreme difficulty breathing or speaking
- Little or no improvement from my budesonide/formoterol reliever inhalations

If I have any of the above danger signs, I should dial _____ for an ambulance and say I am having a severe asthma attack.

While I am waiting for the ambulance start my asthma first aid plan:

- Sit upright and stay calm.
- Take 1 inhalation of budesonide/formoterol. Wait 1-3 minutes. If there is no improvement, take another inhalation of budesonide/formoterol (up to a maximum of 6 inhalations on a single occasion).
- If only albuterol is available, take 4 puffs as often as needed until help arrives.
- Start a course of prednisolone tablets (as directed) while waiting for the ambulance.
- Even if my symptoms appear to settle quickly, I should see my doctor immediately after a serious attack.

Modified from Australian action plan with permission from National Asthma Council Australia and AstraZeneca Australia

Uncontrolled Asthma

Assess potential reasons of poor control, and correct if indicated

Assess adherence

Assess inhalation technique

Assess environmental, including occupational, exposures

Assess key potential co-morbidities or alternative diagnoses, and if suspected, investigate/treat

Rhinosinusitis

Gastro-esophageal reflux.

Vocal cord dysfunction (VCD)

Anxiety and depression

Consider less frequent co-morbidities or alternative diagnosis

Immunodeficiency

Cystic fibrosis

Tracheobronchomalacia or other suspected airway abnormalities

Non CF bronchiectasis

Vasculitis

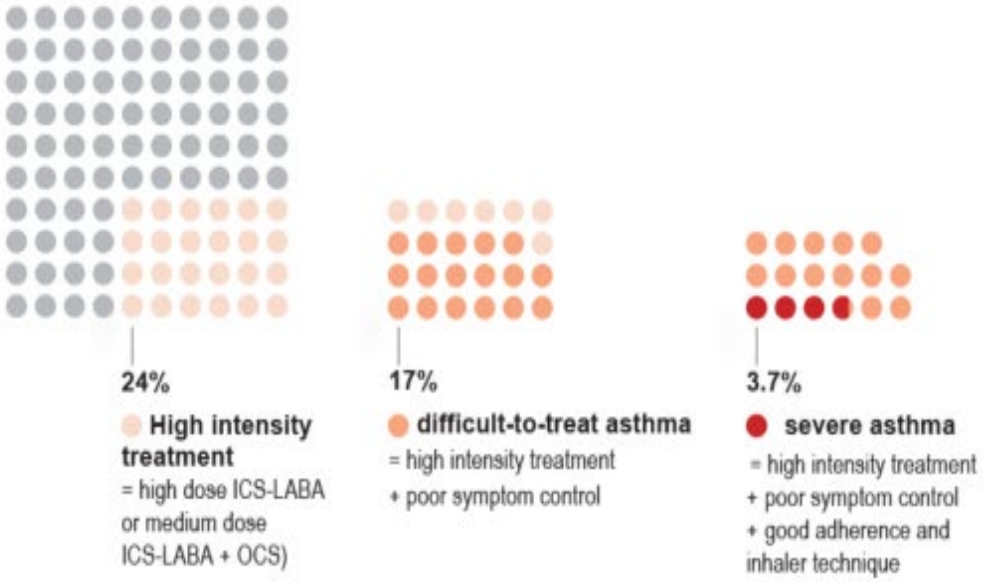
Allergic pulmonary aspergillosis

Atypical mycobacteria infections

J Mark FitzGerald, et al. CANADIAN JOURNAL OF RESPIRATORY, CRITICAL CARE, AND SLEEP MEDICINE 2017, VOL. 1, NO. 4, 199–221

Severe Asthma

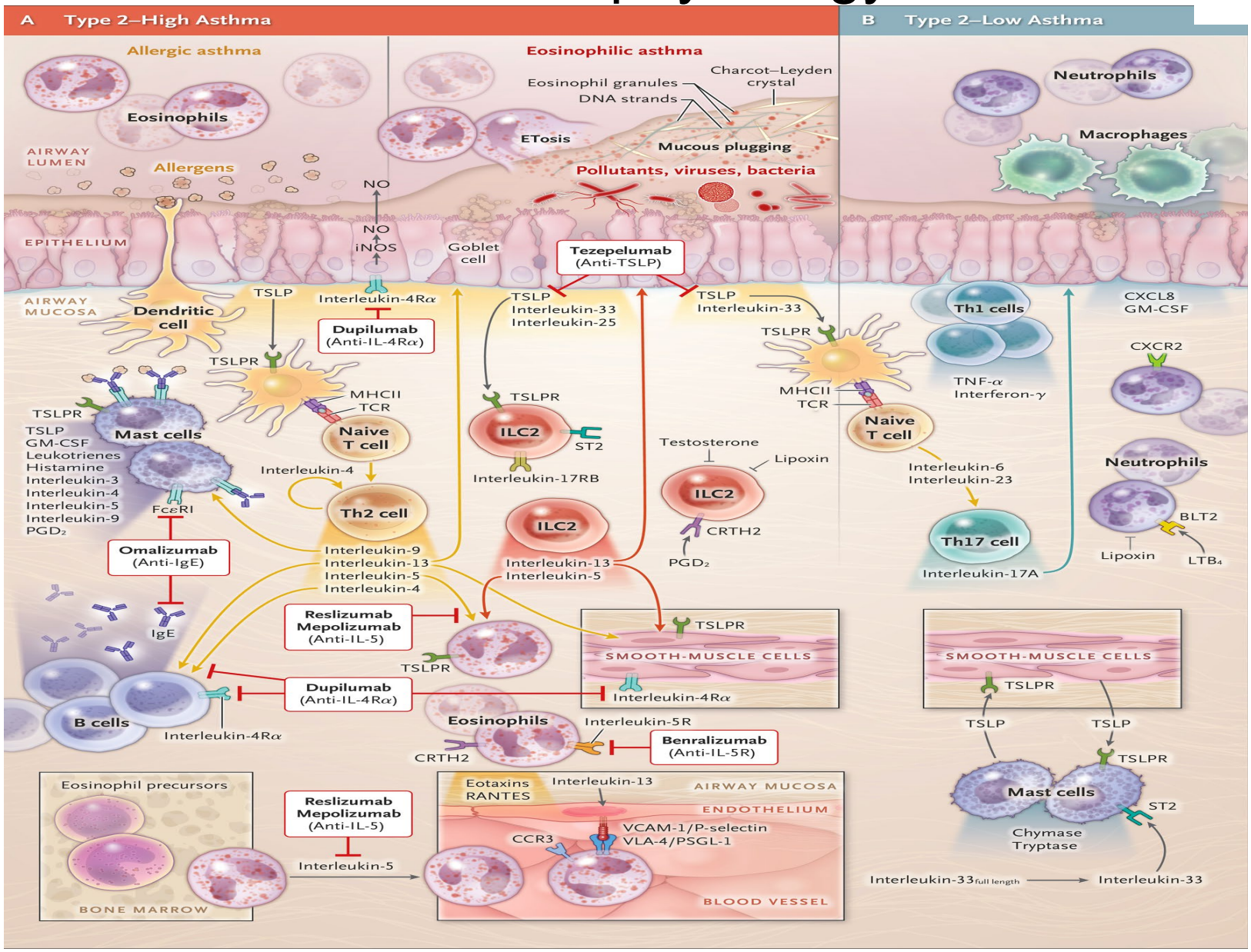
What proportion of adults have severe asthma?



Data from Hekking et al, JACI 2015

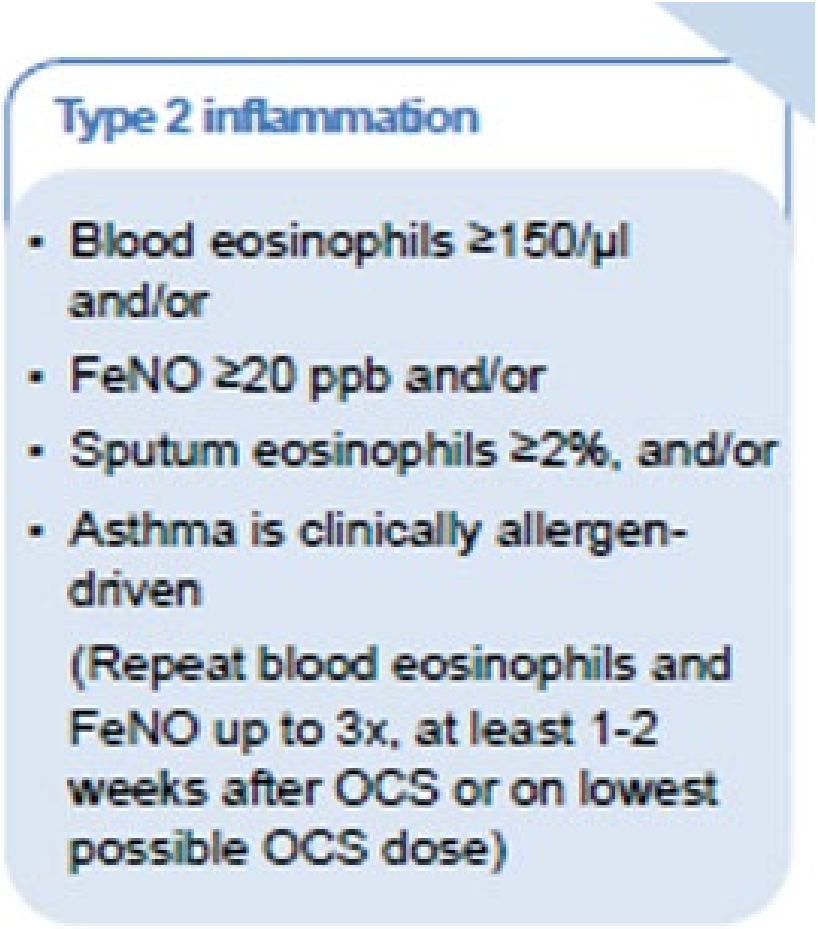
ICS: inhaled corticosteroids; LABA: long-acting beta$_2$-agonist; OCS: oral corticosteroids

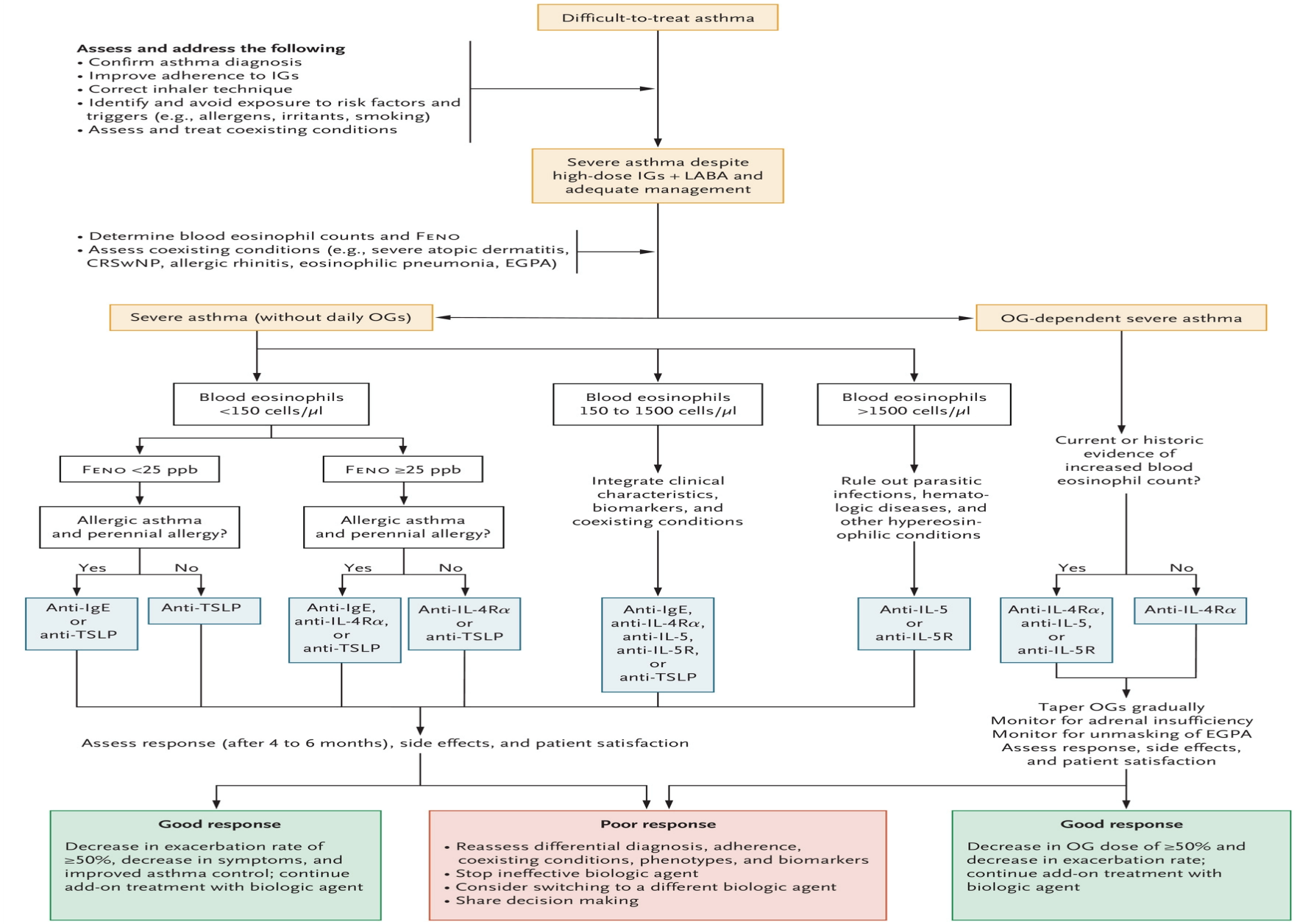
Asthma Pathophysiology



Guy G. Brusselle, et al, N Engl J Med 2022; 386:157-171

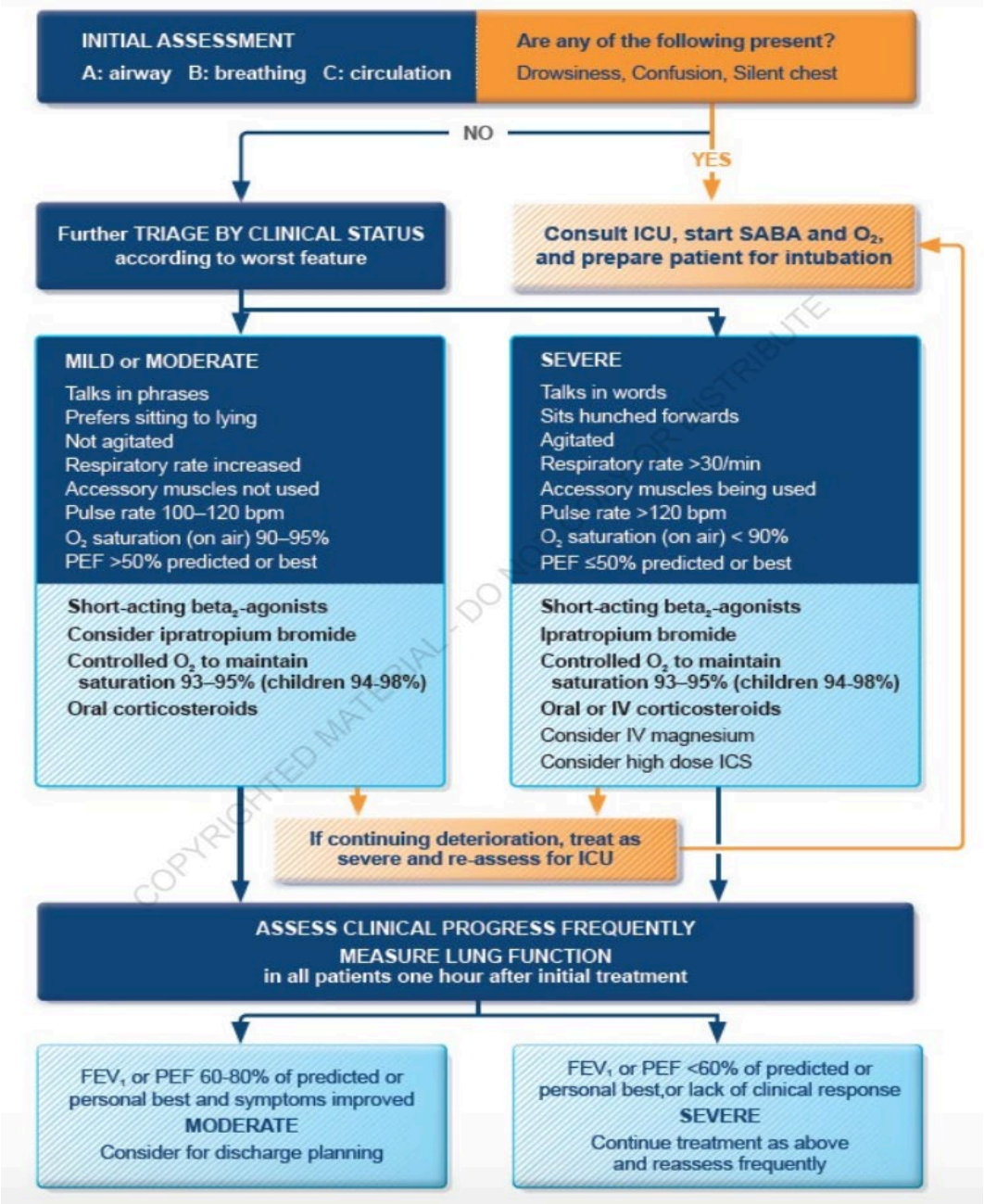
Biomarkers


Type 2 inflammation
• Blood eosinophils ≥150/µl and/or
• FeNO ≥20 ppb and/or
• Sputum eosinophils ≥2%, and/or
• Asthma is clinically allergen-driven
(Repeat blood eosinophils and FeNO up to 3x, at least 1-2 weeks after OCS or on lowest possible OCS dose)



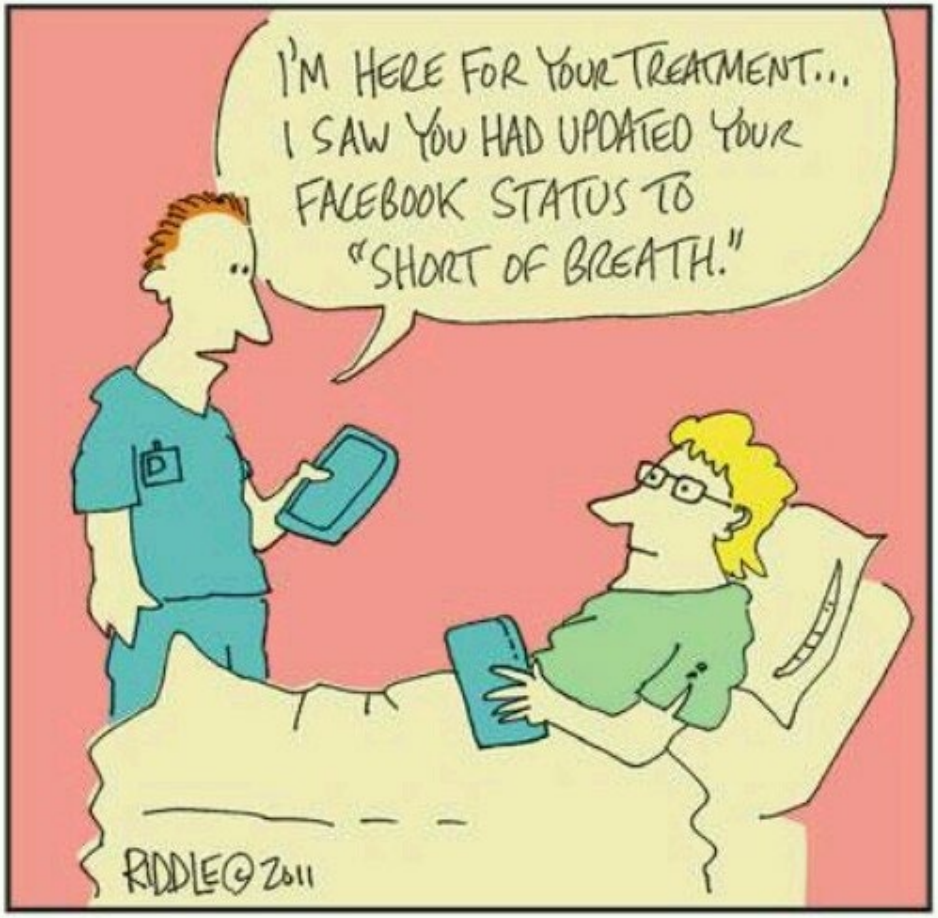
Guy G. Brusselle, et al, N Engl J Med 2022; 386:157-171

Acute Exacerbation



Global Initiative for Asthma, GINA (2023)

Questions?


I'M HERE FOR YOUR TREATMENT... I SAW YOU HAD UPDATED YOUR FACEBOOK STATUS TO "SHORT OF BREATH."
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