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# POCKET GUIDE FOR ASTHMA MANAGEMENT AND PREVENTION

for adults, adolescents and children 6–11 years



*A Pocket Guide for Health Professionals*  
Updated 2023

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**BASED ON THE GLOBAL STRATEGY FOR ASTHMA  
MANAGEMENT AND PREVENTION**

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## **GLOBAL INITIATIVE FOR ASTHMA**

### **ASTHMA MANAGEMENT AND PREVENTION for adults, adolescents and children 6–11 years**

### **A POCKET GUIDE FOR HEALTH PROFESSIONALS**

**Updated July 2023**

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## LIST OF ABBREVIATIONS

BDP	Beclometasone dipropionate
COPD	Chronic obstructive pulmonary disease
CYP450	Cytochrome P450
DPI	Dry powder inhaler
ED	Emergency department
FeNO	Fraction of exhaled nitric oxide
FEV <sub>1</sub>	Forced expiratory volume in 1 second
FVC	Forced vital capacity
GERD	Gastroesophageal reflux disease
ICS	Inhaled corticosteroids
ICS-LABA	Combination ICS and LABA
Ig	Immunoglobulin
IL	Interleukin
IV	Intravenous
LABA	Long-acting beta <sub>2</sub> -agonist
LAMA	Long-acting muscarinic antagonist
LTRA	Leukotriene receptor antagonist
NSAID	Nonsteroidal anti-inflammatory drug
O <sub>2</sub>	Oxygen
OCS	Oral corticosteroids
PEF	Peak expiratory flow
pMDI	Pressurized metered dose inhaler
SABA	Short-acting beta <sub>2</sub> -agonist
SC	Subcutaneous
SLIT	Sublingual immunotherapy
TSLP	Thymic stromal lymphopoietin

References to support statements in the Pocket Guide can be found in the full GINA 2023 report.

The reader acknowledges that **this Pocket Guide is a brief summary of the GINA 2023 report** for primary health care providers. It does NOT contain all of the information required for managing asthma, for example, about the safety of treatments, and it should be used in conjunction with the full GINA 2023 report. When assessing and treating patients, health professionals are strongly advised to use their own professional judgment and to take into account local and national regulations and guidelines. GINA cannot be held liable or responsible for inappropriate healthcare associated with the use of this document, including any use which is not in accordance with applicable local or national regulations or guidelines.

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## ABOUT ASTHMA AND GINA

Asthma affects an estimated 300 million individuals worldwide. It is a serious global health problem affecting all age groups, with increasing prevalence in many economically developing countries, rising treatment costs, and a rising burden for patients and the community. Asthma still imposes an unacceptable burden on health care systems, and on society through loss of productivity in the workplace, and (especially for pediatric asthma), disruption to the family. Asthma still contributes to many deaths worldwide, including among young people. Approximately 96% of asthma deaths are in low- and middle-income countries. Healthcare providers managing asthma face different issues globally, depending on the local context, the health system, and access to resources.

**The Global Initiative for Asthma (GINA)** was established to increase awareness about asthma among health professionals, public health authorities and the community, and to improve prevention and management through a coordinated worldwide effort. GINA prepares annually updated evidence-based reports and clinical resources on asthma, encourages dissemination and implementation of the recommendations, and promotes international collaboration on asthma research.

**The Global Strategy for Asthma Management and Prevention** ('GINA report') provides a comprehensive and integrated approach to asthma management that can be adapted for local conditions and for individual patients. It focuses not only on the existing strong evidence base, but also on practical advice for clinicians. The report is updated each year based on a twice-yearly review of new evidence, both original research and systematic reviews. For GINA methodology, see <https://ginasthma.org/about-us/methodology>.

The full 2023 GINA report can be obtained from [www.ginasthma.org](http://www.ginasthma.org).

## WHAT IS KNOWN ABOUT ASTHMA?

**Asthma is a common and potentially serious chronic disease** that imposes a substantial burden on patients, their families and their communities. It causes respiratory symptoms, limitation of activity, and flare-ups (attacks) that sometimes require urgent health care and may be fatal.

**Fortunately, asthma can be effectively treated**, and most patients can achieve good control of their asthma. Good asthma control means that patients can:

- ✓ Avoid troublesome symptoms during day and night
- ✓ Need little or no reliever medication
- ✓ Have productive, physically active lives
- ✓ Have normal or near normal lung function
- ✓ Avoid serious asthma flare-ups (exacerbations, or attacks).

Asthma affects all levels of society. Olympic athletes, famous leaders and celebrities, and ordinary people live successful and active lives with asthma.

**What is asthma?** Asthma causes respiratory symptoms such as wheezing, shortness of breath, chest tightness and cough that vary over time, including in their frequency and intensity. These symptoms are associated with variable expiratory airflow limitation, i.e. difficulty breathing air out of the lungs due to bronchoconstriction (airway narrowing), airway wall thickening, and increased mucus. Some variation in airflow can also occur in people without asthma, but it is greater in untreated asthma. There are different types of asthma (also called phenotypes), and different underlying disease processes.

**Factors that may trigger or worsen asthma symptoms** include viral infections, allergens at home or work (e.g. house dust mite, pollens, cockroach), tobacco smoke, exercise and stress. These responses are more likely when asthma is uncontrolled. Asthma can also be induced or symptoms triggered by some drugs, e.g. beta-blockers, and (in some patients), by aspirin or other nonsteroidal anti-inflammatory drugs (NSAIDs).

**Asthma flare-ups** (also called exacerbations or attacks) can be fatal, even in people with apparently mild asthma. They are more common and more severe when asthma is uncontrolled, and in some high-risk patients. All patients should have a written asthma action plan; 'written' includes handwritten, printed, digital or pictorial, not just verbal instructions.

**ICS-containing treatment** markedly reduces the frequency and severity of asthma symptoms and markedly reduces the risk of flare-ups or death.

**Asthma treatment should be customized to the individual patient**, taking into account their level of symptom control, their risk factors for exacerbations, phenotypic characteristics, and preferences, as well as the effectiveness of available medications, their safety, and their cost to the payer or patient.

# MAKING THE DIAGNOSIS OF ASTHMA

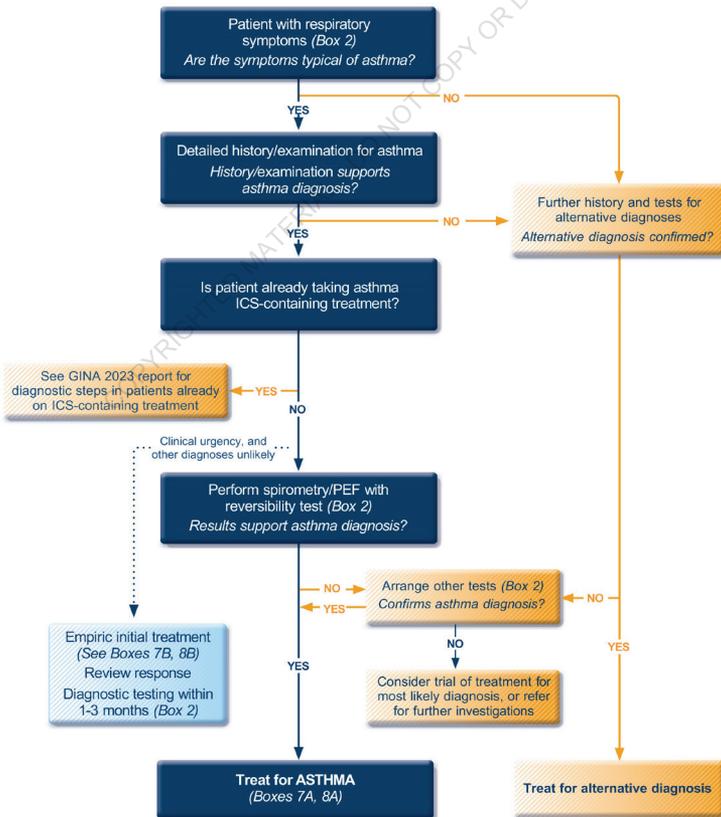
Asthma is a disease with many variations (phenotypes), usually characterized by chronic airway inflammation. Asthma has two key defining features:

- a history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough, that vary over time and in intensity, AND
- variable expiratory airflow limitation, although airflow limitation may become persistent (no longer variable) in long-standing asthma.

The **diagnosis of asthma should be confirmed** (Box 1, Box 2), and the evidence documented in the patient's medical record, preferably before starting ICS-containing treatment. Confirming the diagnosis of asthma is more difficult after treatment has been started (see p.9).

**Physical examination in people with asthma is often normal**, but the most frequent finding is wheezing on auscultation, especially on forced expiration.

## Box 1. Diagnostic flow-chart for asthma in clinical practice



## CRITERIA FOR MAKING THE DIAGNOSIS OF ASTHMA

### Box 2. Features used in making the diagnosis of asthma

#### 1. A history of variable respiratory symptoms

Typical symptoms are wheeze, shortness of breath, chest tightness, cough:

- People with asthma generally have more than one of these symptoms.
- The symptoms occur variably over time and vary in intensity.
- The symptoms often occur or are worse at night or on waking.
- Symptoms are often triggered by exercise, laughter, allergens or cold air.
- Symptoms often occur with or worsen with viral infections.

#### 2. Evidence of variable expiratory airflow limitation

- Variation in expiratory lung function is greater than in healthy people. For example, excess variability is recorded if:
  - FEV<sub>1</sub> increases after inhaling a bronchodilator by >200 mL and >12% of the pre-bronchodilator value (or in children, increases from the pre-bronchodilator value by >12% of the predicted value). This is called significant bronchodilator responsiveness or reversibility.
  - Average daily diurnal PEF variability\* is >10% (in children, >13%).
  - FEV<sub>1</sub> increases by more than 12% and 200 mL from baseline (in children, by >12% of the predicted value) after 4 weeks of anti-inflammatory treatment (outside respiratory infections).
- The greater the variation, or the more times excess variation is seen, the more confident you can be of the diagnosis of asthma.
- Testing may need to be repeated during symptoms, in the early morning, or after withholding bronchodilator medications.
- At least once during the diagnostic process, e.g. when FEV<sub>1</sub> is low, document that the FEV<sub>1</sub>/FVC ratio is below the lower limit of normal.†
- Significant bronchodilator responsiveness may be absent during severe exacerbations or viral infections, or in long-standing asthma. If significant bronchodilator responsiveness is not present, the next step depends on the clinical urgency and the availability of other tests.
- For other tests to assist in diagnosis, including bronchial challenge tests, see Chapter 1 of the 2023 GINA report.

\*Calculated from twice daily readings (best of 3 each time), as (the day's highest PEF minus the day's lowest PEF) divided by the mean of the day's highest and lowest PEF, and averaged over 1–2 weeks. If using PEF at home or in the office, use the same PEF meter each time. † Using Global Lung Initiative reference equations.

## HOW TO CONFIRM THE DIAGNOSIS IN PATIENTS ALREADY TAKING MAINTENANCE ASTHMA TREATMENT

For many patients (25–35%) with a label of asthma in primary care, the diagnosis cannot be confirmed. If the basis of the diagnosis has not already been documented, it should be confirmed with objective testing.

If standard criteria for asthma (Box 2, p.8) are not met, consider other investigations. For example, if lung function is normal, repeat reversibility testing when the patient is symptomatic, or after withholding bronchodilators (withhold SABA for >4 hours, twice-daily ICS-LABAs for >24 hours, and once-daily ICS-LABAs for >36 hours).

If the patient is already taking maintenance asthma treatment and has *frequent symptoms*, consider a trial of step-up in ICS-containing treatment and repeat lung function testing after 3 months. If the patient has *few symptoms*, consider stepping down ICS-containing treatment; ensure the patient has a written asthma action plan (p.43), monitor asthma carefully, and repeat lung function testing. More information about confirming the diagnosis of asthma is in Boxes 1-3 and 1-4 of the full 2023 GINA report.

## DIAGNOSING ASTHMA IN OTHER CONTEXTS

### Occupational asthma and work-aggravated (work-exacerbated) asthma

Every patient with adult-onset asthma should be asked about occupational or domestic exposures to allergens or irritants, and whether their asthma is better when they are away from these exposures. It is important to confirm the diagnosis objectively (which often needs specialist referral) and to eliminate exposure as quickly as possible.

### Pregnant women

Ask all pregnant women and those planning pregnancy whether they have asthma, and advise them about the importance of taking ICS-containing treatment for the health of both mother and baby. If objective confirmation of asthma diagnosis is needed, it is not advisable to step down ICS-containing treatment for this purpose or to carry out bronchial provocation testing until after delivery.

### The elderly

Asthma may be under-diagnosed in the elderly, due to poor perception, an assumption that dyspnea is normal in old age, lack of fitness, or reduced activity. Asthma may also be over-diagnosed in the elderly if shortness of breath due to heart failure or ischemic heart disease is mistakenly attributed to asthma. If there is a history of smoking or biomass fuel exposure, COPD or asthma-COPD overlap should also be considered (see below).

## Patients with persistent airflow limitation

Asthma and COPD may co-exist or overlap (often called asthma+COPD or asthma-COPD overlap), particularly in smokers and the elderly. The history and pattern of symptoms and past records can help to distinguish asthma with persistent airflow limitation from COPD. Uncertainty about the diagnosis, or features consistent with both diagnoses, should prompt early referral, because asthma+COPD has worse outcomes than asthma or COPD alone. Asthma+COPD is not a single disease, but is likely caused by several different mechanisms. There is little clinical trial evidence about how to treat these patients, as they are often excluded from clinical trials. However, patients with a diagnosis of COPD who also have any history or diagnosis of asthma should be treated as asthma with at least low-dose ICS (see p.28) as well as bronchodilators, because of increased risks of hospitalization or death if they are treated with bronchodilators alone.

## Patients with persistent cough as the only respiratory symptom

This may be due to chronic upper airway cough syndrome ('postnasal drip'), chronic sinusitis, gastroesophageal reflux disease, angiotensin-converting enzyme (ACE) inhibitor-induced cough, inducible laryngeal obstruction (often called vocal cord dysfunction), eosinophilic bronchitis, or cough-variant asthma. Cough-variant asthma is characterized by cough and airway hyperresponsiveness, and documenting variability in lung function is essential to make this diagnosis. However, lack of variability at the time of testing does not exclude asthma. For other diagnostic tests in patients with cough as their only symptom, see Box 2 (p.8), and Chapter 1 of the GINA report, or refer the patient for specialist opinion.

## Diagnosis of asthma in low- and middle-income countries (LMIC)

The differential diagnosis of asthma in LMIC often includes other endemic respiratory disease (e.g. tuberculosis, HIV/AIDS-associated lung diseases, and parasitic or fungal lung diseases). A structured algorithmic approach to patients presenting with respiratory symptoms forms part of several strategies developed for improving respiratory disease management in LMIC.

Access to spirometry in LMIC is often very limited or unaffordable. In this context, PEF can be used to identify variable expiratory airflow limitation in order to confirm the diagnosis of asthma (Box 2, p.8). For example, a  $\geq 20\%$  improvement in PEF 15 minutes after giving 2 puffs of albuterol (salbutamol), or improved symptoms and PEF after a 4-week therapeutic trial with ICS, can help to confirm the diagnosis of asthma (or prompt investigation for alternative diagnoses) before starting long-term ICS-containing treatment.

There is a pressing need for access to affordable diagnostic tools (PEF meters and spirometry), and training in their use, to be substantially scaled up in LMIC, to avoid underdiagnosis and overdiagnosis.

# ASSESSING A PATIENT WITH ASTHMA

Take every opportunity to assess patients with asthma, particularly when they are symptomatic or after a recent exacerbation, but also when they ask for a prescription refill. In addition, schedule a routine review at least once a year.

## Box 3. How to assess a patient with asthma

### 1. Asthma control – assess both symptom control and risk factors

- Assess symptom control over the last 4 weeks (Box 4, p.12).
- Identify any modifiable risk factors for poor outcomes (Box 4, p.12).
- Measure lung function before starting treatment, 3–6 months later, and then periodically, e.g. at least yearly in most patients.

### 2. Assess multimorbidity

- Comorbidities include rhinitis, chronic rhinosinusitis, gastroesophageal reflux (GERD), obesity, obstructive sleep apnea, depression and anxiety.
- They may contribute to respiratory symptoms, flare-ups and poor quality of life. Their treatment may complicate asthma management.

### 3. Treatment issues

- Record the patient's treatment. Ask about side-effects.
- Watch the patient using their inhaler, to check their technique (p.37).
- Have an open empathic discussion about adherence (p.38).
- Check that the patient has a written asthma action plan (p.43).
- Ask the patient about their goals and preferences for asthma treatment.

## Box 4. Assessment of symptom control and future risk

A. Assessment of symptom control		Level of asthma symptom control		
		Well controlled	Partly controlled	Uncontrolled
In the past 4 weeks, has the patient had:				
Daytime symptoms more than twice/week?	Yes <input type="checkbox"/> No <input type="checkbox"/>	None of these	1–2 of these	3–4 of these
Any night waking due to asthma?	Yes <input type="checkbox"/> No <input type="checkbox"/>			
SABA* reliever needed more than twice/week?	Yes <input type="checkbox"/> No <input type="checkbox"/>			
Any activity limitation due to asthma?	Yes <input type="checkbox"/> No <input type="checkbox"/>			
B. Risk factors for poor asthma outcomes				
Assess risk factors at diagnosis and periodically, at least every 1-2 years, particularly for patients experiencing exacerbations.				
Measure FEV <sub>1</sub> at start of treatment, after 3–6 months for personal best lung function, then periodically for ongoing risk assessment.				
<b>Having uncontrolled asthma symptoms is an important risk factor for exacerbations.</b>				
<b>Additional potentially modifiable risk factors for exacerbations, even in patients with few symptoms, include:</b>				
<ul style="list-style-type: none"> <li>• <b>Medications:</b> SABA overuse (<math>\geq 3 \times 200</math>-dose canisters per year; mortality substantially increased if <math>\geq 1</math> canister per month); inadequate ICS (not prescribed, poor adherence or incorrect inhaler technique)</li> <li>• <b>Comorbidities:</b> obesity; chronic rhinosinusitis; GERD; confirmed food allergy; anxiety; depression; pregnancy</li> <li>• <b>Exposures:</b> smoking; e-cigarettes; allergen exposure if sensitized; air pollution</li> <li>• <b>Setting:</b> major socioeconomic problems</li> <li>• <b>Lung function:</b> low FEV<sub>1</sub>, especially if <math>&lt; 60\%</math> predicted; high bronchodilator responsiveness</li> <li>• <b>Type 2 inflammatory markers:</b> high blood eosinophils; high FeNO despite ICS treatment</li> </ul>				<p>Having any of these risk factors increases the patient's risk of exacerbations <b>even if they have few asthma symptoms</b></p>
<p>Other major independent risk factors for flare-ups (exacerbations) include:</p> <ul style="list-style-type: none"> <li>• Ever intubated or in intensive care for asthma; having <math>\geq 1</math> severe exacerbations in the last 12 months.</li> </ul>				

\*Only for Track 2 patients with SABA reliever; use of SABA before exercise not included.  
Table continues on next page.

## Box 4. Assessment of symptom control and future risk (continued)

### B. Risk factors for poor asthma outcomes (continued)

Risk factors for developing persistent airflow limitation include:

- History: preterm birth, low birth weight, greater infant weight gain; chronic mucus hypersecretion
- Medications: lack of ICS in patients with history of severe exacerbation
- Noxious or irritant exposures: tobacco smoke, chemicals, occupational or domestic exposures
- Investigations: low FEV<sub>1</sub>; sputum or blood eosinophilia.

Risk factors for medication side-effects include:

- *Systemic*: frequent OCS; long-term, high-dose and/or potent ICS; also taking CYP450 inhibitors such as ritonavir, ketoconazole, itraconazole
- *Local*: high-dose or potent ICS; poor inhaler technique.

ICS: inhaled corticosteroid; OCS: oral corticosteroid

## HOW TO ASSESS ASTHMA CONTROL

**Asthma control** means the extent to which the effects of asthma can be seen in the patient, or have been reduced or removed by treatment. Asthma control has two domains: symptom control and risk factors for future poor outcomes, particularly flare-ups (exacerbations) (see Box 4, p.12). Questionnaires like the Asthma Control Test and Asthma Control Questionnaire assess only symptom control.

**Poor symptom control** is a burden to patients and a risk factor for flare-ups.

**Risk factors** are factors that increase the patient's future risk of having exacerbations (flare-ups), loss of lung function, or medication side-effects.

### What is the role of lung function in monitoring asthma?

Once asthma has been diagnosed, lung function is most useful as an indicator of future risk. It should be recorded at diagnosis, 3–6 months after starting treatment, and periodically thereafter. Most patients should have lung function measured at least every 1–2 years, more often in children and those at higher risk of flare-ups or lung function decline. Patients who have either few or many symptoms relative to their lung function need more investigation.

### How is asthma severity assessed?

Currently, asthma severity is assessed retrospectively from the level of treatment required to control symptoms and exacerbations (i.e. after several months of treatment). Severe asthma is asthma that remains uncontrolled despite optimized high-dose ICS-LABA or that requires high-dose ICS-LABA to prevent it from becoming uncontrolled. Mild asthma is asthma that can be controlled with as-needed ICS-formoterol, or with low-dose ICS. It is important to emphasize to patients that mild asthma still needs ICS treatment. We

suggest that, in clinical practice, the term ‘mild asthma’ should generally be avoided if possible, because of the common but mistaken assumption that it equates to low risk. Explain that patients with infrequent or mild asthma symptoms can still have severe or fatal exacerbations if treated with SABA alone, and that this risk is reduced by half to two-thirds with low-dose ICS or with as-needed low-dose ICS-formoterol.

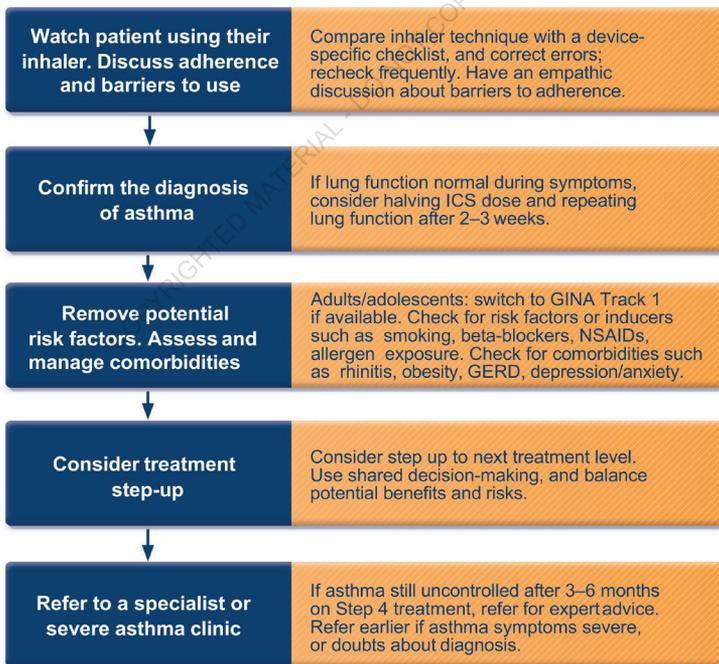
For health professional education, the term ‘apparently mild asthma’ may be useful to highlight the discordance between symptoms and risk. However, be aware that in some languages the word ‘apparently’ may translate to the opposite of the intended meaning.

## HOW TO INVESTIGATE UNCONTROLLED ASTHMA

Most patients can achieve good asthma control with ICS-containing treatment, but some patients do not, and further investigation is needed.

Box 5 shows a practical approach to investigations in primary care if the patient has uncontrolled asthma despite taking ICS-containing treatment.

### Box 5. How to investigate uncontrolled asthma in primary care



This flowchart shows the most common problems first, but the steps can be carried out in a different order, depending on resources and clinical context. Always check inhaler technique and adherence first.

# MANAGEMENT OF ASTHMA

## GENERAL PRINCIPLES

The long-term goals of asthma management are **symptom control and risk reduction**. The aim is to reduce the burden to the patient and to reduce their risk of asthma-related death, exacerbations, airway damage, and medication side-effects. The patient's own goals and preferences regarding their asthma and its treatment should also be identified.

**Population-level recommendations** about 'preferred' asthma treatments represent the overall best treatment for most patients in a particular population. For example, there are different recommendations for adults/adolescents, children 6–11 years and children 5 years and younger. For severe asthma, there are also different population-level recommendations depending on the inflammatory phenotype: Type 2 or non-Type 2.

**Patient-level treatment decisions** should also take into account any individual characteristics, risk factors, multimorbidity or phenotype that predict how likely the patient's symptoms and exacerbation risk are to be reduced by a particular treatment, together with their personal goals, and practical issues such as inhaler technique, adherence, and affordability. For adults and adolescents there are two treatment tracks, depending on availability of medications, and on the patient's risk factors and likely adherence. More details are on p.19.

A **partnership** between the patient and their health care providers is important for effective asthma management. Training health care providers in **communication skills** may lead to increased patient satisfaction, better health outcomes, and reduced use of health care resources.

**Health literacy** – that is, the patient's ability to obtain, process and understand basic health information to make appropriate health decisions – should be taken into account in asthma management and education.

## THE ASTHMA MANAGEMENT CYCLE TO MINIMIZE RISK AND CONTROL SYMPTOMS

Asthma management involves a continuous cycle to **assess, adjust treatment and review response** (see Box 6, p.16).

**Assessment** of a patient with asthma includes not only **symptom control**, but also the patient's individual **risk factors and comorbidities** that can contribute to their burden of disease and risk of poor health outcomes, or that may predict their response to treatment. Patients (or parents/caregivers) should be asked about their goals and preferences for asthma treatment, as part of shared decision-making about asthma treatment options.

**Treatment to prevent asthma exacerbations and control symptoms** includes:

- **ICS-containing medication for all patients with asthma**, even those with infrequent symptoms, to reduce their risk of serious exacerbations.
- **A reliever inhaler** for all patients with asthma, either ICS-formoterol, ICS-SABA or SABA. Low-dose ICS-formoterol is the preferred reliever because it reduces the risk of severe exacerbations compared with treatment options in which the reliever is SABA. However, ICS-formoterol should not be used as the reliever by patients who are taking a different maintenance ICS-LABA; for these patients, the appropriate reliever is SABA or ICS-SABA.
- **Treating modifiable risk factors** and multimorbidity (Box 4, p.12).
- **Non-pharmacological therapies** and strategies as appropriate (p.39).

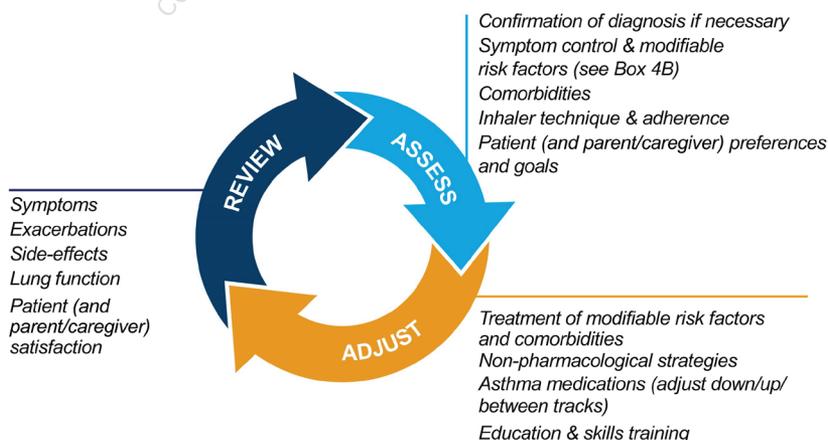
**Importantly, every patient should also be trained in essential skills and guided asthma self-management**, including:

- Asthma information
- Inhaler skills (p.37)
- Adherence (p.38)
- Written asthma action plan (p.43)
- Self-monitoring of symptoms and/or peak flow
- Regular medical review (p.11).

**Response** should be evaluated whenever treatment is changed. Assess symptom control, exacerbations, side-effects, lung function and patient (or parent/caregiver) satisfaction.

### Box 6. The asthma management cycle of shared decision-making

The aim of asthma management is to prevent exacerbations and asthma deaths, and to relieve and control symptoms.



## SABA-ONLY TREATMENT OF ASTHMA IS NOT RECOMMENDED

**For safety, GINA does not recommend treatment of asthma in adults or adolescents with short-acting beta<sub>2</sub>-agonists (SABA) alone. Instead, all patients should receive inhaled corticosteroids (ICS), either regularly or, in patients with mild asthma, as-needed ICS-formoterol, to reduce their risk of serious exacerbations and asthma death. For children 6–11 years with mild asthma, taking ICS whenever SABA is taken is safer than SABA alone.**

### Why is SABA-only treatment not recommended?

Starting treatment of asthma with as-needed SABA reliever alone dates back more than 50 years, to when asthma was thought of primarily as a disease of bronchoconstriction. However, airway inflammation is found in most patients with asthma, even in those with intermittent or infrequent symptoms, and patients with apparently mild asthma can still have severe, life-threatening or fatal asthma exacerbations. These risks are substantially reduced by ICS.

*SABA-only treatment* is associated with increased risk of exacerbations and lower lung function, and of asthma-related death.

*Regular use of SABA* increases allergic responses and airway inflammation, and reduces the bronchodilator response to SABA when it is needed.

*Over-use of SABA* (e.g.  $\geq 3 \times 200$ -dose canisters dispensed in a year) is associated with an increased risk of severe exacerbations. Dispensing of  $\geq 12$  SABA canisters in a year (and possibly even less than this) is associated with increased risk of asthma-related death. Home use of nebulized SABA is also associated with an increased risk of asthma death.

## STARTING ASTHMA TREATMENT

**ICS-containing treatment should be started as soon as possible after the diagnosis of asthma is made, because:**

- Patients with even mild asthma can have severe exacerbations.
- Low-dose ICS markedly reduces asthma hospitalizations and death.
- Low-dose ICS is very effective in preventing severe exacerbations, reducing symptoms, improving lung function, and preventing exercise-induced bronchoconstriction, even in patients with mild asthma.
- Early treatment with low-dose ICS is associated with better lung function than if symptoms have been present for more than 2–4 years.
- Patients not taking ICS who experience a severe exacerbation have lower long-term lung function than those who have started ICS.
- In occupational asthma, early removal from exposure and early treatment increase the probability of recovery.
- In patients previously taking SABA alone or low-dose ICS or LTRA, as-needed low-dose ICS-formoterol reduces the risk of emergency room visits or hospitalizations by about two-thirds compared with SABA alone, and by over one-third compared with low-dose ICS plus as-needed SABA.

For most adults or adolescents with asthma, treatment can be started at Step 2 with either as-needed low-dose ICS-formoterol (preferred), or regular daily low-dose ICS plus as-needed SABA or ICS-SABA (see Box 7B, p.22).

**Most patients with asthma do not need higher doses of ICS**, because at a group level, most of the benefit (including prevention of exacerbations) is obtained at low doses. For ICS doses, see Box 9, p.28.

Consider starting at Step 3 (preferably with maintenance-and-reliever therapy [MART] with low-dose ICS-formoterol) if, at initial presentation, the patient has troublesome asthma symptoms most days (e.g. 4–5 days/week); or is waking from asthma once or more a week.

If the patient has severely uncontrolled asthma or low lung function at initial asthma presentation, or if the initial presentation is during an acute exacerbation, start treatment at Step 4 (preferably with medium-dose ICS-formoterol maintenance and reliever therapy); a short course of OCS may also be needed.

Consider stepping down after asthma has been well-controlled for 3 months. However, ICS should not be completely stopped.

**Before starting initial asthma treatment** (Box 7B, p.22 and 8B, p.26)

- Record evidence for the diagnosis of asthma.
- Document symptom control and risk factors.
- Assess lung function, when possible.
- Train the patient to use the inhaler correctly, and check their technique.
- Schedule a follow-up visit.

**After starting initial asthma treatment** (Box 7A, p.20, and 8A, p.24)

- Review response after 2–3 months, or according to clinical urgency.
- See Box 7A/8A for ongoing treatment and other key management issues.
- Consider step-down when asthma has been well controlled for 3 months.

## ASTHMA TREATMENT TRACKS FOR ADULTS & ADOLESCENTS

The options for treatment for adults and adolescents are shown as two treatment 'tracks' (Box 7A, p.20). The key difference between the tracks is the medication that is used for symptom relief: as-needed low-dose ICS-formoterol in Track 1 (preferred), and as-needed SABA or as-needed ICS-SABA in Track 2.

**Track 1: The reliever is as-needed low-dose ICS-formoterol.**

**This is the preferred approach recommended by GINA for adults and adolescents**, based on strong evidence that it reduces the risk of severe exacerbations compared with regimens with SABA as reliever with similar symptom control, and the simplicity of treatment. With this approach:

- When a patient at any treatment step has asthma symptoms, they use low-dose combination ICS-formoterol for symptom relief.
- In Steps 3–5, patients also take combination ICS-formoterol as their daily maintenance treatment. This is called 'maintenance and reliever therapy' (MART).

ICS-formoterol should not be used as the reliever by patients taking any other (non-formoterol) ICS-LABA or ICS-LABA-LAMA.

**Track 2: The reliever is as-needed SABA or ICS-SABA.** This is an alternative approach when Track 1 is not possible or is not preferred by a patient who has stable asthma and no exacerbations on their current therapy.

- In Step 1, the patient takes a SABA and a low-dose ICS together for symptom relief when symptoms occur, either in a combination inhaler, or with the ICS taken right after the SABA.
- In Steps 2–5, the patient also takes maintenance ICS-containing medication every day.

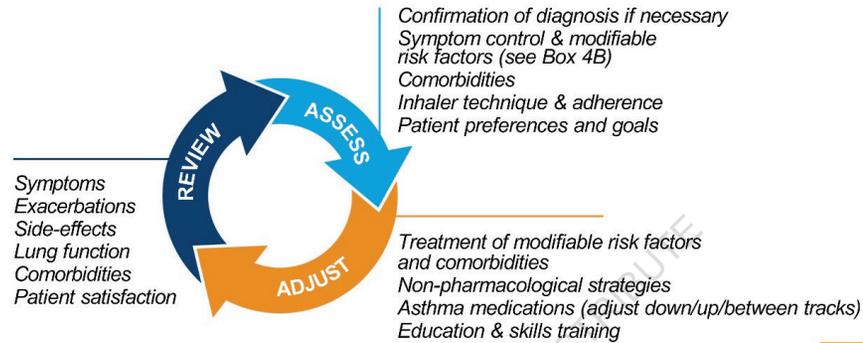
Before prescribing a regimen with SABA reliever, consider whether the patient is likely to be adherent with their ICS-containing therapy, as otherwise they will be exposed to SABA-only treatment and a higher risk of exacerbations.

**During ongoing treatment**, treatment can be stepped up or down along one track, using the same reliever at each step, or it can be switched between tracks, according to the individual patient's needs.

**Before stepping up**, check for common problems such as incorrect inhaler technique, poor adherence, and environmental exposures, and confirm that the symptoms are due to asthma (see Box 5, p.14) .

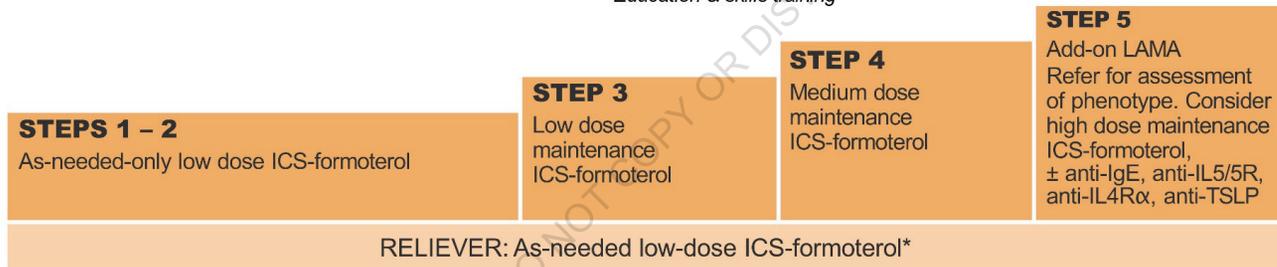
## GINA 2023 – Adults & adolescents 12+ years

**Personalized asthma management**  
Assess, Adjust, Review  
for individual patient needs



### TRACK 1: PREFERRED CONTROLLER and RELIEVER

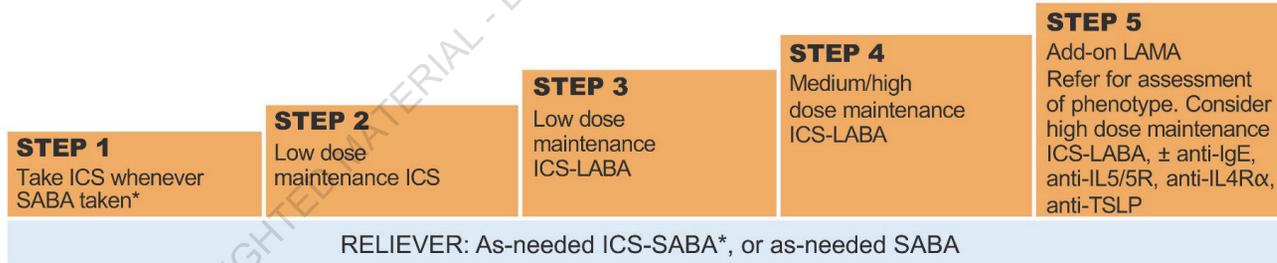
Using ICS-formoterol as the reliever\* reduces the risk of exacerbations compared with using a SABA reliever, and is a simpler regimen



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



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
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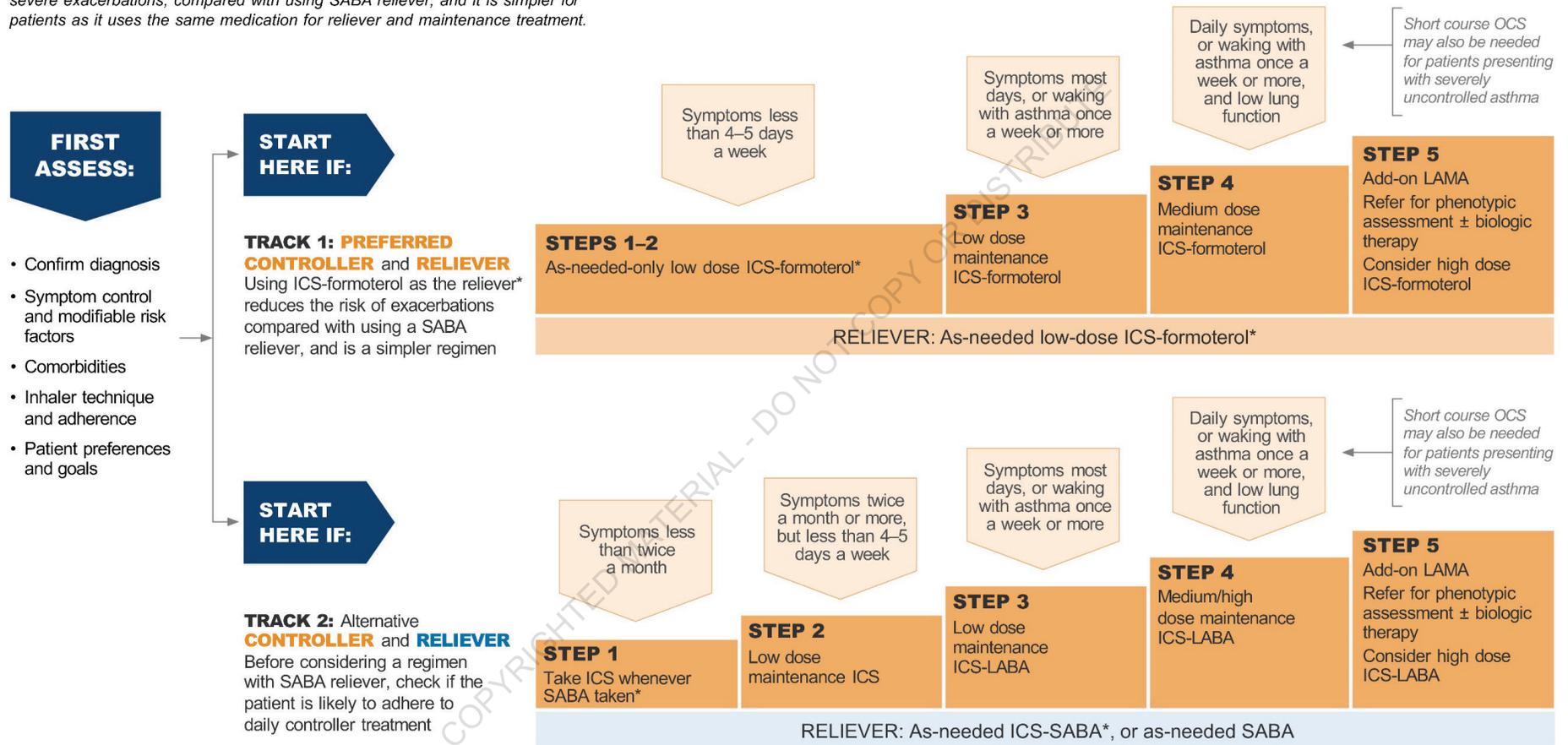
\*Anti-inflammatory reliever (AIR)

ICS: inhaled corticosteroid; LABA: long-acting beta<sub>2</sub>-agonist; LAMA: long-acting muscarinic antagonist; LTRA: leukotriene receptor antagonist; OCS: oral corticosteroid; SABA: short-acting beta<sub>2</sub>-agonist. For more details about Track 1 medications and doses, see Box 12 (p.52). See Box 8A (p.24) for children 6–11 years. For more details about treatment recommendations, and for supporting evidence, and clinical advice about implementation in different populations, see the full 2023 GINA report ([www.ginasthma.org/reports](http://www.ginasthma.org/reports)). For more details about Step 5 add-on therapies, see Chapter 3.2 of the GINA report or the GINA 2023 Short Guide *Difficult-to-Treat & Severe Asthma in adolescent and adult patients*, and check eligibility criteria with local payers.

Box 7B. Initial treatment: adult or adolescents with a diagnosis of asthma

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

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



\*Anti-inflammatory reliever (AIR)

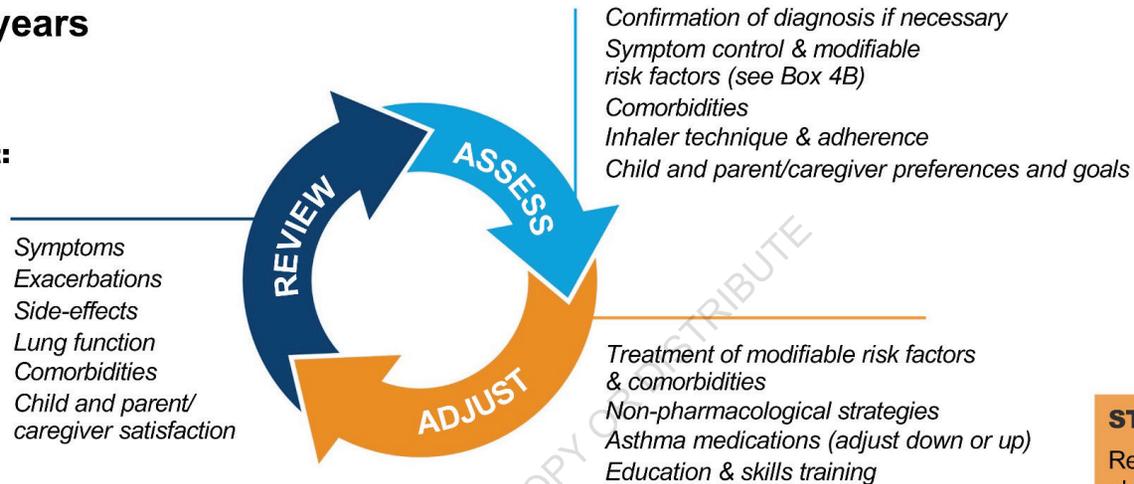
ICS: inhaled corticosteroid; SABA: short-acting beta<sub>2</sub>-agonist. For more details about Track 1 medications and doses, see Box 12 (p.52).

For initial asthma treatment in children 6–11 years, see Box 8B (p.26). For more details about treatment recommendations including supporting evidence, and clinical advice about implementation in different populations, see the full 2023 GINA report ([www.ginasthma.org](http://www.ginasthma.org)). For more details about Step 5 add-on therapies, see Chapter 3.3 of the GINA report, or the GINA 2023 Short Guide on *Difficult-to-Treat & Severe Asthma in adolescent and adult patients*, and check eligibility criteria with local payers.

## GINA 2023 – Children 6–11 years

### Personalized asthma management:

Assess, Adjust, Review



### Asthma medication options:

Adjust treatment up and down for individual child's needs

#### PREFERRED CONTROLLER

to prevent exacerbations and control symptoms

Other controller options (limited indications, or less evidence for efficacy or safety)

	<b>STEP 1</b> Low dose ICS taken whenever SABA taken*	<b>STEP 2</b> Daily low dose inhaled corticosteroid (ICS) (see table of ICS dose ranges for children)	<b>STEP 3</b> Low dose ICS-LABA, OR medium dose ICS, OR very low dose ICS-formoterol maintenance and reliever (MART)	<b>STEP 4</b> Medium dose ICS-LABA, OR low dose ICS-formoterol maintenance and reliever therapy (MART). Refer for expert advice	<b>STEP 5</b> Refer for phenotypic assessment ± higher dose ICS-LABA or add-on therapy, e.g. anti-IgE, anti-IL4Rα, anti-IL5
	Consider daily low dose ICS	Daily leukotriene receptor antagonist (LTRA), or low dose ICS taken whenever SABA taken*	Low dose ICS + LTRA	Add tiotropium or add LTRA	As last resort, consider add-on low dose OCS, but consider side-effects
<b>RELIEVER</b>	As-needed SABA (or ICS-formoterol reliever* in MART in Steps 3 and 4)				

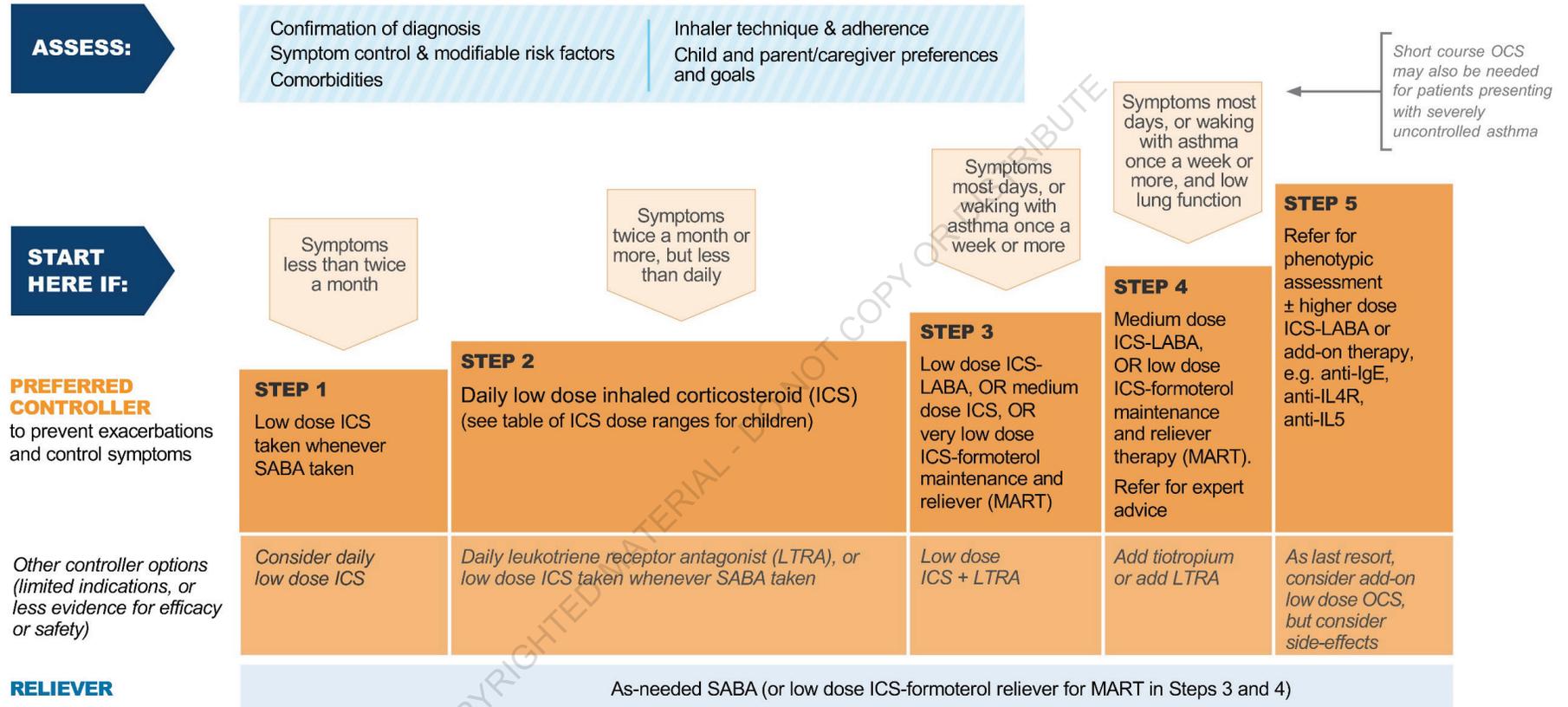
\*Anti-inflammatory reliever (AIR)

ICS: inhaled corticosteroid; LABA: long-acting beta<sub>2</sub>-agonist; LTRA: leukotriene receptor antagonist; OCS: oral corticosteroid; SABA: short-acting beta<sub>2</sub>-agonist. See Box 7A (p.20) for adults and adolescents. For more details about treatment recommendations, and for supporting evidence, and clinical advice about implementation in different populations, see the full 2023 GINA report ([www.ginasthma.org](http://www.ginasthma.org)). Check eligibility criteria with local payers.

Box 8B. Initial treatment: children 6–11 years with a diagnosis of asthma

## GINA 2023 – STARTING TREATMENT

### Children 6–11 years with a diagnosis of asthma



ICS: inhaled corticosteroid; LABA: long-acting beta<sub>2</sub>-agonist; LTRA: leukotriene receptor antagonist; OCS: oral corticosteroid; SABA: short-acting beta<sub>2</sub>-agonist.

For initial asthma treatment in adults and adolescents, see Box 7B (p.22). For more details about treatment recommendations including supporting evidence, and clinical advice about implementation in different populations, see the full 2023 GINA report ([www.ginasthma.org](http://www.ginasthma.org)). Check eligibility criteria with local payers.

## Box 9. Low, medium and high daily doses of inhaled corticosteroids

**This is not a table of equivalence**, but suggested total daily ICS doses for the 'low', 'medium' and 'high' dose options in Boxes 7 and 8. It is based on available studies and product information. Doses may be country-specific depending on local availability, regulatory labelling and clinical guidelines, and for mometasone, with addition of LAMA to ICS-LABA.

**Low-dose ICS** provides most of the clinical benefit for most patients. However, ICS responsiveness varies between patients, so some patients may need **medium-dose ICS** if asthma is uncontrolled despite good adherence and correct inhaler technique with low-dose ICS.

**High-dose ICS** is needed by very few patients, and its long-term use is associated with an increased risk of local and systemic side-effects.

Adults and adolescents Inhaled corticosteroid	Total daily ICS dose (mcg)		
	Low	Medium	High
BDP (pMDI*, HFA)	200–500	>500–1000	>1000
BDP (DPI or pMDI, extrafine particle, HFA)	100–200	>200–400	>400
Budesonide (DPI or pMDI*, HFA)	200–400	>400–800	>800
Ciclesonide (pMDI, extrafine particle, HFA)	80–160	>160–320	>320
Fluticasone furoate (DPI)	100		200
Fluticasone propionate (DPI)	100–250	>250–500	>500
Fluticasone propionate (pMDI*, HFA)	100–250	>250–500	>500
Mometasone furoate (DPI)	Depends on DPI device		
Mometasone furoate (pMDI*, HFA)	200–400		400
Children 6–11 years Inhaled corticosteroid	Total daily ICS dose (mcg)		
	Low	Medium	High
BDP (pMDI*, HFA)	100–200	>200–400	>400
BDP (pMDI, extrafine particle, HFA)	50–100	>100–200	>200
Budesonide (DPI)	100–200	>200–400	>400
Budesonide (nebulas)	250–500	>500–1000	>1000
Ciclesonide (pMDI, extrafine particle, HFA)	80	>80–160	>160
Fluticasone furoate (DPI)	50		–
Fluticasone propionate (DPI)	50–100	>100–200	>200
Fluticasone propionate (pMDI*, HFA)	50–100	>100–200	>200
Mometasone furoate (pMDI*, HFA)	100		200

Table shows metered doses. For abbreviations, see p.2.

\* standard (non-fine) particle. ICS by pMDI should preferably be used with a spacer.

**For new or generic preparations, or products containing a LAMA, the manufacturer's product information should be reviewed carefully, as products containing the same molecule may not be clinically equivalent.**

## STEPWISE APPROACH FOR ADJUSTING TREATMENT FOR INDIVIDUAL PATIENT NEEDS

Treatment options for adults and adolescents in Box 7A (p.20) are shown as two tracks, based on the choice of reliever. In Track 1, the reliever is low-dose ICS-formoterol. This is the preferred approach recommended by GINA, because it reduces the risk of severe exacerbations compared with using a SABA reliever, and because of the simplicity of the regimen.

Once asthma treatment has been started (Box 7B, p.22 and Box 8B, p.26), ongoing decisions are based on a cycle of shared decision-making to assess the patient, adjust their treatment (pharmacological and non-pharmacological) if needed, and review their response (Box 6, p.16). Treatment can be stepped up or down along one track using the same reliever at each step, or it can be switched between tracks, according to the individual patient's needs.

The **preferred treatments at each step** are shown in Box 7A (p.20) for adults and adolescents and in Box 8A (p.24) for children 6–11 years. See Box 9 (p.28) for ICS doses. For more details, including for children 5 years and younger, see the full GINA 2023 report.

At each step, **other options** are also listed, that have specific indications or less evidence for efficacy and safety.

For patients whose asthma is not well controlled on a particular treatment, adherence, inhaler technique, risk factors and comorbidities should be checked before considering a different medication in the same step, or before stepping up.

### ***STEP 1. Preferred treatment for adults and adolescents: low-dose ICS-formoterol taken as needed for symptom relief (Track 1)***

These recommendations are for:

- Initial asthma treatment for patients with symptoms less than twice a month and no exacerbation risk factors, a group that is rarely studied.
- Step-down treatment for patients whose asthma is well controlled on low-dose ICS-formoterol or low-dose ICS.

***As-needed low-dose ICS-formoterol*** is the preferred treatment at this step. This strategy is supported by evidence from two studies comparing as-needed low-dose budesonide-formoterol with SABA-only treatment in patients taking SABA alone, low-dose ICS, or LTRA (see below).

In making this recommendation, the most important considerations were that:

- Patients with few interval asthma symptoms can have severe or fatal exacerbations.
- The historic distinction between so-called 'intermittent' and 'persistent' asthma is arbitrary. With as-needed ICS-formoterol, a large reduction in

risk of severe exacerbations was seen compared with as-needed SABA, even in patients with SABA use twice a week or less at baseline.

- Adherence with daily ICS is particularly poor in patients with infrequent symptoms, exposing them to risks of SABA-only treatment.
- There is no evidence for the safety or efficacy of SABA-only treatment. Regular use of SABA for 1–2 weeks leads to increased airway hyper-responsiveness and reduced bronchodilation. SABA over-use (e.g. dispensing of 3 or more 200-dose canisters/year) is associated with increased risk of exacerbations and death.
- It is important to avoid the conflicting messages from the past in which patients were initially told to use SABA for symptom relief but then (despite this treatment being effective from their perspective) they were told that they needed to take ICS treatment every day to reduce their SABA use and prevent exacerbations.
- Starting treatment with SABA alone trains the patient to regard SABA as their primary asthma treatment.

All evidence for as-needed ICS-formoterol is with low-dose budesonide-formoterol, but beclometasone-formoterol may also be suitable. Both reduce exacerbations with MART in Steps 3 to 5. ICS-LABA with a non-formoterol LABA cannot be used as needed.

The usual dose of as-needed budesonide-formoterol in Steps 1–2 is one inhalation of 200/6 mcg dry powder inhaler (delivered dose 160/4.5 mcg) taken whenever needed for symptom relief, or before exercise if needed. The maximum recommended dose in a single day is a total of 72 mcg formoterol (54 mcg metered dose). However, patients rarely need this much, and average usage in the clinical trials was only 3–4 inhalations per week. See Box 12 (p.52) for more details about inhalers and dosage.

### **Other options at Step 1 for adults and adolescents (Track 2)**

**Low-dose ICS taken whenever SABA is taken:** This may be an option if as-needed ICS-formoterol is not available or affordable, although there is much less evidence for its safety and effectiveness. In Step 1, the evidence is indirect, from small studies with separate or combination ICS and SABA inhalers in patients with well-controlled asthma on Step 2 treatment (see below). For this recommendation, the most important considerations were reducing the risk of severe exacerbations, and the fact that adherence with daily ICS is poor in patients with symptoms less than twice a month.

Daily low-dose ICS with as-needed SABA is not recommended at Step 1, since patients with symptoms less than twice a month are unlikely to take ICS regularly, leaving them exposed to the risks of SABA-only treatment.

### **Children 6–11 years**

Taking ICS whenever SABA is taken is a possible option, with indirect evidence from two Step 2 studies with separate ICS and SABA inhalers.

## ***STEP 2. Preferred treatment for adults and adolescents: low-dose ICS-formoterol taken as needed for symptom relief (Track 1)***

***As-needed low-dose ICS-formoterol taken whenever needed for symptom relief:*** the evidence to date is with low-dose budesonide-formoterol.

- Compared with as-needed SABA alone, as-needed low-dose ICS-formoterol reduces severe exacerbations and ED/hospital visits by about two-thirds.
- Compared with daily low-dose ICS plus as-needed SABA, as-needed low-dose ICS-formoterol reduces severe exacerbations to a similar extent, and reduces ED/hospital visits by over one-third, with a very small difference in symptom control favoring ICS.
- Even a single day with increased as-needed doses of ICS-formoterol reduces the short-term risk of severe exacerbations compared with SABA alone, suggesting that timing of use is important.
- The treatment effects with as-needed low-dose ICS-formoterol compared with SABA alone or daily ICS were similar regardless of whether blood eosinophils or FeNO were low or elevated at baseline.

For this Step 2 recommendation, the most important considerations were to prevent severe exacerbations and to avoid the need for daily ICS. The small differences in symptom control and lung function, compared with daily ICS, were considered to be less important, as they were much less than the minimal important difference.

The usual dose of as-needed budesonide-formoterol is one inhalation of 200/6 mcg dry powder inhaler (delivered dose 160/4.5 mcg) taken whenever needed for symptom relief. The maximum recommended dose in a single day is a total of 72 mcg formoterol (delivered dose 48 mcg). In mild asthma studies, average usage was only 3–4 inhalations per week. Use double the number of inhalations for pMDIs with 3 mcg (2.25 mcg) formoterol in each inhalation. See Box 12 (p.52) for more details about inhalers and dosage. ICS-LABA with a non-formoterol LABA cannot be used as needed.

ICS-formoterol taken as-needed and before exercise showed similar benefit as daily ICS. Patients prescribed as-needed ICS-formoterol do not need to be prescribed a SABA for pre-exercise use.

## ***Alternative Step 2 treatment for adults and adolescents: daily low-dose ICS plus as-needed SABA (Track 2)***

There is a large body of evidence from RCTs and observational studies showing that, compared with SABA-only treatment, the risks of severe exacerbations, hospitalizations and mortality are substantially reduced with regular low-dose ICS plus as-needed SABA. Symptoms and exercise-induced bronchoconstriction are also reduced. Severe exacerbations are halved even

in patients with symptoms 0–1 days a week, compared with SABA alone. For this recommendation, the most important consideration was reducing the risk of severe exacerbations. However, adherence with ICS in the community is very poor, exposing patients to the risks of SABA-only treatment.

*Other options at Step 2 with limited indications, or less evidence for efficacy and/or safety*

- *Low-dose ICS taken whenever SABA is taken*, in combination or separate inhalers. Evidence is from two small studies in adults and two small studies in children/adolescents, showing no difference in exacerbations compared with daily ICS. A high importance was given to preventing severe exacerbations, and a lower importance was given to small differences in symptom control and the inconvenience of needing to carry two inhalers if combination ICS-SABA inhaler is not available.
- *Leukotriene receptor antagonists (LTRA)* are less effective than daily ICS, particularly for preventing exacerbations. There is a US FDA boxed warning about the risk of serious mental health effects with montelukast.
- *Daily low-dose ICS-LABA* as initial therapy leads to faster improvement in symptoms and FEV<sub>1</sub> than ICS alone but is costlier, and the reduction in exacerbations compared with SABA is similar to that with ICS.
- For purely seasonal allergic asthma, evidence is needed. Current advice is to start ICS or as-needed low-dose ICS-formoterol at the start of the allergen season and cease 4 weeks after end of exposure.
- For adults with rhinitis who are allergic to house dust mite and have FEV<sub>1</sub> >70% predicted, consider adding sublingual immunotherapy (SLIT).

**Step 2 treatment for children 6–11 years**

The preferred Step 2 treatment is regular low-dose ICS with as-needed SABA (see Box 9, p.28 for ICS doses). Other options include taking low-dose ICS whenever SABA is taken, using separate inhalers. Daily LTRA is less effective for exacerbation reduction; advise parents about FDA warning on montelukast.

**STEP 3. Preferred treatment for adults and adolescents: low-dose ICS-formoterol maintenance and reliever therapy (Track 1)**

**Before considering a step-up in treatment**, check adherence, inhaler technique, environmental exposures, and comorbidities.

The preferred Step 3 option is low-dose ICS-formoterol as both maintenance and reliever treatment (MART). In patients with or without a history of severe exacerbations, this reduces the risk of severe exacerbations compared with other options (maintenance ICS-LABA, higher dose ICS, or conventional best practice) with as-needed SABA, with a similar level of symptom control.

The usual dose of budesonide-formoterol 200/6 mcg dry powder inhaler (delivered dose 160/4.5 mcg) or beclometasone-formoterol 100/6 mcg pMDI (84.5/5.0 mcg) is 1 inhalation twice daily plus 1 inhalation as needed for symptom relief. See Box 12 (p.52) for more information about dosage, including the maximum number of inhalations in any day.

***Alternative Step 3 treatment for adults and adolescents: maintenance low-dose ICS-LABA plus as-needed SABA (Track 2)***

For patients whose asthma is uncontrolled on low-dose ICS, low-dose combination ICS-LABA plus as-needed SABA reduces severe exacerbations by about 20%, and lung function is higher, with little difference in reliever use.

A new Step 3 option for adults in 2023 is maintenance ICS-LABA plus as-needed combination ICS-SABA (≥18 years). Using ICS-SABA as the reliever reduced severe exacerbations compared with using a SABA reliever. Most of the benefit was seen in patients taking Step 3 maintenance treatment. For budesonide-salbutamol 100/100 mcg via pMDI (delivered dose 80/90 mcg), the maximum dose is 2 inhalations 6 times in any day.

***Other Step 3 options for adults and adolescents:*** Medium-dose ICS, or low-dose ICS plus LTRA (but see above re FDA warning). These options are less effective than maintenance ICS-LABA. For adults with rhinitis who are allergic to house dust mite and have FEV<sub>1</sub> >70% predicted, consider adding sublingual immunotherapy (SLIT).

***Preferred Step 3 treatment for children 6–11 years***

After checking inhaler technique and adherence, and treating modifiable risk factors, there are three preferred options for children:

- Maintenance medium-dose ICS plus as-needed SABA (see Box 9, p.28, for ICS doses).
- Maintenance low-dose ICS-LABA, plus as-needed SABA. Combination ICS-LABA is non-inferior to ICS alone for reducing severe exacerbations, with no difference in symptom control or reliever use.
- Maintenance and reliever therapy with a very low dose of budesonide-formoterol DPI (100/6 mcg once-daily, delivered dose 80/4.5 mcg) showed a large reduction in severe exacerbations in children, compared with the same dose of ICS-formoterol or higher dose of ICS.

Individual children's responses vary, so each of these options may be tried before considering a step-up to Step 4.

**STEP 4. Preferred treatment for adults and adolescents: Medium-dose ICS-formoterol as maintenance and reliever therapy (Track 1)**

At a group level, most benefit from ICS is obtained at low dose, but individual ICS responsiveness varies, and some patients whose asthma is uncontrolled on Step 3 MART despite good adherence and correct technique may benefit from increasing the maintenance ICS-formoterol dose to medium.

The maintenance dose of MART can be increased by doubling the number of maintenance inhalations. However, the reliever should still be *low-dose* ICS-formoterol. The maximum recommended dose in a single day is the same as in Step 3. See Box 12 (p.52) for more information about dosage of ICS-formoterol for MART, including the maximum number of inhalations in any day.

**Alternative Step 4 treatment for adults and adolescents: medium or high-dose ICS-LABA plus as-needed SABA (Track 2)**

Some patients whose asthma is uncontrolled or who have frequent exacerbations on low-dose ICS-LABA despite good adherence and correct technique may benefit from medium-dose ICS-LABA, if MART is not available.

A new Step 4 option for adults in 2023 is higher-dose maintenance ICS-LABA plus as-needed combination ICS-SABA ( $\geq 18$  years). For budesonide-salbutamol 100/100 mcg via pMDI (delivered dose 80/90 mcg), the maximum dose is 2 inhalations, 6 times in any day.

**Other Step 4 options for adults and adolescents** include add-on LAMA for patients  $\geq 18$  years ( $\geq 6$  years for tiotropium by mist inhaler) in separate or combination ('triple') inhalers. Compared with ICS-LABA, there is a modest increase in lung function, and a small decrease in exacerbations, but no clinically important reduction in symptoms. Before considering add-on LAMA for patients with exacerbations, increase ICS dose to at least medium, or switch to MART. For adult patients with rhinitis and asthma who are allergic to house dust mite, consider adding SLIT, provided  $FEV_1$  is  $>70\%$  predicted.

**Preferred Step 4 treatment for children (6–11 years):** Options include increasing the dose of maintenance ICS-LABA to medium; for maintenance and reliever therapy, the maintenance dose may be increased to 100/6 mcg twice daily (delivered dose 80/4.5 mcg). If asthma is not well controlled with Step 4 treatment, continue ICS-containing treatment, and refer for expert advice.

## STEP 5. Refer for phenotypic investigation ± add-on treatment

Patients with uncontrolled symptoms and/or exacerbations despite Step 4 treatment should be assessed for contributory factors, have their treatment optimized, and be referred for expert assessment including severe asthma inflammatory phenotype, and potential add-on treatment. The [GINA Short Guide Difficult-to-Treat & Severe Asthma 2023](#) provides a decision tree and practical guide for assessment and management in adults and adolescents.

Treatment guided by sputum eosinophils, if available, reduces exacerbations in patients with moderate-severe asthma. There is no evidence about initiating MART in patients taking Step 5 add-on treatment, but for a patient on MART, switching the reliever back to SABA may increase exacerbation risk.

**Add-on treatments in Step 5** include:

- LAMA for patients  $\geq 18$  years ( $\geq 6$  years for tiotropium) in separate or combination ('triple') inhalers
- anti-IgE (SC omalizumab,  $\geq 6$  years) for severe allergic asthma
- anti-IL5 (SC mepolizumab,  $\geq 6$  years, or IV reslizumab,  $\geq 18$  years) or anti-IL5R (SC benralizumab,  $\geq 12$  years) or anti-IL4R (SC dupilumab,  $\geq 6$  years) for severe eosinophilic/Type 2 asthma
- anti-TSLP (SC tezepelumab,  $\geq 12$  years) for severe asthma
- Add-on azithromycin three days/week reduces exacerbations, but increases antibiotic resistance.

See Glossary, p.48 for more details. Always check local eligibility criteria for specific add-on therapies.

**Other options:** Maintenance OCS should be used only as last resort, because short-term and long-term systemic side-effects are common and serious.

## REVIEWING RESPONSE AND ADJUSTING TREATMENT

### How often should patients with asthma be reviewed?

Patients should preferably be seen 1–3 months after starting treatment and every 3–12 months after that, but in pregnancy, asthma should be reviewed every 4–6 weeks. After an exacerbation, a review visit within 1 week should be scheduled. The frequency of review depends on the patient's initial level of symptom control, their risk factors, their response to initial treatment, and their ability and willingness to engage in self-management with an action plan.

## Stepping up asthma treatment

Asthma is a variable condition, and periodic adjustment of ICS-containing treatment by the clinician and/or patient may be needed.

- *Day-to-day adjustment by patient in GINA Track 1* (p.20), with as-needed low-dose ICS-formoterol in Steps 1–2, or ICS-formoterol as maintenance and reliever therapy (MART) in Steps 3–5. The patient takes ICS-formoterol as needed for day-to-day symptom relief, instead of SABA (p.52). This is particularly effective in reducing severe exacerbations. Day-to-day adjustment also occurs with use of as-needed ICS-SABA reliever in Track 2, studied at Steps 3–5. Information about action plans for patients using ICS-formoterol or ICS-SABA reliever is found on p.43.
- *Short-term step-up (for 1–2 weeks)* by clinician or by patient with written asthma action plan (p.43), e.g. during viral infection or allergen exposure. Mostly only needed for Track 2 patients whose reliever is a SABA.
- *Sustained step-up (for at least 2–3 months)*: if symptoms and/or exacerbations persist despite 2–3 months of ICS-containing treatment, assess the following common issues before considering a step-up:
  - incorrect inhaler technique
  - poor adherence
  - modifiable risk factors, e.g. smoking
  - are symptoms due to comorbid conditions, e.g. allergic rhinitis.

## Stepping down treatment when asthma is well-controlled

Consider stepping down treatment once good asthma control has been achieved and maintained for 2–3 months, to find the lowest treatment that controls both symptoms and exacerbations, and minimizes side-effects:

- Choose an appropriate time for step-down (no respiratory infection, patient not travelling, not pregnant).
- Assess risk factors, including history of previous exacerbations or emergency department (ED) visit, and low lung function.
- Document baseline status (symptom control and lung function), provide a written asthma action plan, monitor closely, and book a follow-up visit.
- Step down through available formulations to reduce the ICS dose by 25–50% at intervals of 2–3 months (see Box 3-7 in full 2023 GINA report for details of how to step down different treatments).
- If asthma is well controlled on low-dose ICS or LTRA, as-needed low-dose ICS-formoterol is a step-down option, based on three large studies in mild asthma. Smaller studies have also shown that low-dose ICS taken whenever SABA is taken (with combination or separate inhalers) is more effective as a step-down strategy than SABA alone.
- Do not completely stop ICS in adults or adolescents with asthma unless this is needed temporarily to confirm the diagnosis of asthma.
- Make sure a follow-up appointment is arranged.

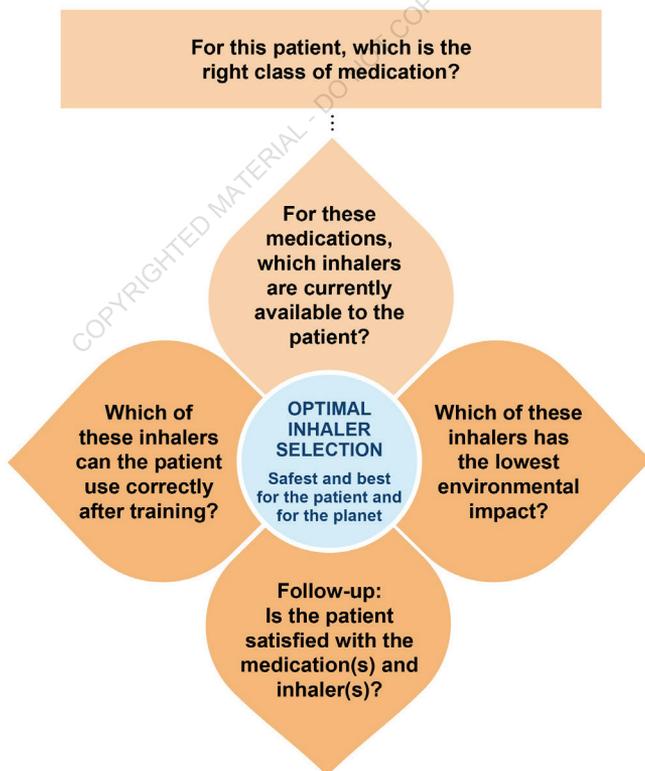
## INHALER SKILLS AND ADHERENCE

### Provide skills training for effective use of inhaler devices

Most patients (up to 80%) cannot use their inhaler correctly. This contributes to poor symptom control and exacerbations, and increases the risk of local adverse effects. To ensure effective inhaler use:

- **Choose** the medication and the most appropriate device for the patient before prescribing: consider physical problems e.g. arthritis, patient skills, and cost; for ICS by pressurized metered dose inhaler, prescribe a spacer; consider environmental impact of inhaler (see Box 10).
- **Check** inhaler technique at every opportunity. Ask the patient to show you how they use the inhaler. Check against a device-specific checklist.
- **Correct** using a physical demonstration, paying attention to incorrect steps. Check technique again, up to 2–3 times if necessary.
- **Confirm** that you have checklists for each of the inhalers you prescribe, and can demonstrate correct technique on them.

### Box 10. Shared decision-making about choice of inhaler



## Check and improve adherence with asthma medications

At least 50% of adults and children do not take their asthma medications as prescribed. Poor adherence with ICS-containing maintenance treatment, with reliance on SABA reliever, contributes to poor symptom control and exacerbations. It may be unintentional (e.g. forgetfulness, cost, misunderstandings) and/or intentional (e.g. not perceiving the need for treatment, fear of side-effects, cultural issues, cost).

Identify patients with adherence problems:

- Ask an empathic question, e.g. *“Most patients don’t take their inhaler exactly as prescribed. In the last 4 weeks, how many days a week have you been taking it? 0 days a week, or 1, or 2 days [etc]?”*, or *“Do you find it easier to remember your inhaler in the morning or night?”*
- Check medication usage, from prescription date, inhaler date/dose counter, dispensing records.
- Ask patients about attitudes and beliefs about asthma and medications.

Only a few adherence interventions have been studied closely in asthma and have led to improved adherence in real-world studies:

- Shared decision-making for medication and dose choice.
- Electronic inhaler reminders for missed doses.
- Comprehensive asthma education with home visits by asthma nurses.
- Clinicians reviewing feedback about their patients’ dispensing records.
- An automated voice recognition program with telephone messages triggered when refills were due or overdue.
- Directly-observed maintenance asthma treatment at school, with telemedicine oversight.

## TREATING MODIFIABLE RISK FACTORS

Exacerbation risk can be minimized by optimizing asthma medications, and by identifying and treating modifiable risk factors. Some examples of risk modifiers with consistent high-quality evidence are:

- **Guided self-management:** self-monitoring of symptoms and/or PEF, a written asthma action plan (p.43), and regular medical review.
- **Use of a regimen that minimizes exacerbations:** prescribe ICS-containing treatment, either daily, or, for mild asthma, as-needed ICS-formoterol. GINA Track 1 (p.20), with ICS-formoterol as the reliever (with maintenance ICS-formoterol in MART, or alone in mild asthma) reduces the risk of severe exacerbations compared with if the reliever is SABA.
- **Avoidance of exposure to tobacco smoke.**
- **For confirmed food allergy:** appropriate food avoidance; ensure availability of injectable epinephrine for anaphylaxis.
- **School-based programs** that include asthma self-management skills.

- **Referral to a specialist center**, if available, for patients with severe asthma, for detailed assessment and consideration of add-on biologic medications and/or sputum-guided treatment.

## NON-PHARMACOLOGICAL STRATEGIES AND INTERVENTIONS

In addition to medications, other therapies and strategies may be considered where relevant, to assist in symptom control and risk reduction. See 2023 GINA report Box 3-18 for details. Some examples with consistent high-quality evidence include:

- **Smoking cessation advice**: at every visit, strongly encourage smokers to quit. Provide access to counselling and resources. Advise parents and caregivers to exclude smoking in rooms/cars used by children with asthma.
- **Physical activity**: encourage people with asthma to engage in regular physical activity because of its general health benefits; it may also have a small benefit for asthma control and lung function. Provide advice about management of exercise-induced bronchoconstriction.
- **Investigation for occupational asthma**: ask all patients with adult-onset asthma about their work history. Identify and remove occupational sensitizers as soon as possible. Refer for expert advice, if available.
- **Identify aspirin-exacerbated respiratory disease**, and before prescribing NSAIDs including aspirin, always ask about previous reactions.

Although allergens may contribute to asthma symptoms in sensitized patients, allergen avoidance is not recommended as a general strategy for asthma. These strategies are often complex and expensive, and there are no validated methods for identifying those who are likely to benefit.

Some common triggers for asthma symptoms (e.g. exercise, laughter) should **not** be avoided, and others (e.g. viral respiratory infections, stress) are difficult to avoid and should be managed when they occur. During the COVID-19 pandemic, many countries saw a reduction in asthma exacerbations and influenza-related illness, possibly due to handwashing, masks and social/physical distancing, which reduced the incidence of other respiratory infections, including influenza.

## TREATMENT IN SPECIFIC POPULATIONS OR CONTEXTS

**Pregnancy**: asthma control often changes during pregnancy, so asthma should be monitored every 4–6 weeks. For baby and mother, the advantages of actively treating asthma markedly outweigh any potential risks of usual asthma medications. Ensure that all patients are receiving ICS-containing therapy, because asthma exacerbations are associated with increased risk of pre-term delivery, low birth weight and increased perinatal mortality. Down-titration has a low priority in pregnancy, and ICS should not be stopped. Exacerbations should be treated aggressively.

**Rhinitis and sinusitis:** these often coexist with asthma. Chronic rhinosinusitis with or without nasal polyps is associated with more severe asthma. Treatment of allergic rhinitis or chronic rhinosinusitis reduces nasal symptoms but does not improve asthma control. Biologic therapy targeting T2 inflammation can significantly improve symptoms due to chronic rhinosinusitis with nasal polyps, as well as reducing asthma symptoms and exacerbations.

**Obesity:** document the diagnosis of asthma in the obese, to avoid over- or under-treatment. Include weight reduction in the treatment plan for obese patients with asthma; even 5–10% weight loss can improve asthma control.

**The elderly:** comorbidities and their treatment may complicate asthma management. Factors such as arthritis, eyesight, inspiratory flow, and complexity of treatment regimens should be considered when choosing medications and inhaler devices.

**Gastroesophageal reflux disease:** this is commonly seen in asthma. Symptomatic reflux should be treated for its general health benefits, and may lead to a small benefit in lung function, but there is no benefit from treating asymptomatic reflux in asthma.

**Anxiety and depression:** these are commonly seen in people with asthma, and are associated with worse symptoms and quality of life. Patients should be assisted to distinguish between symptoms of anxiety and of asthma.

**Aspirin-exacerbated respiratory disease (AERD):** a history of exacerbation following ingestion of aspirin or other NSAIDs is highly suggestive. Patients often have severe asthma and nasal polyposis. Confirmation of the diagnosis of AERD may require challenge in a specialized center with resuscitation facilities, but avoidance of NSAIDs may be recommended on the basis of a clear history. ICS are the mainstay of treatment, but OCS may be required; LTRA may also be useful. Desensitization is sometimes effective but must be done under specialist care; there is a significantly increased risk of adverse effects such as gastritis and gastrointestinal bleeding.

**Food allergy and anaphylaxis:** food allergy is rarely a trigger for asthma symptoms. It must be assessed with specialist testing. Confirmed food allergy is a risk factor for asthma-related death. Good asthma control is essential; patients (and parents/caregivers) should also have an anaphylaxis plan and be trained in appropriate avoidance strategies and use of injectable epinephrine.

**Surgery:** whenever possible, good asthma control should be achieved pre-operatively. Ensure that ICS-containing therapy is maintained throughout the peri-operative period. Patients on long-term high-dose ICS, or having more than 2 weeks' OCS in the past 6 months, should receive intra-operative hydrocortisone to reduce the risk of adrenal crisis.

## ADVICE ON ASTHMA MANAGEMENT DURING THE COVID-19 PANDEMIC

### Overall, people with asthma do not appear to be at increased risk of being infected with COVID-19, or of having severe COVID-19

People with well-controlled asthma do not appear to be at increased risk of severe COVID-19 or COVID-19-related death, but the risk of COVID-19 death is increased in people who recently needed oral corticosteroids (OCS) for their asthma and in hospitalized patients with severe asthma. In a meta-analysis, the risk of COVID-19-related mortality in people with asthma appeared to be *lower* than in people without asthma.

During 2020–21, many countries saw a decrease in asthma exacerbations and influenza-related illness, possibly due to handwashing, masks and physical distancing that reduced respiratory infections including influenza.

### Advise patients with asthma to continue taking their prescribed asthma medications, particularly inhaled corticosteroid (ICS) medications

Asthma medications should be continued as usual during the COVID-19 pandemic. This includes ICS-containing medications (alone or in combination), and add-on therapy including biologic therapy for severe asthma. Stopping ICS often leads to potentially dangerous worsening of asthma. Advise patients to discuss with you before stopping *any* asthma medication. This includes OCS in the small proportion of patients with severe asthma for whom these are needed as last resort.

### Make sure that all patients have a written asthma action plan

A written action plan can be handwritten, printed, digital or pictorial. It tells the patient how to recognize worsening asthma, how to increase their asthma medications, and when to seek medical help. A short course of OCS may be needed during severe asthma flare-ups (exacerbations or attacks). See p.43 and the 2023 GINA report for more information about asthma action plans.

### When COVID-19 is confirmed or suspected, or local risk is moderate or high, avoid using nebulizers where possible due to the risk of transmitting infection to healthcare workers and other patients

Instead, to deliver short-acting beta<sub>2</sub>-agonist for acute asthma in adults and children, use a pressurized metered-dose inhaler and spacer, with a mouthpiece or tightly fitting face mask, if required.

### Avoid spirometry in patients with confirmed/suspected COVID-19

In healthcare facilities, follow local COVID-19 testing recommendations and infection control procedures if spirometry or peak flow measurement is needed. Use of an in-line filter minimizes the risk of transmission during spirometry, but patients often cough *after* spirometry. Coach the patient to stay on the mouthpiece if they need to cough.

## **Follow local infection control recommendations if other aerosol-generating procedures are needed**

These include oxygen therapy (including with nasal prongs), sputum induction, manual ventilation, non-invasive ventilation and intubation. U.S. Centers for Disease Control and Prevention (CDC) recommendations are found [here](#). **Follow local health advice** about hygiene strategies and use of personal protective equipment.

## **Advise people with asthma to be up to date with COVID-19 vaccines**

Many COVID-19 vaccines are in use, and allergic reactions are rare. Patients with a history of severe allergic reaction to a COVID-19 vaccine ingredient (e.g. polyethylene glycol for Pfizer/BioNTech or Moderna, or polysorbate 80 for AstraZeneca or J&J/Janssen) should receive a different vaccine type. However, people with anaphylaxis to foods, insect venom, or other medications can safely receive COVID-19 vaccines.

Usual vaccine precautions apply. For example, ask about history of allergy to vaccines or their components, and delay vaccination if the patient has a fever or other infection. GINA suggests that, if possible, the first dose of a biologic therapy for severe asthma and COVID-19 vaccination should not be given on the same day.

## **Remind people with asthma to have an influenza vaccination**

CDC (advice [here](#)) advises that influenza vaccine and COVID-19 vaccine can be given on the same day.

## **Management of asthma if the patient acquires COVID-19**

Advise patients to continue their usual asthma medications. Avoid use of nebulizers where possible. Monitor patients with uncontrolled asthma (e.g. recent need for OCS) closely, as they are at higher risk of hospitalization. Before prescribing antiviral therapies, consult local prescribing guidelines, and check carefully for potential interactions with asthma therapy. Be cautious if considering prescribing ritonavir-boosted nirmatrelvir (NMV/r) for patients taking ICS-salmeterol or ICS-vilanterol, as the interaction may increase cardiac toxicity of the LABA. For such patients, consider prescribing alternative anti-COVID-19 treatment (if available), or switching to ICS or ICS-formoterol for the duration of anti-viral therapy; train in correct inhaler technique if switching medications.

## **Additional resources**

The CDC website provides up-to-date information about COVID-19 for health professionals [here](#) and for patients [here](#).

The website of the World Health Organization provides comprehensive advice for health professionals and health systems about prevention and management of COVID-19 [here](#).

## ASTHMA FLARE-UPS (EXACERBATIONS)

A flare-up or exacerbation is an acute or sub-acute worsening in symptoms and lung function from the patient's usual status; occasionally it may be the initial presentation of asthma.

For discussion with patients, the word 'flare-up' is preferred. 'Episodes', 'attacks' and 'acute severe asthma' are often used in medical literature, but they have variable meanings, particularly for patients.

The management of worsening asthma and exacerbations should be considered as a continuum, from self-management by the patient with a written asthma action plan, through to management of more severe symptoms in primary care, the ED and in hospital.

### Identifying patients at risk of asthma-related death

Patients with features indicating increased risk of asthma-related death should be flagged for more frequent review. These features include:

- *History*: A history of near-fatal asthma (ever) requiring intubation and ventilation; hospitalization or emergency care for asthma in the last year
- *Medications*: not currently using ICS, or with poor adherence with ICS; currently using or recently stopped OCS (an indication of recent severity); over-use of SABA, especially if dispensed more than 1 canister (200 doses) per month
- *Comorbidities*: history of psychiatric disease or psychosocial problems; confirmed food allergy in a patient with asthma; comorbidities associated with older age such as pneumonia, diabetes or arrhythmias
- *Lack of a written asthma action plan.*

## WRITTEN ASTHMA ACTION PLANS

All patients should be provided with a written asthma action plan appropriate for their level of asthma control and health literacy, so they know how to recognize and respond to worsening asthma.

### The written asthma action plan should include:

- the patient's usual asthma medications
- when and how to increase inhaled medications, and start OCS if needed
- how to access medical care if symptoms fail to respond.

Action plans can be based on symptoms and/or (in adults) PEF. Patients who are deteriorating quickly should be advised to seek urgent care immediately.

## Inhaled medication changes for written asthma action plans.

Advise the patient to increase their reliever medication, as below, when asthma symptoms increase. Patients with a SABA reliever should also increase their maintenance ICS-containing treatment. For more details about action plan options, see the full GINA 2023 report, Box 4-2.

**TRACK 1 with ICS-formoterol reliever:** Advise the patient to take extra doses of low-dose ICS-formoterol whenever needed for symptom relief, and (for Steps 3–5) continue their usual doses of maintenance ICS-formoterol. They should seek medical care if rapidly deteriorating, or if they need more than a total of 12 budesonide-formoterol inhalations in a day (8 inhalations for children) or more than a total of 8 beclometasone-formoterol inhalations in a day. See Box 12, p.52 for more details about doses of ICS-formoterol. Examples of action plan templates for Track 1 are available [here](#) and [here](#).

**TRACK 2 with ICS-SABA reliever:** Advise the patient to take extra doses of ICS-SABA (2 inhalations of budesonide-salbutamol 100/100 mcg [delivered dose 80/90 mcg] each time) for symptom relief, and continue their usual maintenance ICS-containing treatment. They should seek medical care if they are rapidly deteriorating or need ICS-SABA more than 6 times in any day.

**TRACK 2 with SABA reliever:** Advise the patient to take SABA when needed for symptom relief, and to increase their ICS-containing maintenance treatment (if prescribed) for at least 1–2 weeks, as follows:

- **ICS:** In adults and adolescents, consider a large (4x) increase in dose. However, in children with good adherence, a large (5x) increase is not likely to be effective.
- **Maintenance ICS-formoterol:** Consider increasing maintenance ICS-formoterol dose to 4x usual dose. Note maximum total dose above.
- **Maintenance ICS-LABA with non-formoterol LABA:** Step up to higher-dose formulation, or consider adding separate ICS inhaler to achieve large (e.g. 4x) increase in ICS dose.

The patient should seek medical care if they are rapidly deteriorating or need SABA again within 3 hours.

## Oral corticosteroids

For most patients, the written asthma action plan should also provide instructions for when and how to commence OCS. Typically, a short course of OCS is used when:

- Worsening symptoms fail to respond to an increase in reliever ± ICS-containing maintenance medication for 2–3 days
- The patient deteriorates rapidly or has a PEF or FEV1 <60% of their personal best or predicted value
- The patient with worsening asthma has a history of sudden severe exacerbations.

OCS are preferably taken in the morning:

- For adults, prednisolone 40–50 mg, usually for 5–7 days.
- For children, prednisolone 1–2 mg/kg/day up to 40 mg, usually for 3–5 days.

Tapering is not needed if OCS has been given for less than 2 weeks.

Patients should contact their doctor if they start taking OCS. Advise patients about common OCS side-effects, including sleep disturbance, increased appetite, reflux, and mood changes.

OCS can be life-saving during severe asthma exacerbations, but there is increasing awareness of the cumulative risks of repeated courses. The need for OCS can be reduced by optimizing inhaled therapy, including attention to inhaler technique and adherence, and by switching to Track 1 therapy with ICS-formoterol, if available.

## MANAGING EXACERBATIONS IN PRIMARY OR ACUTE CARE

**Assess** exacerbation severity while starting SABA and oxygen. Check for anaphylaxis. Assess dyspnea (e.g. is the patient able to speak sentences, or only words), respiratory rate, pulse rate, oxygen saturation and lung function (e.g. PEF). Note potential over-estimation of pulse oximetry in patients with dark skin color.

**Consider alternative causes** of acute breathlessness (e.g. heart failure, upper airway dysfunction, inhaled foreign body or pulmonary embolism).

**Arrange immediate transfer** to an acute care facility if there are signs of severe exacerbation, or to intensive care if the patient is drowsy, confused, or has a silent chest. For these patients, immediately give inhaled SABA, inhaled ipratropium bromide, oxygen and systemic corticosteroids.

**Start treatment** with repeated doses of SABA (usually by pMDI and spacer), early OCS, and controlled flow oxygen if available. Check response of symptoms and saturation frequently, and measure lung function after 1 hour.

**Titrate oxygen**, if needed, to maintain target saturation of 93–95% in adults and adolescents (94–98% in children 6–12 years). (See note above.)

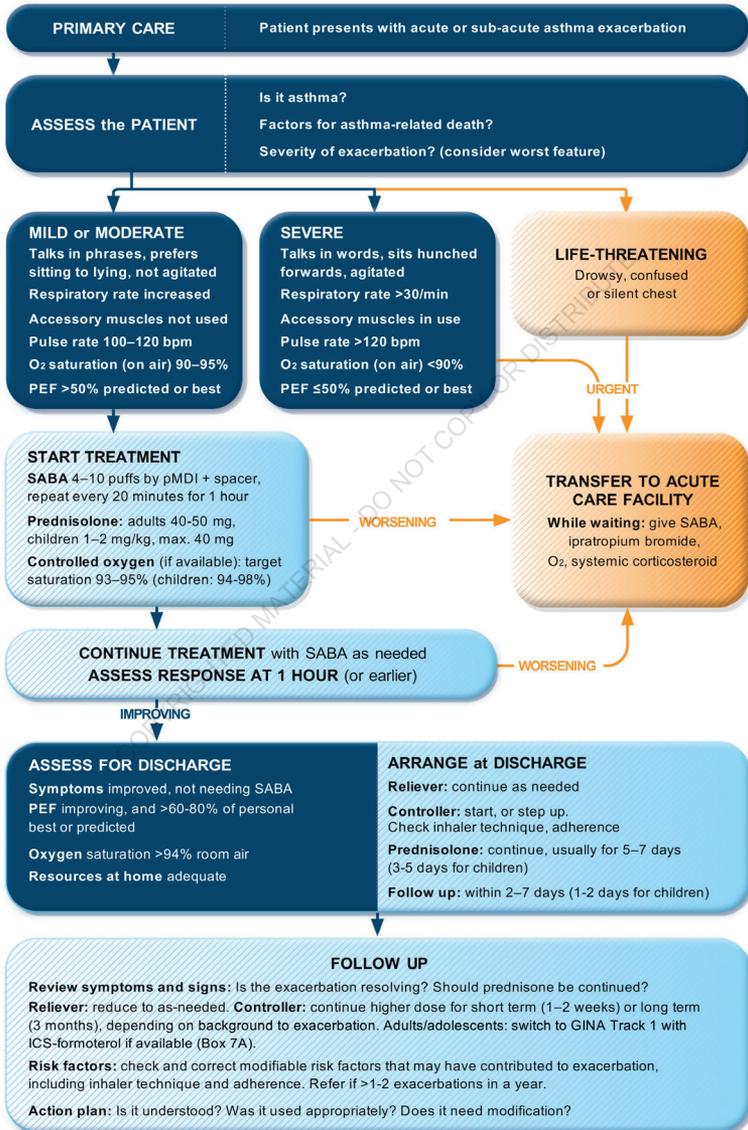
**For severe exacerbations**, arrange transfer to an acute care facility, add ipratropium bromide, and consider giving SABA by nebulizer (with infection control procedures). In acute care facilities, intravenous magnesium sulfate may be considered for inadequate response to intensive initial treatment.

Do not routinely perform chest X-ray or blood gases, or routinely prescribe antibiotics, for asthma exacerbations. Do not use sedatives.

Box 11 (p.46) summarizes the approach to assessment and management of asthma exacerbations for adults, adolescents and children 6–11 years presenting in primary care.

Currently, inhaled albuterol (salbutamol) is the most commonly used bronchodilator for acute asthma management, but similar efficacy and safety to inhaled albuterol have been reported from ED studies with budesonide-formoterol, in patients with FEV<sub>1</sub> >30% predicted.

### Box 11. Management of asthma exacerbations in primary care



SABA: short-acting beta<sub>2</sub>-agonist (doses are for salbutamol)

## REVIEWING RESPONSE

**Monitor patients closely and frequently** during treatment, and titrate treatment according to response. Transfer to higher-level care if worsening or failing to respond. **Decide on need for hospitalization** based on clinical status, symptoms and lung function, response to treatment, recent and history of exacerbations, and ability to manage at home.

**Before discharge, arrange ongoing treatment.** Prescribe regular maintenance ICS-containing treatment, preferably GINA Track 1 with ICS-formoterol (initially at Step 4) to reduce the risk of further exacerbations. For patients in Track 2, increase previous maintenance dose for 2–4 weeks. Reduce reliever to as-needed dosing, and return patient to as-needed ICS-formoterol reliever if prescribed this before exacerbation. Check inhaler technique and adherence. Provide an interim written asthma action plan.

**Arrange early follow-up** after any exacerbation, within 2–7 days (for children, within 1–2 working days) if possible. Consider early referral for specialist advice after hospitalization, or for patients with repeated ED presentations.

## FOLLOW-UP AFTER AN EXACERBATION

Exacerbations often represent failures in chronic asthma care, and they provide opportunities to review the patient's asthma management. **All patients must be followed up regularly by a health care provider until symptoms and lung function return to normal.**

Take the opportunity to review:

- The patient's understanding of the cause of the exacerbation
- Modifiable risk factors for exacerbations, e.g. smoking
- Choice of treatment track – Track 1 (p.20) with ICS-formoterol reliever reduces risk of further severe exacerbations. See also Box 12 (p.52).
- Understanding of purposes of medications
- Inhaler technique skills
- Adherence with ICS and OCS as this may fall rapidly after discharge
- Written asthma action plan – revise if necessary.

Comprehensive post-discharge programs that include optimized medication management, inhaler technique, self-monitoring, written asthma action plan and regular review are cost-effective and are associated with significant improvement in asthma outcomes.

Referral for expert advice should be considered for patients who have been hospitalized for asthma, or who re-present for acute asthma care. Patients who have had more than 1 or 2 exacerbations/year despite medium- or high-dose ICS-LABA should be referred (see GINA 2023 Short Guide *Difficult to Treat & Severe Asthma*, [www.ginasthma.org/severeasthma](http://www.ginasthma.org/severeasthma)).

## GLOSSARY OF ASTHMA MEDICATION CLASSES

For more details about medications, see full 2023 GINA report ([www.ginasthma.org](http://www.ginasthma.org)) and Product Information from manufacturers. Always check local eligibility criteria.

### MEDICATIONS for MAINTENANCE TREATMENT

#### Inhaled corticosteroids (ICS)

*Medications:* Beclometasone, budesonide, ciclesonide, fluticasone propionate, fluticasone furoate, mometasone, triamcinolone. *Devices:* pMDIs or DPIs.

*Action and use:* ICS-containing medications are the most effective anti-inflammatory medications for asthma. ICS reduce symptoms, increase lung function, reduce airway hyperresponsiveness, improve quality of life, and reduce the risk of exacerbations, asthma-related hospitalizations and death. ICS differ in their potency and bioavailability, but most of the benefit is seen at low doses (see Box 9 (p.28) for low, medium and high doses of different ICS). Adherence with ICS alone (i.e. not in combination with a bronchodilator) is usually very poor.

*Adverse effects:* Most patients do not experience side-effects. Local side-effects include oropharyngeal candidiasis and dysphonia; these can be reduced by use of a spacer with pMDIs, and rinsing with water and spitting out after inhalation. Long-term high doses increase the risk of systemic side-effects such as osteoporosis, cataract and glaucoma.

#### ICS in combination with a long-acting beta<sub>2</sub>-agonist bronchodilator (ICS-LABA)

*Medications:* Beclometasone-formoterol, budesonide-formoterol, fluticasone furoate-vilanterol, fluticasone propionate formoterol, fluticasone propionate-salmeterol, mometasone-formoterol and mometasone-indacaterol. *Devices:* pMDIs or DPIs

*Action and use:* When a low-dose of ICS alone fails to achieve good control of asthma, the addition of LABA to maintenance ICS improves symptoms, lung function and reduces exacerbations in more patients, more rapidly, than doubling the dose of ICS. Two regimens are available: low-dose combination beclometasone or budesonide with low-dose formoterol for both maintenance and reliever treatment (MART, GINA Track 1), and maintenance ICS-LABA with SABA or ICS-SABA as reliever (Track 2). MART with low-dose ICS-formoterol reliever is preferred as it reduces exacerbations compared with conventional maintenance therapy with SABA as reliever, and is a simpler regimen. (See section on anti-inflammatory relievers below for as-needed ICS-formoterol in mild asthma; and section on add-on medications for ICS-LABA-LAMA).

*Adverse effects:* The LABA component may be associated with tachycardia, headache or cramps. LABA is safe for asthma when used in combination with ICS. LABA should not be used without ICS in asthma (or in patients with asthma+COPD) due to increased risk of serious adverse outcomes.

#### Leukotriene modifiers (leukotriene receptor antagonists, LTRA)

*Medications:* tablets, e.g. montelukast, pranlukast, zafirlukast, zileuton.

*Action and use:* Target one part of the inflammatory pathway in asthma. Sometimes used as an option for maintenance therapy, mainly only in children. When used alone: less effective than low-dose ICS. When added to ICS: less effective than ICS-LABA.

*Adverse effects:* Few in placebo-controlled studies except elevated liver function tests with zileuton and zafirlukast. FDA boxed warning for montelukast about risk of serious behaviour and mood changes including in children; should be discussed with patients/parents.

## ADD-ON MAINTENANCE MEDICATIONS

**Long-acting muscarinic antagonists (LAMA)** (check your local eligibility criteria)

*Medications:* Tiotropium, ≥6 years, by mist inhaler, added to ICS-LABA. Combination ICS-LABA-LAMA inhalers for adults ≥18 years: beclometasone-formoterol-glycopyrronium; fluticasone furoate-vilanterol-umeclidinium; mometasone-indacaterol-glycopyrronium. *Devices:* pMDIs or DPIs or mist inhalers.

*Action and use:* An add-on option at Step 5 (or, non-preferred, at Step 4) in combination or separate inhalers for patients with uncontrolled asthma despite ICS-LABA. Modestly improves lung function but not symptoms or quality of life; small reduction in exacerbations. For patients with exacerbations, ensure that ICS is increased to at least medium dose before considering need for add-on LAMA.

*Adverse effects:* Uncommon, but include dry mouth, urinary retention.

**Anti-IgE** (check your local eligibility criteria)

*Medications:* Omalizumab, ≥6 years, subcutaneous (SC) injection

*Action and use:* An add-on option for patients with severe allergic asthma uncontrolled on high-dose ICS-LABA. May also be indicated for nasal polyps and chronic spontaneous (idiopathic) urticaria. Self-administration may be an option.

*Adverse effects:* Reactions at the site of injection are common but minor. Anaphylaxis is rare.

**Anti-IL5 and anti-IL5R** (check your local eligibility criteria)

*Medications:* Anti-IL5: mepolizumab (≥6 years, SC injection) or reslizumab (≥18 years, intravenous infusion). Anti-IL5 receptor benralizumab (≥12 years, SC injection).

*Action and use:* Add-on options for patients with severe eosinophilic asthma uncontrolled on high-dose ICS-LABA. Maintenance OCS dose can be significantly reduced with benralizumab and mepolizumab. Mepolizumab may also be indicated for eosinophilic granulomatosis with polyangiitis (EGPA), hypereosinophilic syndrome or chronic rhinosinusitis with nasal polyposis. For mepolizumab and benralizumab, self-administration may be an option.

*Adverse effects:* Headache, and reactions at injection site are common but minor.

**Anti-IL4Rα** (check your local eligibility criteria)

*Medications:* Anti-interleukin 4 receptor alpha: dupilumab, ≥6 years, SC injection

*Action and use:* An add-on option for patients with severe eosinophilic or Type 2 asthma uncontrolled on high-dose ICS-LABA, or patients requiring maintenance OCS. Not advised for patients with current or historical blood eosinophils ≥1500/μl. May also be indicated for treatment of skin conditions including moderate-severe atopic dermatitis, chronic rhinosinusitis with nasal polyps, and eosinophilic esophagitis. Self-administration may be an option.

*Adverse effects:* Reactions at injection site are common but minor. Transient blood eosinophilia occurs in 4–13% of patients. Rarely, cases of eosinophilic granulomatosis with polyangiitis (EGPA) may occur.

**Anti-TSLP** (check your local eligibility criteria)

*Medications:* Tezepelumab, SC injection, ≥12 years

*Action and use:* An add-on option for patients with severe asthma uncontrolled on high-dose ICS-LABA. In patients taking maintenance OCS, no significant reduction in OCS dose compared with placebo.

*Adverse effects:* Injection-site reactions; anaphylaxis is rare; adverse events generally similar between active and placebo groups.

### Systemic corticosteroids

*Medications:* include prednisone, prednisolone, methylprednisolone, hydrocortisone tablets, dexamethasone. Given by tablets or suspension or by IM or IV injection

*Action and use:* Short-term treatment (usually 5–7 days in adults) is important in the treatment of severe acute exacerbations, with main effects seen after 4–6 hours. For acute severe exacerbations, OCS therapy is preferred to IM or IV therapy and is effective in preventing short-term relapse. Tapering is required if OCS given for more than 2 weeks. Patients should be reviewed after any exacerbation, to optimize their inhaled therapy in order to reduce the risk of future exacerbations.

As a last resort, long-term treatment with OCS may be required for some patients with severe asthma, but side-effects are problematic. Patients for whom this is considered should be referred for specialist review if available, to have treatment optimized and phenotype assessed.

*Adverse effects:* Short courses: adverse effects include sepsis, thromboembolism, sleep disturbance, reflux, appetite increase, hyperglycemia, mood changes. Even 4–5 lifetime courses increase cumulative risk of long-term adverse effects e.g. diabetes, osteoporosis, cataract, glaucoma, heart failure.

Maintenance use: consider only as last resort, because of significant adverse effects e.g. cataract, glaucoma, hypertension, diabetes, adrenal suppression osteoporosis. Assess for these risks and treat appropriately.

## ANTI-INFLAMMATORY RELIEVER MEDICATIONS

### Low-dose combination ICS-formoterol

*Medications:* Beclometasone-formoterol or budesonide-formoterol. pMDIs or DPIs

*Action and use:* This is the reliever inhaler for GINA Track 1, for patients prescribed maintenance and reliever therapy (MART) with ICS-formoterol in Steps 3-5, or for patients prescribed as-needed-only ICS-formoterol in Steps 1-2. In both settings, it reduces the risk of severe exacerbations compared with using SABA as reliever, with similar symptom control. In patients with mild asthma, as-needed-only ICS-formoterol reduces emergency visits/hospitalizations, compared with daily ICS plus as-needed SABA. Low-dose ICS-formoterol can be taken before exercise to reduce exercise-induced bronchoconstriction, and it can be taken before or during allergen exposure to reduce allergic responses.

*Recommended maximum doses in any day:* The maximum total dose recommended in a single day (maintenance plus reliever doses) for beclometasone-formoterol is 48 mcg formoterol (delivered dose 36 mcg), and for budesonide-formoterol, 72 mcg

formoterol (delivered dose 54 mcg) in adolescents and adults, and 48 mcg (delivered dose 36 mcg) in children 6–11 years prescribed MART.

*Adverse effects:* As for ICS-formoterol above.

### Low-dose combination ICS-SABA

*Medications:* Budesonide-salbutamol (also described as albuterol-budesonide); beclometasone-salbutamol. *Device:* pMDI

*Action and use:* Anti-inflammatory reliever therapy option for GINA Track 2. Budesonide-salbutamol 100/100 mcg (delivered dose 80/90 mcg) taken 2 inhalations as needed for symptom relief on top of maintenance ICS or ICS-LABA reduced the risk of severe exacerbations in adults compared with SABA reliever; most benefit seen in Step 3. Cannot be used for maintenance and reliever therapy. No evidence for as-needed-only use of budesonide-salbutamol in Steps 1–2.

*Recommended maximum doses in any day:* budesonide-salbutamol 100/100 mcg, maximum 6 doses each of 2 inhalations in any day.

*Adverse effects:* As for ICS and SABA.

## SHORT-ACTING BRONCHODILATOR RELIEVER MEDICATIONS

### Short-acting inhaled beta<sub>2</sub>-agonist bronchodilators (SABA)

*Medications:* e.g. salbutamol (albuterol), terbutaline. Administered by pMDIs, DPIs and, rarely, as solution for nebulization or injection

*Action and use:* Inhaled SABAs provide quick relief of asthma symptoms and bronchoconstriction, and for pre-treatment before exercise. SABAs should be used only as-needed (not regularly) and at the lowest dose and frequency required. SABA-only treatment is not recommended because of the risk of severe exacerbations and asthma-related death. Currently, inhaled SABAs are the most commonly used bronchodilator for acute exacerbations requiring urgent primary care visit or ED presentation.

*Adverse effects:* Tremor and tachycardia are commonly reported with initial use of SABA. Tolerance develops rapidly with even 1–2 weeks of regular use, with increased airway hyperresponsiveness, reduced bronchodilator effect, and increased airway inflammation. Excess use, or poor response indicate poor asthma control and risk of exacerbations. Dispensing of 3 or more 200-dose canisters per year is associated with increased risk of exacerbations, and dispensing of 12 or more canisters per year is associated with markedly increased risk of death.

### Short-acting anticholinergics

*Medications:* e.g. ipratropium bromide, oxitropium bromide. May be in combination with SABAs. pMDIs or DPIs.

*Action and use:* As-needed use: ipratropium is a less effective reliever medication than SABAs, with slower onset of action. Short-term use in severe acute asthma, where adding ipratropium to SABA reduces the risk of hospital admission.

*Adverse effects:* Dryness of the mouth or a bitter taste.

## Box 12: Medications and doses for GINA Track 1 with ICS-formoterol

Age (years)	Medication and device	Metered (mcg)	Delivered (mcg)	Suggested dosage
<b>STEP 1–2 (AIR-only)</b>				
6–11	(No evidence)	-	-	(No evidence)
12–17 ≥18	BUD-formoterol DPI	200/6	160/4.5	1 inhalation whenever needed*
<b>STEP 3 (MART)</b>				
6–11	BUD-formoterol DPI	100/6	80/4.5	1 inhalation once daily, PLUS 1 inhalation whenever needed*
12–17 ≥18	BUD-formoterol DPI	200/6	160/4.5	1 inhalation once or twice daily, PLUS 1 inhalation whenever needed*
≥18	BDP-formoterol pMDI	100/6	84.5/5.0	1 inhalation once or twice daily, PLUS 1 inhalation whenever needed
<b>STEP 4 (MART)</b>				
6–11	BUD-formoterol DPI	100/6	80/4.5	1 inhalation twice daily, PLUS 1 inhalation whenever needed*
12–17 ≥18	BUD-formoterol DPI	200/6	160/4.5	2 inhalations twice daily, PLUS 1 inhalation whenever needed*
≥18	BDP-formoterol pMDI	100/6	84.5/5.0	2 inhalations twice daily, PLUS 1 inhalation whenever needed
<b>STEP 5 (MART)</b>				
6–11	(No evidence)	-	-	(No evidence)
12–17 ≥18	BUD-formoterol DPI	200/6	160/4.5	2 inhalations twice daily, PLUS 1 inhalation whenever needed*
≥18	BDP-formoterol pMDI	100/6	84.5/5.0	2 inhalations twice daily PLUS 1 inhalation whenever needed

**Always check that the patient can use the inhaler correctly.**

BDP: beclomethasone dipropionate; BUD: budesonide; DPI: dry powder inhaler; pMDI: pressurized metered dose inhaler. \*For budesonide-formoterol pMDIs with 3 mcg formoterol (delivered dose 2.25 mcg), use double the number of inhalations.

### How much ICS-formoterol can be taken in any day, if needed?

The maximum **total** number of inhalations of ICS-formoterol that can be taken in any day (total of as-needed plus maintenance doses, if used) are:

#### *Budesonide-formoterol*

- Adults and adolescents: 12 inhalations of 200/6 mcg (160/4.5)
- Children 6-11 years: 8 inhalations of 100/6 mcg (80/4.5)

For budesonide-formoterol pMDIs with 3 mcg formoterol (delivered dose 2.25 mcg), use double the above number of inhalations.

#### *Beclomethasone-formoterol*

- Adults: 8 inhalations of 100/6 mcg (delivered dose 84.5/5.0)

**Most patients need far less than this.**

## ACKNOWLEDGEMENTS

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## ADDITIONAL GINA RESOURCES

- **Global Strategy for Asthma Management and Prevention** (updated 2023). This report provides an integrated approach to asthma that can be adapted for a wide range of health systems. The report has a user-friendly format with many practical summary tables and flow-charts for use in clinical practice. It is updated yearly.
- **Difficult-to-treat & severe asthma in adolescent and adult patients. Diagnosis and Management. A short GINA Guide for Health Professionals V4.0, 2023.** This short guide includes a decision tree about how to assess and manage patients presenting with uncontrolled asthma despite medium- or high-dose ICS-LABA. Content of this guide is included in the full 2023 GINA report.
- **COVID-19 and asthma:** This slide set provides practical advice about asthma and COVID-19. It is updated as new information is available.

**GINA publications and other resources are available from**  
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