Let's Talk About Asthma (Again!)

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Disclosures

I have no disclosures

What we will discuss

1. Oral Corticosteroid Use – Reviewing its significance
2. GINA 2025 asthma management including (S)MART and AIR
3. Prescribing ICS vs ICS/LABA
4. Asthma severity classification
5. PCV 15 vs PCV 20
6. If time: Diagnosing asthma in 5 years and younger per GINA 2025

Oral Corticosteroids for Asthma

Part I

Introduction

- Asthma is the most common chronic disease of childhood in the U.S.
  - Affects 6-10% of Americans <18 years old, ~6 million
- Oral corticosteroids (OCS) are fast-acting anti-inflammatory agents.
- Used to treat exacerbations due to rapid onset and effectiveness
- An estimated 4.33 million prednisolone prescriptions were given in 2022 for all indications
  - Compare with approximately 4.5 million children with asthma at that time
- Data from a large managed care Medicaid and Children's Health Insurance Program showed that >40% of asthmatic children receive ≥1 OCS course per year (vs. 6.8% of the general pediatric population)

DOI:10.1542/peds.2016-4146
DOI.org/10.1111/cts.13649
CDC Asthma Data (2022)
Clincalc.com

Mechanism of Action

- OCS suppress immune response via genomic and non-genomic pathways — reducing cytokine activity, leukocyte recruitment, and mucosal inflammation.
- Systemic absorption is complete and rapid: peak plasma concentrations in 1–2 hours, clinical benefits within 4–6 hours; peak effects at 24–48 hours.
- Unlike ICS, OCS do not target the lungs specifically — all organs are exposed, including brain, bone, adrenal glands, and gut.

DOI: 10.1183/09031936.00074905

Acute Side Effects of OCS in Children

- Common effects: irritability, mood swings (depression > euphoria > mixed hypomania -> depression), sleep disturbance, hyperactivity, stomach upset, increased appetite.
- Even one burst may cause behavior changes that interfere with school and parent-child relationships.

Doi: 10.4065/81.10.1361.
Doi: 10.1136/adc.2003.041541
Doi: 10.1097/00004583-198811000-00010
Doi: 10.1017/S1355617712001014

Complication Risks in Children

Data from Large Datasets:

- 60% increased odds of any complication; higher healthcare resource utilization
  - 60,000+ studied between 2000-2017
- 1.4- to 2.2-fold increased risk of GI bleeding, sepsis, and pneumonia within the first month of a single OCS burst that is attenuated during the subsequent 31 to 90 days
  - 4.5 million Taiwanese children studied, 1.06 million received oral steroids, most commonly for acute respiratory tract infections and allergic diseases

DOI: 10.1016/j.jaip.2020.11.049
DOI: 10.1001/jamapediatrics.2021.0433

Potential Cumulative Harms

- Adults (>18 yo):
  - ≥4 courses/year -> ~30% increased odds of new osteoporosis, HTN, DM, GI ulcers/bleeds, fractures, and cataracts that same year
- Pediatric asthmatics:
  - ≥2 courses/year (<18yo) -> measurable growth suppression in longitudinal studies.
  - ≥4 courses/year: Possible dose-dependent fracture risk, risk of adrenal suppression
  - Possible long-term neuropsychiatric impacts, especially with repeated cycles.

DOI: 10.1111/pai.70143
DOI: 10.1016/s0091-6749(87)80195-1
Global Initiative for Asthma 2025
NAEPP Expert Panel Report 3 2007

OCS Side Effects: Big Picture

- We know that OCS are associated with multiple-system side effects.
- It's clear that daily, long-term steroids are relatively high risk.
- Less is known about the effects of acute bursts.
- Most studies have been done in adults.
- Main takeaway is that OCS are not benign. There is some data supporting adverse effects even after a few courses of OCS and potential cumulative effects.

Compare to Inhaled Corticosteroids

- Inhaled corticosteroids (ICS) result in lower circulating steroid concentrations, but not zero, so may also cause adverse effects.
  - Overall seems much less
  - Thrush and dysphonia are main risks
  - Growth deceleration concerns:
    - Slight decrease in linear growth velocity (studies range from 0.2-0.48cm/year), highest in the first year
    - Does not appear to be progressive or cumulative
    - The Childhood Asthma Management Program (CAMP) study found an initial growth velocity reduction in the first year, which normalized by the end of the 4-6 year study. Total height difference was 1.1 cm lower in the budesonide group compared to placebo.

DOI: 10.1164/ajrccm.164.4.2101050
DOI: 10.1016/j.tem.2007.10.005

Do asthmatic children need OCS as often as they receive it?

No (but it’s nuanced)

ORAL CORTICOSTEROID STEWARDSHIP STATEMENT

November 2018

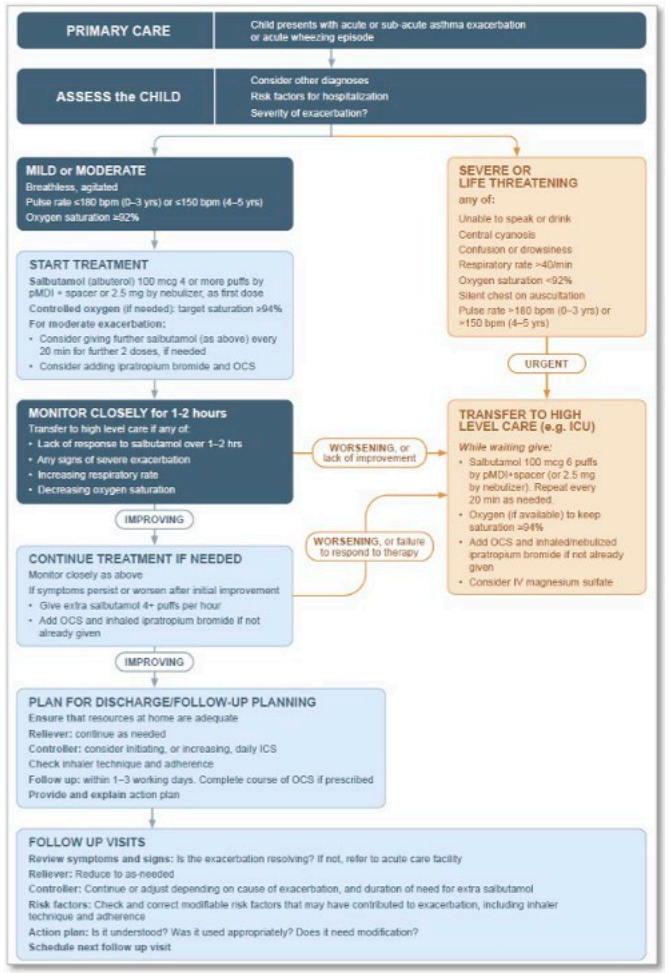
It is time to protect patients with asthma from potential overexposure to oral corticosteroids (OCS) – and to recognize OCS overuse for what it often is: a treatment plan failure.

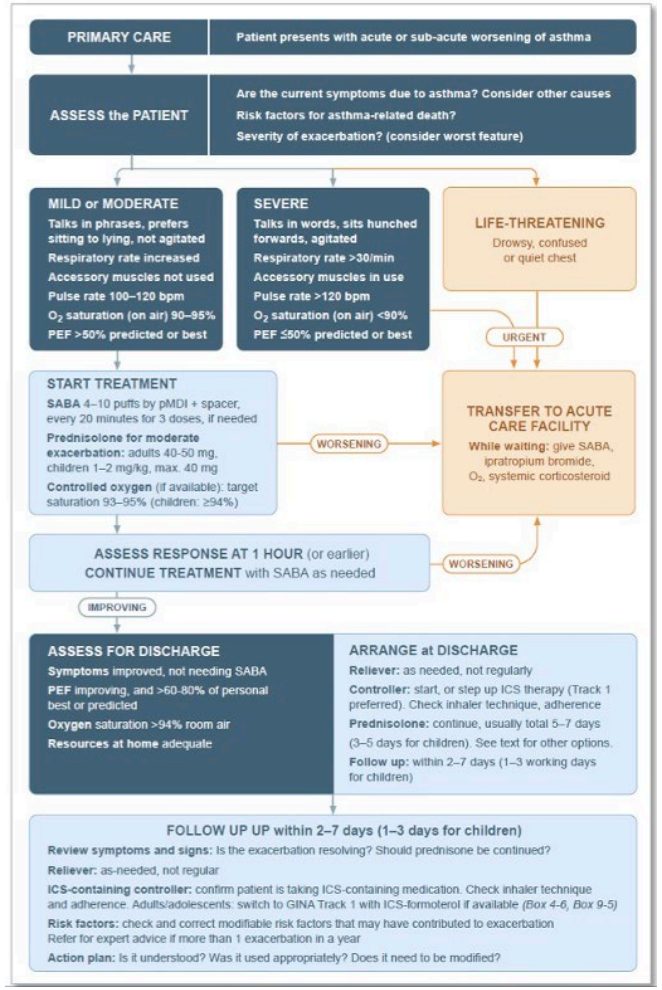
GINA 2025 Asthma Management

Part II

OCS Indications for Asthma in Primary Care

Exacerbation Management by Primary Care





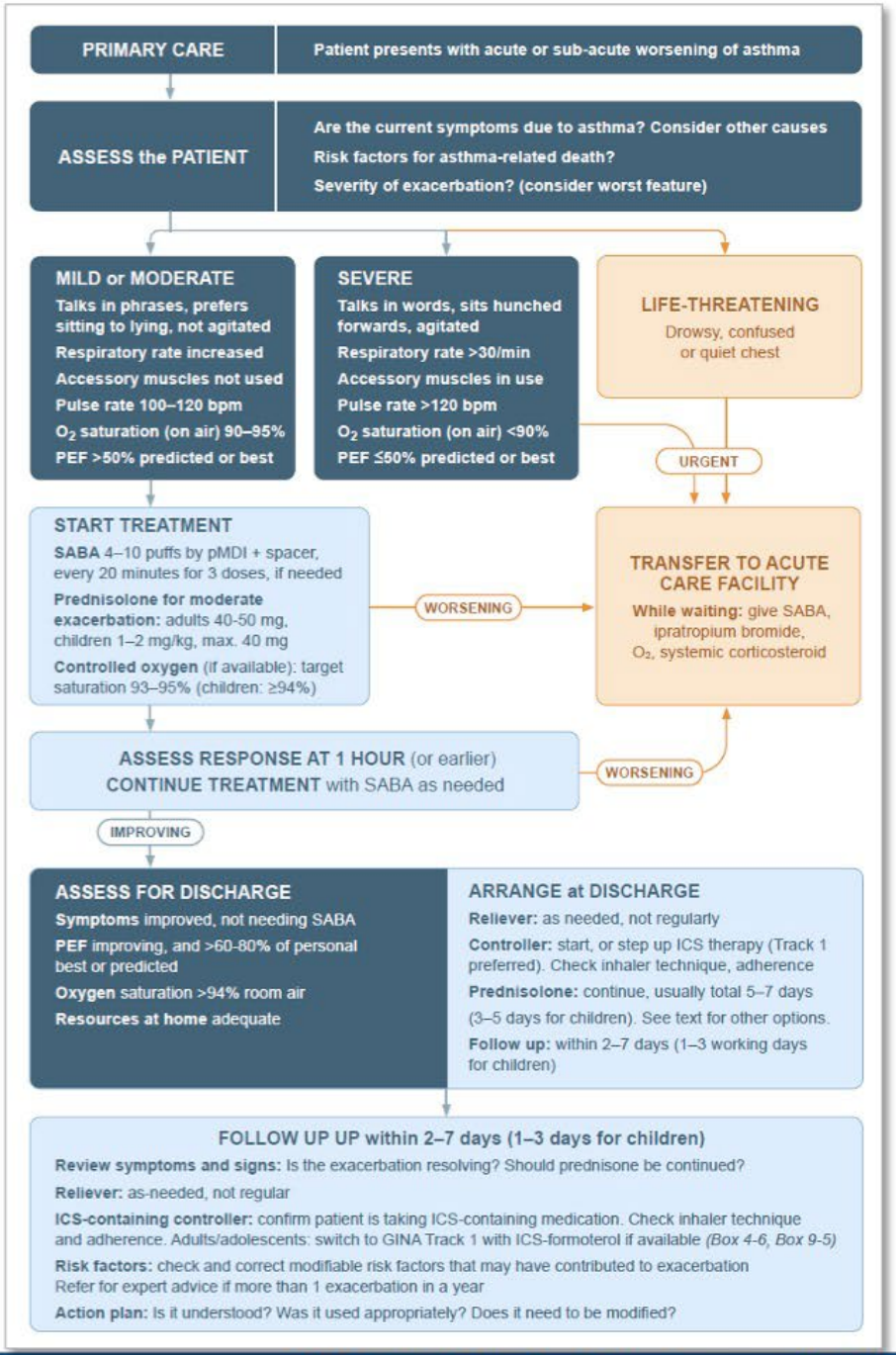
Global Initiative for Asthma 2025

Asthma exacerbations in primary care
(adults, adolescents, children 6–11 years)

Key changes in 2025

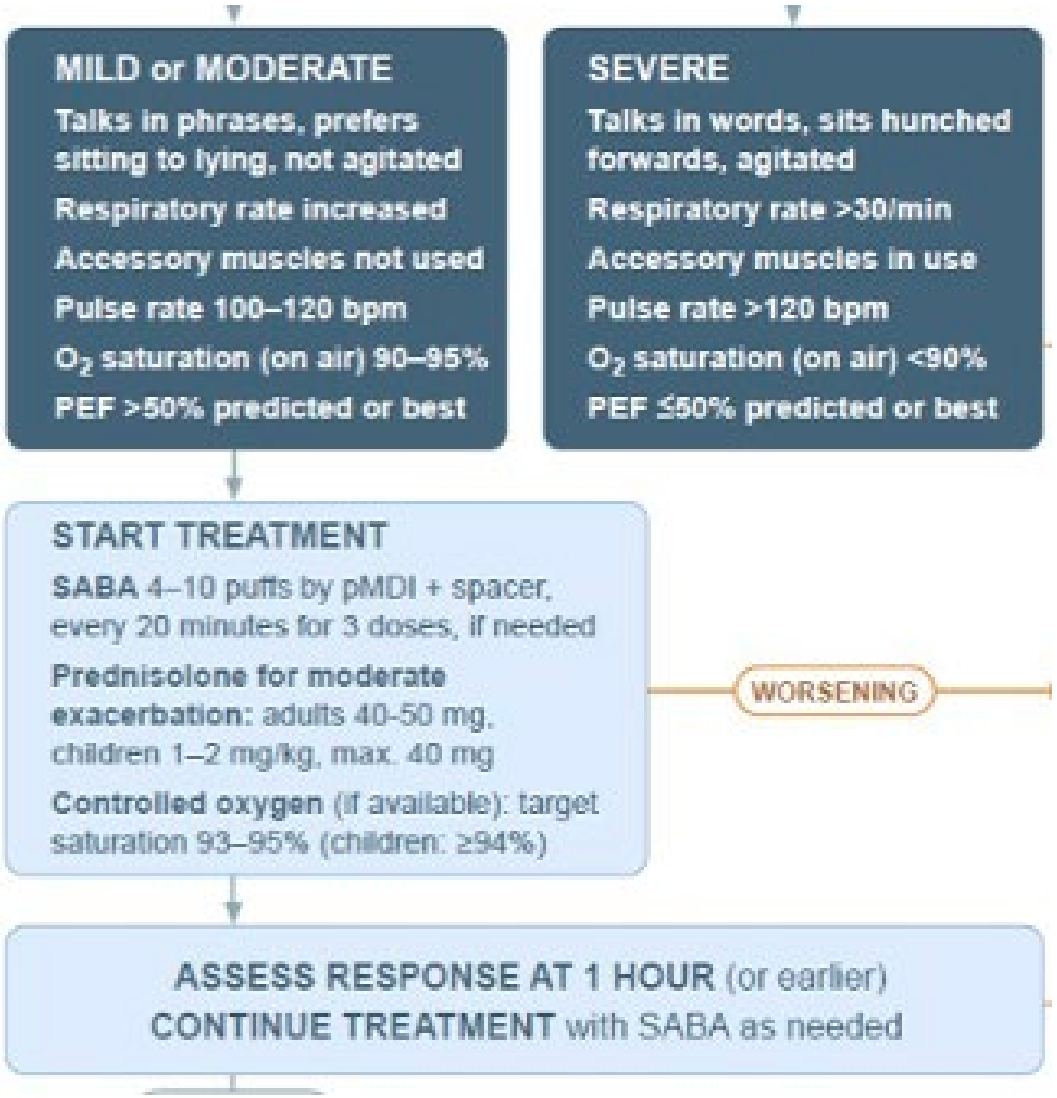
- Prompt to consider differential diagnosis
- In mild/moderate exacerbations, review response to initial SABA before continuing high dose SABA or giving oral corticosteroids
- Target O_2 saturation is 93–95% for adults and adolescents, ≥94% for children
- Initiate or increase ICS-containing treatment on discharge; review risk factors, inhaler technique, adherence

Further review is planned for 2026



ICS: inhaled corticosteroid; O_2: oxygen; SABA: short-acting beta$_2$-agonist

Exacerbations – 6 years and older



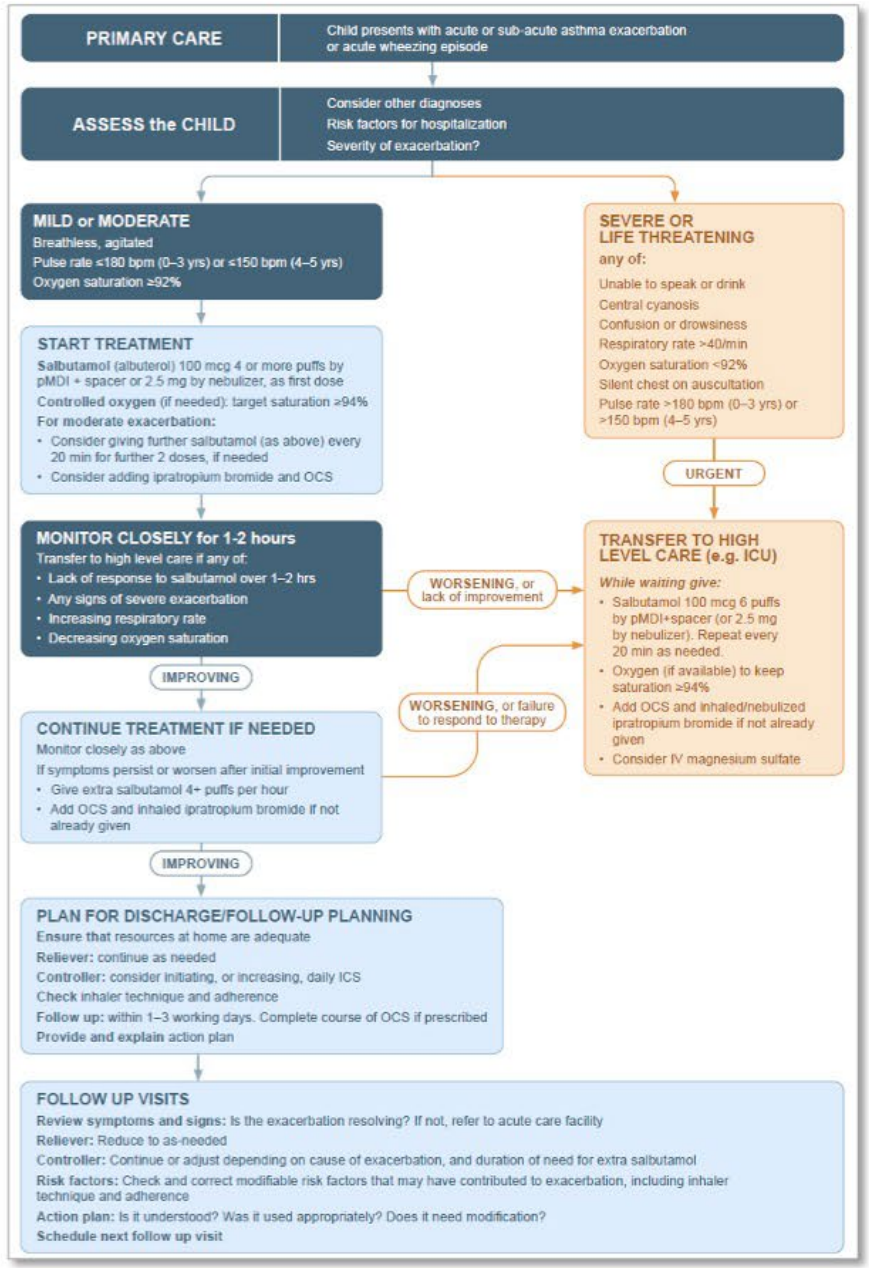
- Oral corticosteroids are indicated for moderate and severe exacerbations

Global Initiative for Asthma 2025

Child 5 years or younger with acute asthma or wheezing in primary care

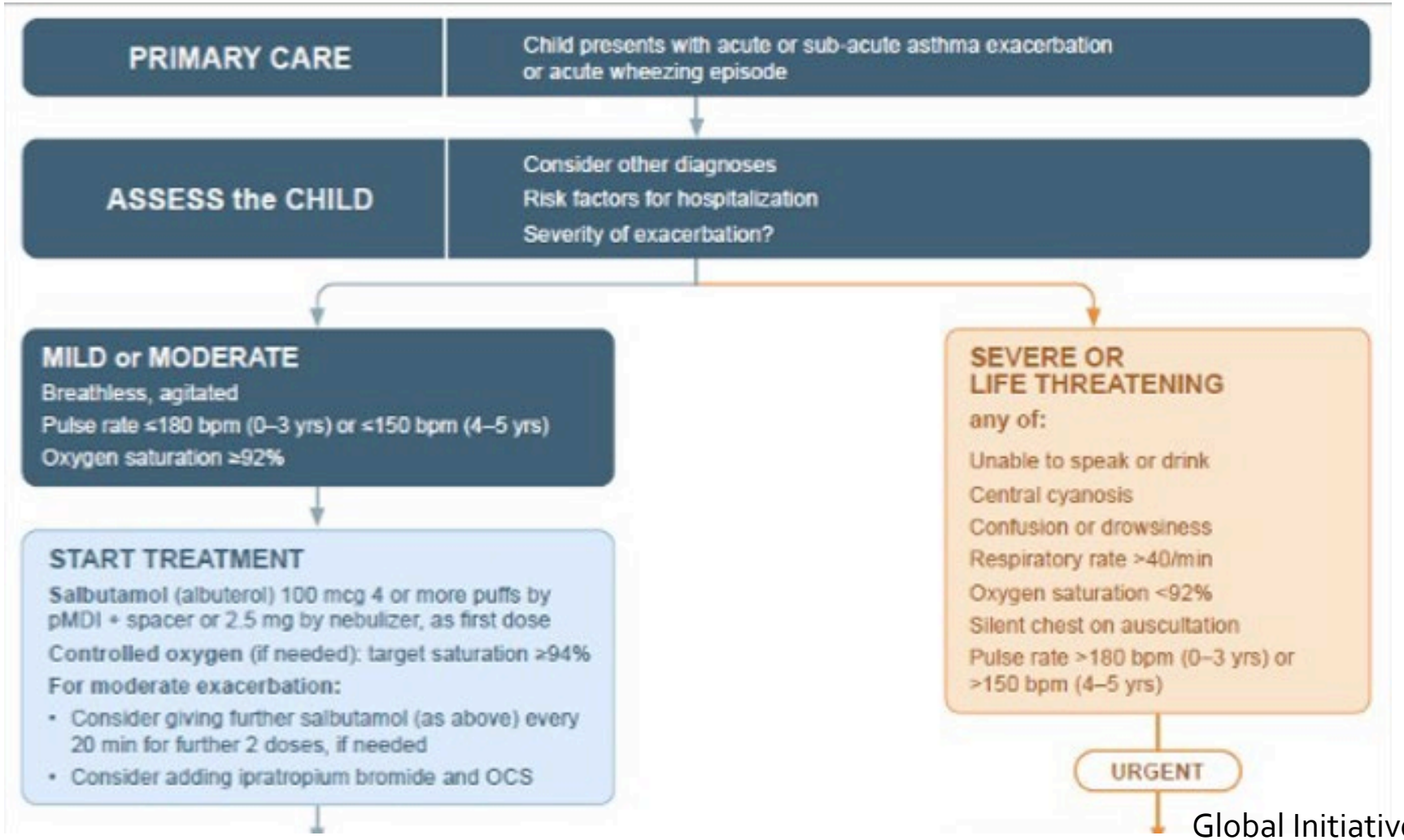
- Amount of SABA depends on response to initial treatment, rather than routine high doses
- Consider adding ipratropium and OCS for moderate exacerbations, or if initially mild symptoms persist or worsen despite SABA
- For severe or life-threatening exacerbations, add inhaled or nebulized ipratropium bromide and OCS if not already given, and consider adding IV magnesium
- On discharge: initiate or increase ICS
- Follow-up visit within 1–3 days: refer to acute care facility if not improving

Further review is planned for 2026



ICS: inhaled corticosteroid; IV: intravenous; O_2: oxygen; OCS: oral corticosteroid; SABA: short-acting beta$_2$-agonist

Exacerbations – Up to 5 years old



Global Initiative for Asthma 2025

OCS dose

12 years and under:

- prednisolone 1-2 mg/kg per day with maximum 40 mg per day, for 3 to 5 days
- Not 60mg

vs adults and adolescents:

- Prednisone 40-50mg/day for 5-7 days

Global Initiative for Asthma 2025

After the exacerbation, re-examine control

GINA 2025 guidelines recommend follow up within 1-3 days of an ED visit or admission to assess progression and adherence

Assessment of asthma control

Asthma control has **two** components

A. Recent asthma symptom control

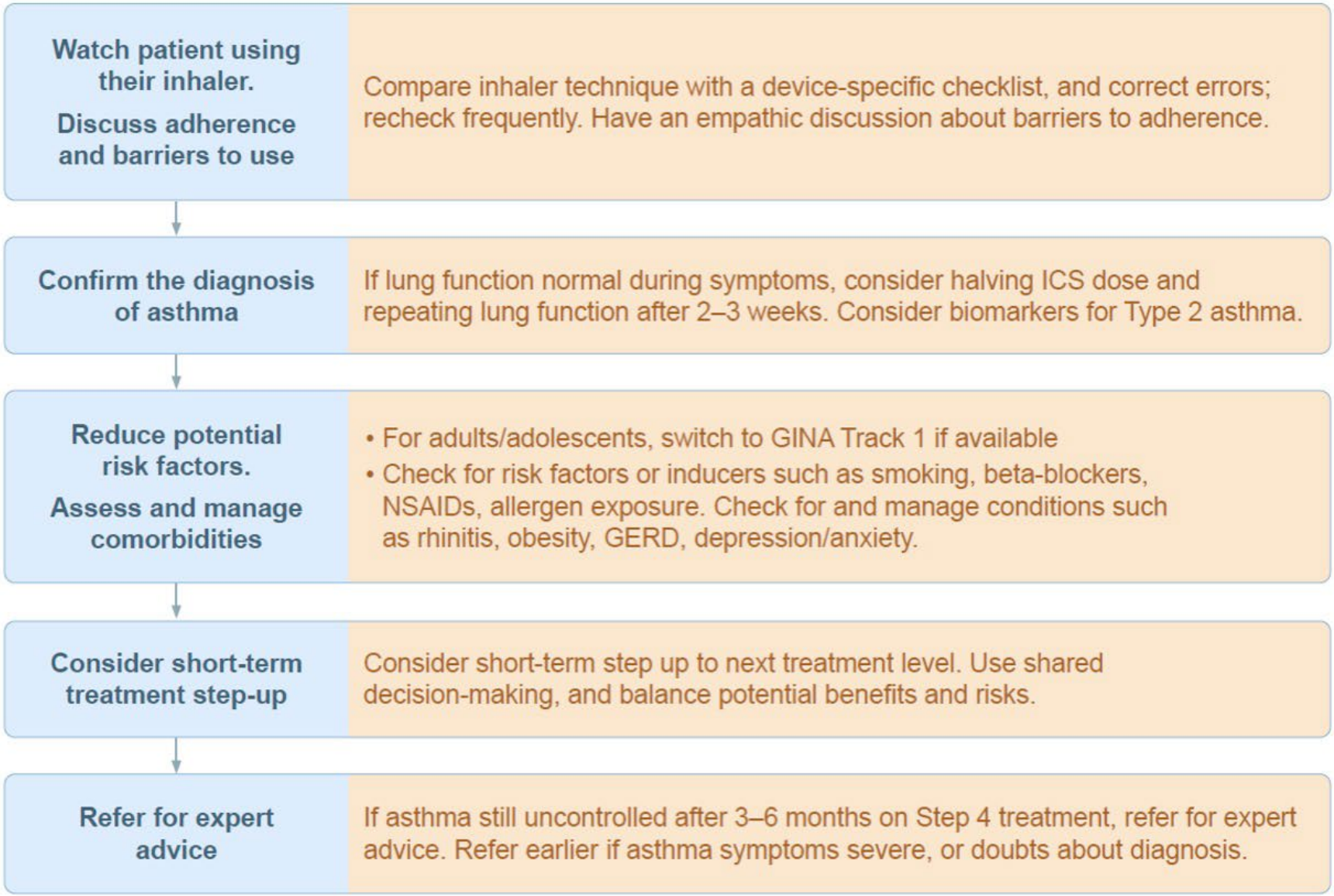
B. Risk factors for poor asthma outcomes

- Exacerbations
- Persistent airflow limitation
- Medication side-effects

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

A. Recent asthma symptom control (but also ask the patient/caregiver about the whole period since last review*)				
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☐			
B. Risk factors for poor asthma outcomes				
Assess risk factors at diagnosis and periodically, including after an exacerbation.				
Measure FEV_1 at start of treatment, after 3–6 months of ICS-containing treatment to record the patient's personal best lung function, then periodically for ongoing risk assessment.				
i. Risk factors for exacerbations				
Uncontrolled asthma symptoms: Having uncontrolled symptoms is an important risk factor for exacerbations.				
Factors that increase the risk of exacerbations even if the patient has few asthma symptoms:‡				
SABA over-use: High SABA use (≥3 x 200-dose canisters/year associated with increased risk of exacerbations, increased mortality particularly if ≥1 canister per month)				
Inadequate ICS: not prescribed ICS, poor adherence, or incorrect inhaler technique				
Other medical conditions: Obesity, chronic rhinosinusitis, GERD, confirmed food allergy, pregnancy				
Exposures: Smoking, e-cigarettes, allergen exposure if sensitized, air pollution				
Psychosocial: Major psychological or socioeconomic problems				
Lung function: Low FEV_1 (especially <60% predicted), high bronchodilator responsiveness				
Type 2 inflammatory markers: Raised blood eosinophils, high FeNO (see biomarker overview)				
Exacerbation history: Ever intubated or in intensive care unit for asthma, ≥1 severe exacerbation in last year				
ii. Risk factors for developing persistent airflow limitation				
History: Preterm birth, low birth weight and greater infant weight gain, frequent productive cough				
Medications: Lack of ICS treatment in patient with history of severe exacerbation				
Exposures: Tobacco smoke, noxious chemicals; occupational or domestic exposures				
Investigation findings: Low initial FEV_1, sputum or blood eosinophilia				
iii. Risk factors for medication side-effects				
Systemic Frequent OCS, long-term, high-dose and/or potent ICS, P450 inhibitors§				
Local: High-dose or potent ICS, poor inhaler technique				

Investigating uncontrolled asthma in primary care



GERD: gastro-esophageal reflux disease; ICS: inhaled corticosteroid; NSAID: non-steroidal anti-inflammatory drug; SABA: short-acting beta$_2$-agonist

GINA 2025 - personalized asthma management

REVIEW

- Symptoms
- Exacerbations
- Side-effects
- Comorbidities
- Lung function
- Consider biomarkers
- Patient (and parent/caregiver) satisfaction

ASSESS

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

ADJUST

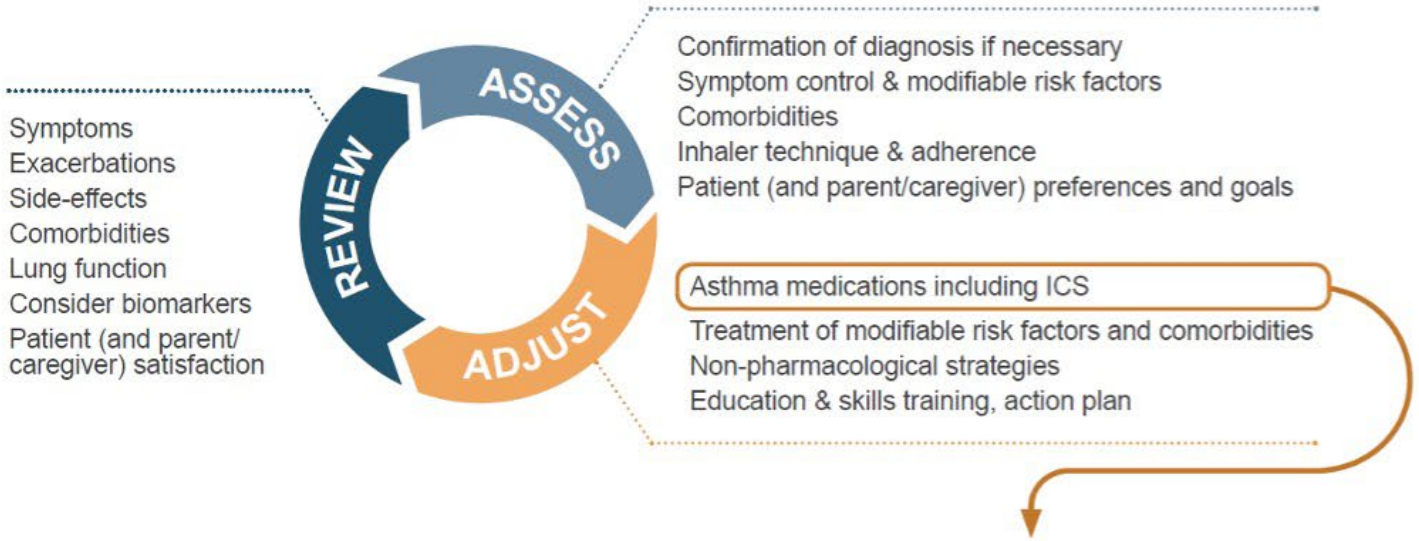
- Treatment of modifiable risk factors and comorbidities
- Non-pharmacological strategies
- Asthma medications including ICS
- Education & skills training, action plan

ICS: inhaled corticosteroids

Asthma management for 12 years and older

GINA 2025 – STARTING TREATMENT

in adults and adolescents 12+ years with a diagnosis of asthma



IF the patient has:	START WITH:	TRACK 1 (preferred)	OR	TRACK 2	
Daily symptoms or waking at night once a week or more, and low lung function or recent exacerbation	YES	Medium dose ICS-formoterol maintenance and reliever (MART)		Medium dose ICS-LABA + as-needed SABA (or ICS-SABA)	STEP 4
Symptoms most days, or waking at night once a week or more, or low lung function	YES	Low dose ICS-formoterol maintenance and reliever (MART)		Low dose ICS-LABA + as-needed SABA (or ICS-SABA)	STEP 3
Symptoms less than 3–5 days a week, with normal (or mildly reduced) lung function	YES	As-needed-only low dose ICS-formoterol (AIR-only)		Low dose ICS + as-needed SABA (or ICS-SABA)	STEP 2
				As-needed ICS+SABA (separate inhalers or combination)	STEP 1

NO

NO

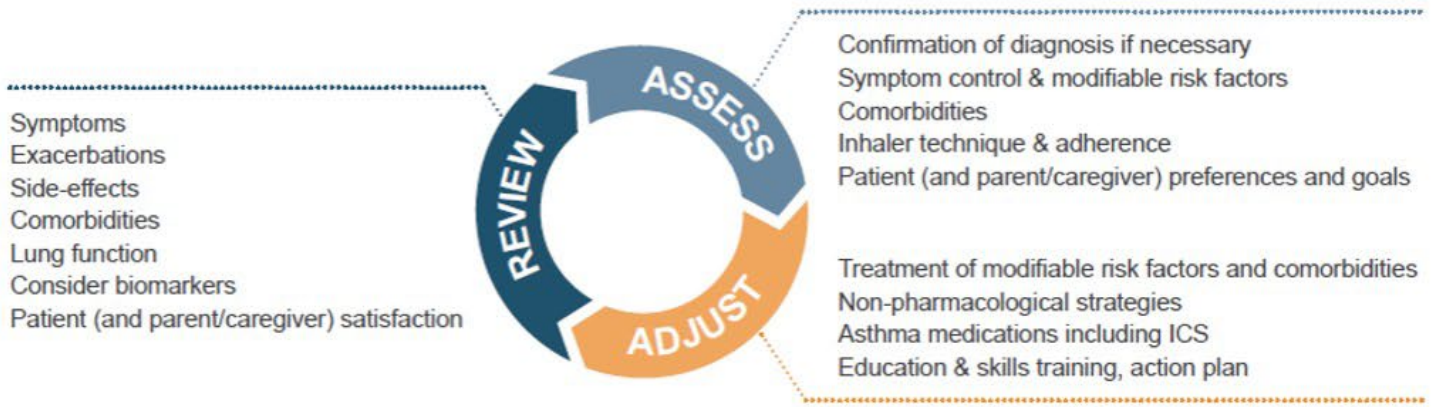
Short course of OCS may also be needed for patients presenting during an exacerbation

Track 2: in patients with symptoms 1–2 days a week or less, adherence with daily ICS would be very poor, so taking low-dose ICS whenever SABA is taken could reduce the risk of exacerbations

AIR: anti-inflammatory reliever; ICS: inhaled corticosteroid; LABA: long-acting beta$_2$-agonist; MART: maintenance-and-reliever therapy with ICS-formoterol; OCS: oral corticosteroid; SABA: short-acting beta$_2$-agonist

GINA 2025
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
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*

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
Reliever only; if SABA, take ICS with each dose

STEP 2
Low dose maintenance ICS

STEP 3
Low dose maintenance ICS-LABA

STEP 4
Medium dose maintenance ICS-LABA

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

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

Non-pharmacologic strategies include smoking cessation, physical activity, pulmonary rehabilitation, weight reduction, vaccinations (see text for more)
Allergen immunotherapy, e.g. HDM SLIT: consider for patients with clinically relevant sensitization and not well-controlled (but stable) asthma See text for further information and safety advice
Additional controller options (e.g., add-on LAMA at Step 4, add-on LTRA) have less evidence for efficacy or for safety than Tracks 1 or 2 (see text). Maintenance OCS should only ever be used as last resort.

AIR: anti-inflammatory reliever; HDM: house dust mite; ICS: inhaled corticosteroid; Ig: immunoglobulin; IL: interleukin; LABA: long-acting beta$_2$-agonist; LAMA: long-acting muscarinic antagonist; LTRA: leukotriene receptor antagonist; MART: maintenance-and-reliever therapy with ICS-formoterol; OCS: oral corticosteroid; SABA: short-acting beta$_2$-agonist; SLIT: subcutaneous immunotherapy; TSLP: thymic stromal lymphopoietin

Example of GINA Track 1 with ICS-formoterol reliever (≥12 years)

STEPS 1 – 2
Take 1 inhalation ICS-form as needed *(AIR-only)*

STEP 3
Take 1 inhalation ICS-form morning and evening, and 1 as needed *(Step 3 MART)*

STEP 4
Take 2 inhalations ICS-form morning and evening, and 1 as needed *(Step 4 MART)*

STEP 5
Refer for expert assessment, phenotyping, and add-on treatment for severe asthma

These examples are for budesonide-formoterol 160/4.5 mcg or BDP-formoterol 100/6 mcg, DPI or pMDI. See Box 4-8 for other formulations.

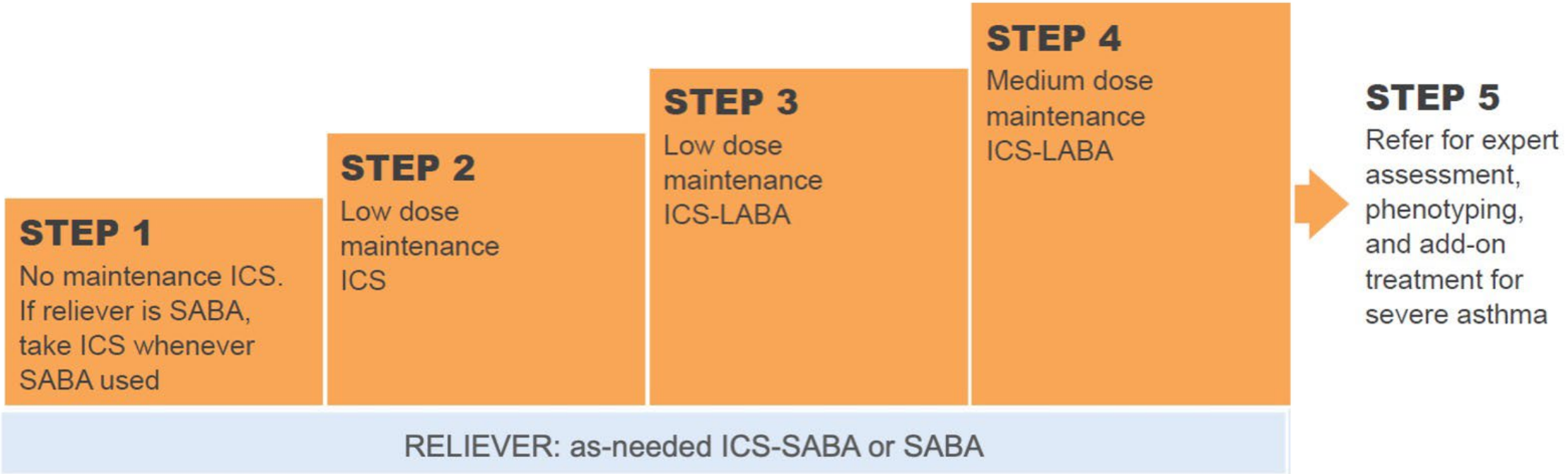
TRACK 1, Steps 1–4: the **PREFERRED** treatment for adults and adolescents.

Using ICS-formoterol as an anti-inflammatory reliever (AIR), with or without maintenance ICS-formoterol, reduces the risk of exacerbations compared with using a SABA reliever, and is a simpler regimen, with a single medication and dose across treatment steps.

Check local payer eligibility criteria for medications and doses

AIR: anti-inflammatory reliever; BDP: beclometasone dipropionate; DPI: dry powder inhaler; form: formoterol; ICS: inhaled corticosteroid; MART: maintenance-and-reliever therapy with ICS-formoterol; pMDI: pressurized metered dose inhaler; SABA: short-acting beta$_2$-agonist

GINA Track 2 with SABA or ICS-SABA reliever (≥12 years)



TRACK 2, Steps 1–4: Alternative CONTROLLER and RELIEVER for adults and adolescents.

Before considering a regimen with SABA reliever, check if the patient is likely to adhere to daily ICS treatment. If controller and reliever are in different types of inhaler device, or if changing steps requires a change in device, train patient in the correct inhaler technique.

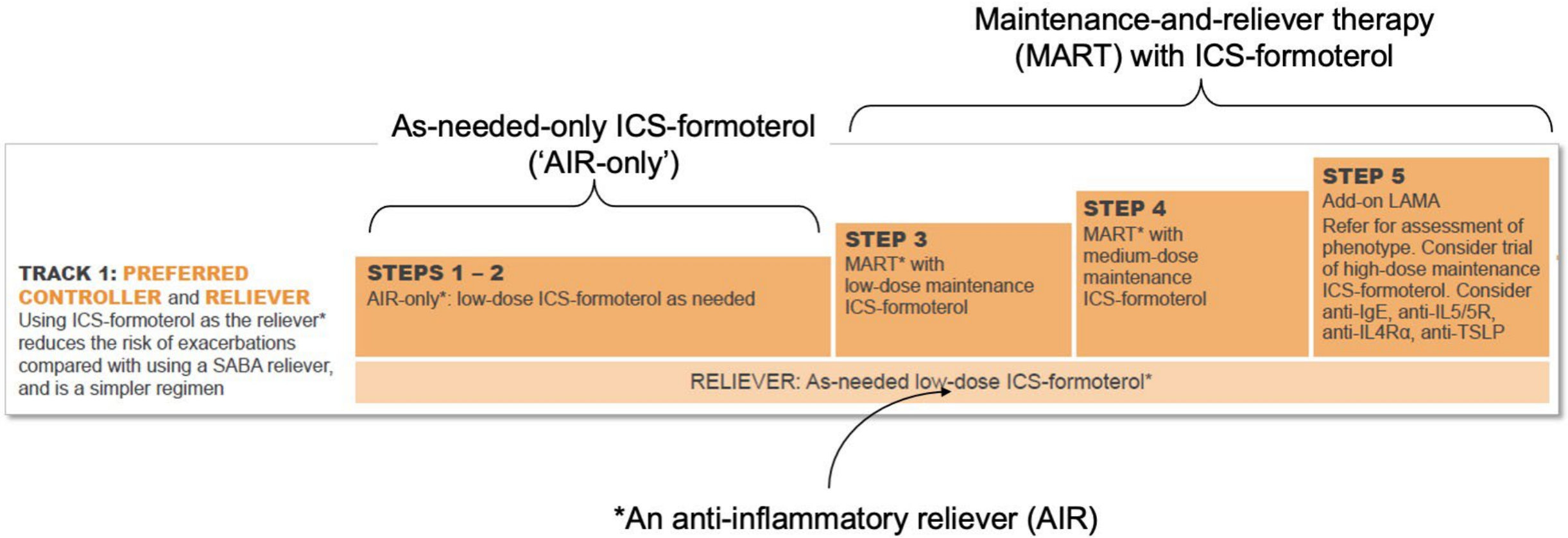
ICS: inhaled corticosteroid; LABA: long-acting beta$_2$-agonist; SABA: short-acting beta$_2$-agonist

Key changes to treatment recommendations for adults and adolescents

- The **two-track approach** has been retained, given GINA's global audience
- **Track 1 with ICS-formoterol anti-inflammatory reliever is preferred** because:
  - It significantly reduces risk of severe exacerbations, oral corticosteroid exposure and need for urgent health care compared with SABA-based regimens
  - With a single inhaler and single inhaler device across Steps 1 to 4, it is easier for patients than Track 2
- **In Track 2**:
  - Step 4, 'medium/high dose' ICS-LABA changed to 'medium dose' ICS-LABA
  - High ICS doses should be used only for a maximum of 3–6 months if possible
  - Check patients are adherent with maintenance ICS or ICS-LABA, else they will be taking SABA alone
  - Make sure the patient knows correct technique for their separate reliever and maintenance inhalers
- Other controller options include non-pharmacologic strategies (including smoking cessation, weight reduction, vaccinations, pulmonary rehabilitation), and allergen immunotherapy. Some additional medications may be available but have less evidence for efficacy and safety
  - Maintenance OCS should be used only as last resort

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

Terminology: AIR, AIR-only and MART



AIR: anti-inflammatory reliever; ICS: inhaled corticosteroid; Ig: immunoglobulin; IL: interleukin; LAMA: long-acting muscarinic antagonist; MART: maintenance-and-reliever therapy with ICS-formoterol; SABA: short-acting beta$_2$-agonist; TSLP: thymic stromal lymphopoietin

Evidence for AIR-only with ICS-formoterol (≥12 years)

- ~10,000 patients with mild asthma
- Compared with SABA alone
  - Severe exacerbations reduced by 65%
  - ED visits/hospitalisations reduced by 65%
  - Small improvements in FEV_1, symptom control, QoL
- Compared with daily ICS + as-needed SABA
  - Similar or lower risk of severe exacerbations
  - Risk of ED visits/hospitalisations reduced by 37%
  - No clinically important differences in symptoms, lung function, quality of life
  - Very low ICS dose
  - No need for daily treatment
  - Preferred by most patients (qualitative research)
- Not just an anti-inflammatory effect
  - Benefits patients with T2-low or T2-high biomarkers
- Approved by regulators in ~50 countries

Evidence for MART with ICS-formoterol (≥12 years)

- ~30,000 patients with moderate-severe asthma
- Compared with regimens with a SABA reliever, MART reduces risk of severe exacerbations…
  - By 32% compared with same dose ICS-LABA
  - By 23% compared with higher dose ICS-LABA
  - By 17% compared with conventional best practice (in patients not required to have exacerbation history)
- Similar or better symptom control
- Lower maintenance ICS dose
- Not just an anti-inflammatory effect
  - Formoterol reduces exacerbations vs SABA, but greatest benefit is with ICS-formoterol reliever
  - Benefits patients with low or high blood eosinophils
- Approved by regulators in ~120 countries

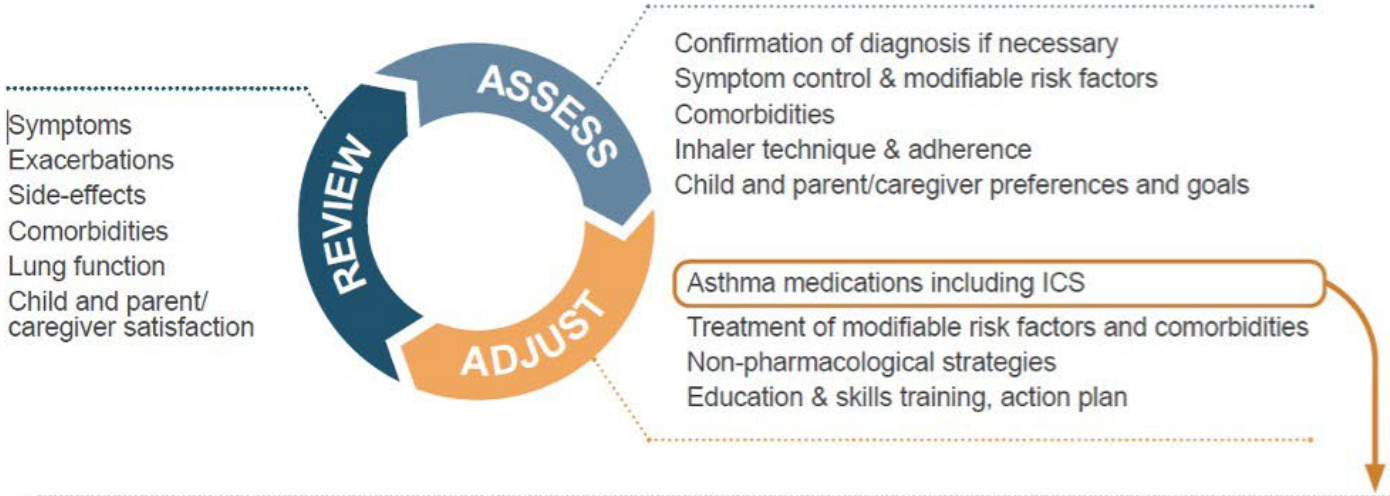
For references, see GINA 2025 report

AIR: anti-inflammatory reliever; ED: emergency department; ICS: inhaled corticosteroid; LABA: long-acting $beta_2$-agonist; MART: maintenance-and-reliever therapy with ICS-formoterol; SABA: short-acting $beta_2$-agonist

Asthma management for 6-11 years

GINA 2025 – STARTING TREATMENT

in children aged 6–11 years with a diagnosis of asthma



IF the patient has:		START WITH:	
Symptoms most days, waking at night once or more a week, and low lung function	YES	Medium dose ICS-LABA plus as-needed SABA, or low-dose MART OR refer for expert advice	**STEP 4**
NO			
Symptoms most days, or waking at night once or more a week	YES	Low-dose ICS-LABA or medium-dose ICS plus as-needed SABA; or very-low-dose MART	**STEP 3**
NO			
Symptoms 2–5 days a week	YES	Daily low-dose ICS plus as-needed SABA	**STEP 2**
NO			
Symptoms less than two days a week	YES	Take low dose ICS whenever SABA is taken	**STEP 1**

Short course of OCS may also be needed for children presenting with an exacerbation

For children with symptoms 1–2 days a week or less, adherence with daily ICS is likely to be very poor, so taking low-dose ICS whenever SABA is taken may be a better option for reducing exacerbation risk

ICS: inhaled corticosteroid; LABA: long-acting beta$_2$-agonist; MART: maintenance-and-reliever therapy with ICS-formoterol; OCS: oral corticosteroid; SABA: short-acting beta$_2$-agonist

GINA 2025
Children 6–11 years

Personalized asthma management:
Assess, Adjust, Review

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

Confirmation of diagnosis if necessary
Symptom control & modifiable risk factors
Comorbidities
Inhaler technique & adherence
Child and parent/caregiver preferences and goals

Treatment of modifiable risk factors and comorbidities
Non-pharmacological strategies
Asthma medications including ICS
Education & skills training, action plan

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 MART* OR refer for expert advice	Refer for phenotypic assessment ± higher dose ICS-LABA or add-on therapy, e.g. LAMA, 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†*	*Only 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)				

ICS: inhaled corticosteroid; Ig: immunoglobulin; IL: interleukin; LABA: long-acting beta$_2$-agonist; LTRA: leukotriene receptor antagonist (†advise about risk of neuropsychiatric adverse effects; MART: maintenance-and-reliever therapy with ICS-formoterol; OCS: oral corticosteroid; SABA: short-acting beta$_2$-agonist

Budesonide/Formoterol Dose Recommendations

MART Recommendations	Children 6-11 years 80/4.5 MAX 8 inhalations per day	Adolescents 12 and up 160/4.5 MAX 12 inhalations per day
Step 1	N/A *(ICS+SABA)*	1 inhalation as needed
Step 2	N/A *(ICS+SABA)*	1 inhalation as needed
Step 3	1 inhalation once daily + 1 as needed	***1 inhalation once a day** plus 1 as needed
Step 4	1 inhalation twice daily + 1 as needed	***1 inhalation twice daily** + 1 as needed
Step 5	***Refer for phenotypic assessment +/- higher dose**	2 inhalations twice daily + 1 as needed

- No specific recommended frequency
- Mometasone-formoterol (Dulera) is an option, but this has not been formally studied

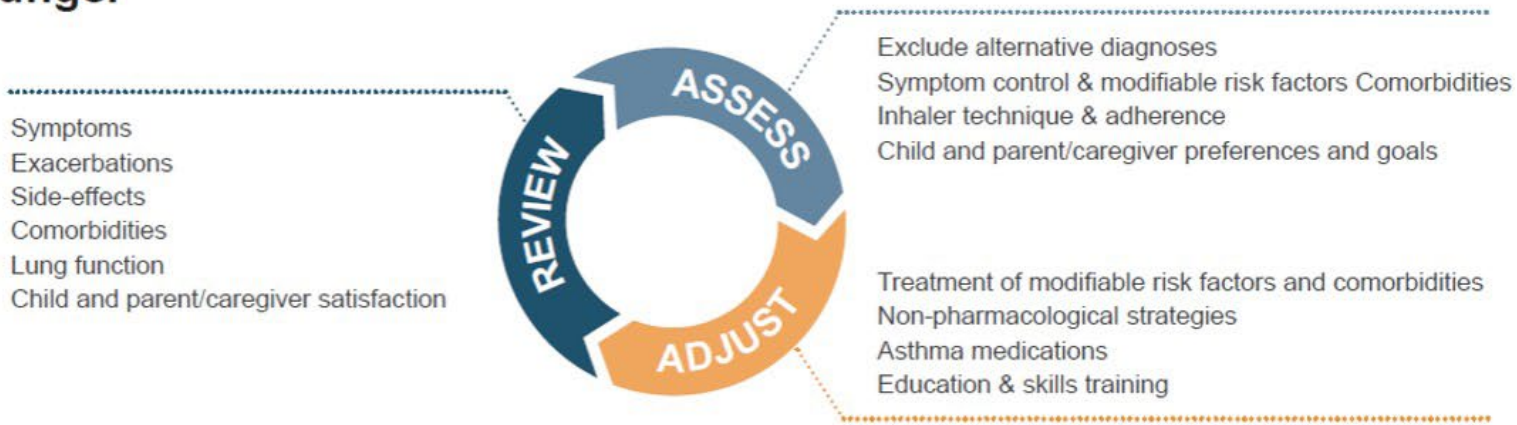
*changed in GINA 2025

Global Initiative for Asthma 2025

Asthma management for 5 years and younger

GINA 2025
Children 5 years and younger

Personalized asthma management:
Assess, Adjust, Review response



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 Box 11-3 for ICS dose ranges for pre-school children)	Double 'low dose' ICS *(See Box 11-3)*	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*	*Consider specialist referral*	
RELIEVER	As-needed short-acting beta$_2$-agonist			
CONSIDER THIS STEP FOR CHILDREN WITH:	Infrequent acute (e.g viral-induced) wheezing episodes and no or minimal interval asthma symptoms	Asthma symptoms not well-controlled (Box 11-1), or one or more severe exacerbations in the past year	Asthma not well controlled on low dose ICS	Asthma not well controlled on double ICS
			Before stepping up, check for alternative diagnosis and inhaler skills, review adherence and exposures	

ICS: inhaled corticosteroid; LTRA: leukotriene receptor antagonist (†advise about risk of neuropsychiatric adverse effects; SABA: short-acting beta$_2$-agonist

Prescribing ICS vs ICS/LABA

Part III

GINA 2025
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
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*

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
Reliever only; if SABA, take ICS with each dose

STEP 2
Low dose maintenance ICS

STEP 3
Low dose maintenance ICS-LABA

STEP 4
Medium dose maintenance ICS-LABA

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

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

Non-pharmacologic strategies include smoking cessation, physical activity, pulmonary rehabilitation, weight reduction, vaccinations (see text for more)
Allergen immunotherapy, e.g. HDM SLIT: consider for patients with clinically relevant sensitization and not well-controlled (but stable) asthma See text for further information and safety advice
Additional controller options (e.g., add-on LAMA at Step 4, add-on LTRA) have less evidence for efficacy or for safety than Tracks 1 or 2 (see text). Maintenance OCS should only ever be used as last resort.

AIR: anti-inflammatory reliever; HDM: house dust mite; ICS: inhaled corticosteroid; Ig: immunoglobulin; IL: interleukin; LABA: long-acting beta$_2$-agonist; LAMA: long-acting muscarinic antagonist; LTRA: leukotriene receptor antagonist; MART: maintenance-and-reliever therapy with ICS-formoterol; OCS: oral corticosteroid; SABA: short-acting beta$_2$-agonist; SLIT: sublingual immunotherapy; TSLP: thymic stromal lymphopoietin

GINA 2025
Children 6–11 years

Personalized asthma management:
Assess, Adjust, Review

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

Confirmation of diagnosis if necessary
Symptom control & modifiable risk factors
Comorbidities
Inhaler technique & adherence
Child and parent/caregiver preferences and goals

Treatment of modifiable risk factors and comorbidities
Non-pharmacological strategies
Asthma medications including ICS
Education & skills training, action plan

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 MART* OR refer for expert advice	Refer for phenotypic assessment ± higher dose ICS-LABA or add-on therapy, e.g. LAMA, 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†*	*Only 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)				

ICS: inhaled corticosteroid; Ig: immunoglobulin; IL: interleukin; LABA: long-acting beta$_2$-agonist; LTRA: leukotriene receptor antagonist (†advise about risk of neuropsychiatric adverse effects; MART: maintenance-and-reliever therapy with ICS-formoterol; OCS: oral corticosteroid; SABA: short-acting beta$_2$-agonist

GINA 2025
Children 5 years and younger

Personalized asthma management:
Assess, Adjust, Review response

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

Exclude alternative diagnoses
Symptom control & modifiable risk factors Comorbidities
Inhaler technique & adherence
Child and parent/caregiver preferences and goals

Treatment of 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 Box 11-3 for ICS dose ranges for pre-school children)	Double 'low dose' ICS *(See Box 11-3)*	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*	*Consider specialist referral*	
RELIEVER	As-needed short-acting beta$_2$-agonist			
CONSIDER THIS STEP FOR CHILDREN WITH:	Infrequent acute (e.g viral induced) wheezing episodes and no or minimal interval asthma symptoms	Asthma symptoms not well-controlled (Box 11-1), or one or more severe exacerbations in the past year	Asthma not well controlled on low dose ICS	Asthma not well controlled on double ICS
			Before stepping up, check for alternative diagnosis and inhaler skills, review adherence and exposures	

ICS: inhaled corticosteroid; LTRA: leukotriene receptor antagonist (†advise about risk of neuropsychiatric adverse effects; SABA: short-acting beta$_2$-agonist

When to start ICS for 5 years and younger

- If one or more acute asthma-like episodes requiring an acute care visit, oral corticosteroids, or hospital admission in the past year
- Asthma-like symptoms occurring more than twice per week
- Start with 2-3 month trial of maintenance ICS plus SABA as needed

In summary, ICS (not ICS/LABA) is used for:

- 5 years and younger: intermittent dosing during viral illness, and as the preferred daily medication (leukotriene receptor antagonists are less preferred)
- 6-11 years: Step 1 therapy for intermittent use, and Step 2 therapy for daily use
- 12 years and older: Typically never
- Also, in other select cases for 6 and older, based on personalized medicine (practical issues)

Population-level vs patient-level treatment decisions

Choosing between treatment options at a population level

(e.g., national formularies, health maintenance organizations, national guidelines)

The 'preferred' medication at each step is the best treatment for most patients, based on:

- **Efficacy**
- **Effectiveness**
- **Safety**

Mainly based on evidence about symptoms and exacerbations (from randomized controlled trials, pragmatic studies and strong observational data)

- **Access**

Population-level availability and cost

There are different population-level recommendations by age-group (adults/adolescents, children 6–11 years, children 5 years and younger). For patients with severe asthma, there are also different population-level recommendations depending on the inflammatory phenotype.

Choosing between controller options for individual patients

Use shared decision-making with the patient or parent/caregiver to discuss the following:

1. Preferred medication

- What is the best medication for symptom control and risk reduction (as above)?

2. Patient characteristics or phenotype

- Does the patient have any factors that predict differences in risk or treatment response, compared with other patients, e.g., smoking; SABA over-use; exacerbation history; high FeNO or eosinophils; environmental exposures; comorbidities?

3. Patient views

- What are the patient's goals, beliefs and concerns about asthma and its treatment?

4. Practical issues

- For the preferred medication(s), which inhalers are available to this patient?
- Can they use the inhaler correctly after training?
- Can they afford the medication?
- Adherence – how often are they likely to take the medication?
- If more than one inhaler is suitable for the patient, which has the lowest environmental impact?

FeNO: fractional exhaled nitric oxide; SABA: short-acting $beta_2$-agonist

Asthma Severity Classification

Part IV

Asthma Severity

- **Retrospective**
- Based on what therapies are needed to achieve good control
- Technically, can only be accurately assessed after achieving good control and stepping down therapy to find the minimum effective controller therapy
- Discourage use of labeling “intermittent” or “persistent” because that provides false assurance that those with infrequent symptoms are at low risk of exacerbations (ATS and GINA)
- Could categorize by Step (GINA) or **mild/moderate/severe asthma**, or just asthma vs severe asthma

NHLBI/NAEPP vs GINA

NHLBI 2020	GINA 2025
Focused on a few topics	Comprehensive
Five years old, before some major studies about SMART/AIR	More up to date
US-focused	International
US Insurances may require their asthma classification	As needed budesonide/formoterol is not FDA approved, for example

PCV15 vs 20

Thanks to Dr. Christine Rukasin for these slides (slightly modified)

Part V

Pnuemococcal vaccines

Protein conjugated (PCV)

- Prevnar 7
- Prevnar 13
- Prevnar 15
- Prevnar 20

Polysaccharide (PPSV)

- Pneumovax23

Pneumococcal vaccines

Protein conjugated (PCV)

- ~~Prevnar 7~~
  - Not really used since 2010
- Prevnar 13
  - Still available, but not preferred
- Vaxneuvance 15
  - Approved in 2022
- Prevnar 20
  - Approved in 2023

Polysaccharide (PPSV)

- Pneumovax23

Serotypes covered

	1	2	3	4	5	6 A	6 B	7F	8	9 N	9 V	10A	11A	12 F	14	15 B	17F	18 C	19 A	19 F	20	22 F	23F	33F
13	X		X	X	X	X	X	X			X				X			X	X	X			X	
15	X		X	X	X	X	X	X			X				X			X	X	X		X	X	X
20	X		X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X		X	X	X
23	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

PPSV23 – unique 2, 9N, 17F, 20

Most common strep pneumo strains are 6, 14, 18, 19, 23 (covered by PCV 15 and PCV 20)

Pneumococcal vaccination recommendations

All children under the age of 5

- 4 doses of PCV15 or PCV20 – 2m, 4m, 6m, 12-15m
- If they miss, use catch up schedule

All adults 65 years and older, no history of PCV or unknown

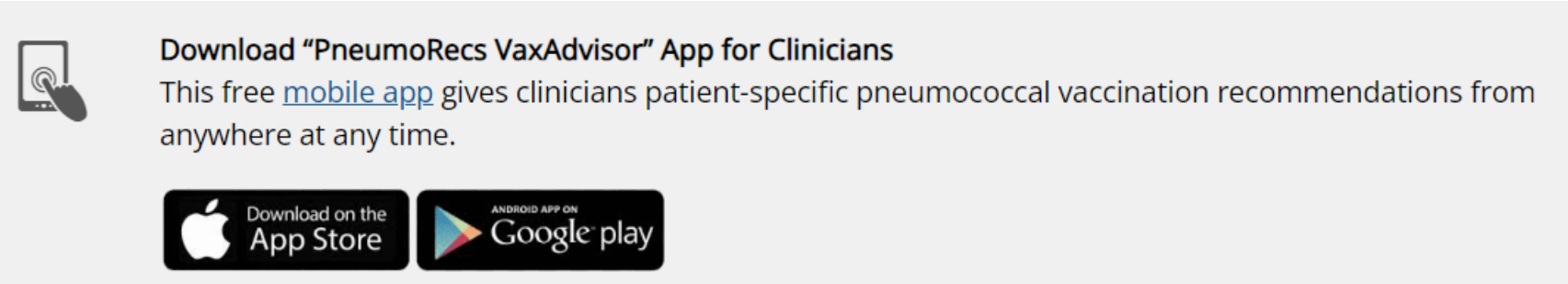
- 1 dose of PCV15 or PCV20
- If PCV15 used, then PPSV23 1 year later
- If PCV20 used, then done

Exceptions for those with certain conditions

Risk conditions	Immunocompromised
• CSF leak • Chronic heart disease • Chronic kidney disease • Chronic liver disease • **Chronic lung disease, including moderate persistent or severe persistent asthma** • Cochlear implant • Decreased immune function from disease or drugs • Diabetes mellitus	• Dialysis or nephrotic syndrome • Congenital or acquired asplenia or splenic dysfunction • Congenital or acquired immunodeficiency • Diseases or conditions treated with immunosuppressive drugs or radiation therapy • HIV infection • Sickle cell disease or other hemoglobinopathies

	Under 2 years	2-5 years	6-18 years
Completed series without PCV20	Per schedule PCV15	1 dose of PCV15 or PCV20	Completed
Completed series with PCV20	Complete	N/A	N/A
Incomplete series or unvaccinated	Catch up schedule	1 dose of PCV15 or PCV20	1 dose of PCV15 or PCV20 - If PCV15 given, follow by PPSV23 - If PCV20, complete
Risk factors, incomplete series	Catch up schedule	2 doses of either PCV15 or PCV20 (8 weeks apart)	
Risk factors, complete series no PPSV23	Per schedule	1 dose **PCV20** or PPSV23 (8 weeks after last)	1 dose **PCV20** or PPSV23 (8 weeks after last)
Risk factors, complete series yes PPSV23	N/A	Complete	Complete
Immunocompromised, complete series no PPSV23	Per schedule	1 doses **PCV20** or PPSV23 (8 weeks) -if PCV20 done -if PPSV23 give another pneumococcal vaccine in 5 years	1 doses **PCV20** or PPSV23 (8 weeks) -if PCV20 done -if PPSV23 give another pneumococcal vaccine in 5 years
Immunocompromised, complete series yes PPSV23	N/A	Give 1 dose of **PCV20** or PPSV23 at least 5 years after last	Give 1 dose of **PCV20** or PPSV23 at least 5 years after last

Tips to help remember



- Anyone over the age of 2 years will likely not have received PCV20 since it was just released in Fall of 2023 and last routine vaccine would have been 12-15 months of age
- If they have moderate or severe asthma, over the age of 2 it's reasonable to offer PCV20
- If they have an immunocompromising condition and we haven't given PPSV23, offer PCV20
- If they have an immunocompromising condition and they did receive PPSV23 more than 5 years ago, offer PCV20

- When in doubt, PCV20

- PneumoRecs VaxAdvisor https://www2a.cdc.gov/vaccines/m/pneumo/pneumo.html

Diagnosing Asthma in 5 years and younger

Part VI

Diagnosis of asthma in children aged 5 years and younger

1

Recurrent acute wheezing episodes

OR

At least 1 acute wheezing episode with asthma-like symptoms between episodes

+

2

No likely alternative cause for the respiratory symptoms

+

3

Timely clinical response of respiratory symptoms or signs to asthma medications

Any of:

- **Short-term response to SABA** within minutes during acute wheezing episode in healthcare setting (or, for more severe episode, within 3-4 hours after SABA and OCS started)
- **Short-term response to SABA at home** (within minutes)
- **Reduced frequency or severity** of acute wheezing episodes and/or of symptoms between episodes during 2–3 months' trial of daily ICS

All three criteria are needed for the diagnosis of asthma in children 5 years and younger

Acute wheezing episode: symptoms such as wheezing on expiration, accessory muscle use, or difficult, fast or heavy breathing, lasting for more than 24 hours

Asthma-like symptoms between episodes (also called *interval symptoms*): symptoms such as dry cough or wheeze after running, laughing or crying, or during sleep, that occur between acute wheezing episodes

If only 1 or 2 criteria are met, describe as 'suspected asthma', and continue follow-up

A personal or family history of allergic disease may strengthen the diagnosis of asthma, but is not required, and is not specific for asthma

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

Diagnosis of asthma in children aged 5 years and younger

1

Recurrent acute wheezing episodes

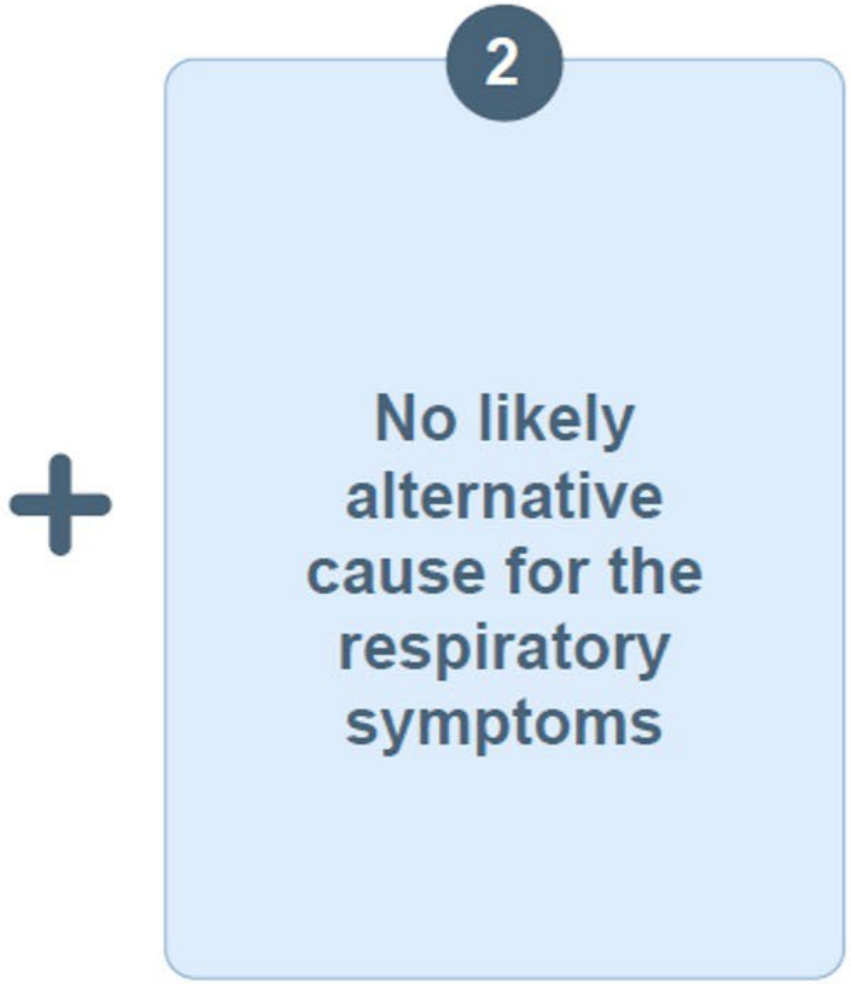
OR

At least 1 acute wheezing episode with asthma-like symptoms between episodes

- **Acute wheezing episodes**: Symptoms such as wheezing on expiration, accessory muscle use, or difficult, fast or heavy breathing, lasting for more than 24 hours

- **Asthma-like symptoms between episodes**: dry cough or wheeze after running, laughing or crying, or during sleep. Also called interval symptoms

Diagnosis of asthma in children aged 5 years and younger



- The younger the child, the greater the likelihood of alternative diagnosis
- A first episode of wheezing before age 12 months is usually due to bronchiolitis, not asthma
- Personal/family history of allergic disease may strengthen the diagnosis of asthma, but is not required, and is not specific for asthma
- Respiratory viral infections are a common trigger for asthma exacerbations; presence of URTI symptoms does not exclude asthma

URTI: upper respiratory tract infection

Alternative causes for respiratory symptoms in children 5 years and younger

If the symptoms or signs below are present, consider…	Condition
Mainly cough and runny congested nose for <10 days, *without* wheezing or difficulty breathing	Viral upper respiratory tract infection
Cough when feeding, recurrent chest infections	Gastroesophageal reflux +/- pharyngeal dysphagia
Sudden onset of symptoms, unilateral wheeze	Inhaled foreign body Other conditions including tuberculosis
Protracted paroxysms of coughing, often with stridor and vomiting	Pertussis
Persistent wet cough	Protracted bacterial bronchitis Tuberculosis
Noisy breathing when crying or eating; harsh cough	Tracheomalacia
Cardiac murmurs, failure to thrive	Congenital heart disease
Pre-term delivery, symptoms since birth	Bronchopulmonary dysplasia
Excessive cough and mucus production, gastrointestinal symptoms, failure to thrive	Cystic fibrosis
Cough and recurrent chest infections; neonatal respiratory distress, chronic ear infections and persistent nasal discharge from birth	Primary ciliary dyskinesia
Noisy breathing, feeding difficulties	Vascular ring
Recurrent fever and infections (including non-respiratory)	Primary immunodeficiency

Diagnosis of asthma in children aged 5 years and younger

+

3

Timely clinical response of respiratory symptoms or signs to asthma medications

Any of:

- **Short-term response to SABA** within minutes during acute wheezing episode in healthcare setting (or, for more severe episode, within 3-4 hours after SABA and OCS started)
- **Short-term response to SABA at home** (within minutes)
- **Reduced frequency or severity** of acute wheezing episodes and/or of symptoms between episodes during 2–3 months' trial of daily ICS

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

Indications for a treatment trial of as-needed SABA in a child aged 5 years or younger

- Consider a trial of as-needed SABA for 2–3 months to help confirm the diagnosis of asthma, if the child has:
  - Infrequent or no mild wheezing episodes, not requiring unscheduled medical care, with or without…
  - Mild intermittent asthma-like symptoms between episodes (e.g., twice a week or less)

Teach the parent/caregiver how to give 2 puffs of SABA by pMDI with spacer (with facemask if appropriate) when the child is wheezing or has asthma-like symptoms.
Ask whether the child's respiratory symptoms or signs improve within 20–60 minutes

pMDI: pressurized metered dose inhaler; SABA: short-acting beta$_2$-agonist

Indications for a treatment trial of daily ICS plus as-needed SABA in a child aged 5 years or younger

- Consider a trial of daily ICS plus as-needed SABA for 2–3 months to help confirm the diagnosis of asthma, if the child has:
  - One or more acute wheezing episodes requiring acute care, OCS, or hospital admission in the past year, or
  - Asthma-like symptoms more than twice/week

Teach the parent/caregiver how to give ICS (e.g., FP 100–250 mcg/day or equivalent) every day by pMDI with spacer (with facemask if appropriate), plus SABA as needed for symptom relief.

Ask whether there has been any change in the frequency or severity of wheezing episodes, or the frequency or severity of asthma-like symptoms between episodes.

Once the diagnosis of asthma has been confirmed, step down the dose of ICS.

FP: fluticasone propionate; ICS: inhaled corticosteroids; OCS: oral corticosteroids; pMDI: pressurized metered dose inhaler; SABA: short-acting beta$_2$-agonist

Diagnosis of asthma in children aged 5 years and younger

1

Recurrent acute wheezing episodes

OR

At least 1 acute wheezing episode with asthma-like symptoms between episodes

+

2

No likely alternative cause for the respiratory symptoms

+

3

Timely clinical response of respiratory symptoms or signs to asthma medications

Any of:

- **Short-term response to SABA** within minutes during acute wheezing episode in healthcare setting (or, for more severe episode, within 3-4 hours after SABA and OCS started)
- **Short-term response to SABA at home** (within minutes)
- **Reduced frequency or severity** of acute wheezing episodes and/or of symptoms between episodes during 2–3 months' trial of daily ICS

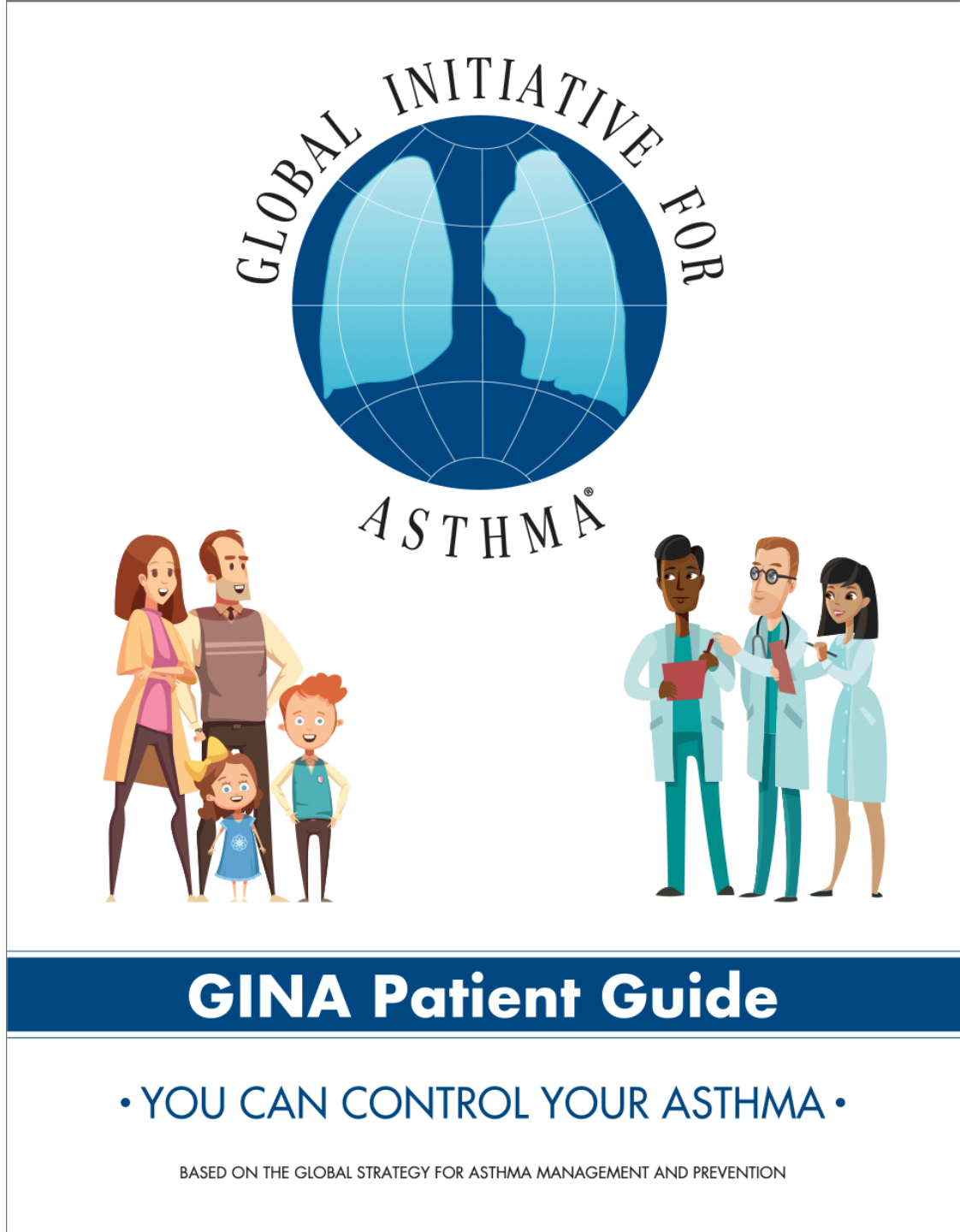
All 3 criteria are needed for diagnosis of asthma in children 5 years and younger

If only 1 or 2 criteria are met, describe as 'suspected asthma' and continue follow-up

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

Cool GINA patient guide:

https://ginasthma.org/wp-content/uploads/2021/05/GINA-Patient-Guide-2021-copy.pdf




Thank you for joining us!
Questions or comments?
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