SPECIAL REPORT

Management of asthma exacerbation in adults: guidelines for primary care doctors

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* KJ is a representative of patients with asthma.

Introduction Asthma affects about 5% of the Polish adult population and despite modern treatments, exacerbations still affect a significant percentage of patients. In order to improve treatment efficacy of asthma exacerbations in Poland, we decided to adapt the established international guidelines on the management of asthma exacerbations to match the reality of the Polish healthcare system. The adaptation process was guided by the ADAPTE Collaboration toolkit.[1] The key stages included: determining health questions, searching for guidelines and other relevant documents followed by assessment of their quality, selecting the best guidelines and recommendations to create an adapted guideline.[1,2] Global Initiative for Asthma (GINA) Guidelines (www.ginasthma.org) were selected as the source document and relevant recommendations concerning asthma exacerbations were adopted and customized to match local conditions in Poland.[3] This document was endorsed by the Country Consultant in Family Medicine and College of Family Physicians in Poland. The current guidelines apply to adults with asthma.

The aim of the guidelines on the management of asthma exacerbations in adults is to improve the safety of patients by ensuring appropriate prevention of exacerbations and appropriate treatment.

Target audience of the guidelines The document is intended primarily for general practitioners (primary care physicians), general practice registrars, and general internal medicine registrars. However, the information provided in the guidelines may also be useful to healthcare managers and representatives of healthcare financing institutions and institutions responsible for the healthcare system structure.

Implementation considerations The current guidelines should not be seen as a legal standard of care for all patients. Instead, it provides some general management principles, which can aid clinical decision-making. Appropriate patient care options are always determined based on clinical situation and availability of treatments. All clinical decisions should always be consulted with the patient or their carer (if the patient lacks capacity).

Strength of recommendations The GINA Science Committee decided not to specify the strength of recommendations in their report, grading the quality of evidence supporting each recommendation instead. Similarly, the current guidelines provide the quality of evidence grade (see TABLE 1) supporting each recommendation only if the original document provided such information.[3] Otherwise, the Polish adaptation does not provide the quality of evidence grade.

TABLE 1 Description of evidence (quality) levels used in the reports of the Global Initiative for Asthma

Evidence level	Source(s) of evidence	Definition
A	RCTs and meta-analyses; rich body of data	Evidence is from endpoints of well-designed RCTs or meta-analyses that provide a consistent pattern of findings in the population for which the recommendation is made. Category A requires substantial numbers of studies involving substantial numbers of participants.
B	RCTs and meta-analyses; limited body of data	Evidence is from endpoints of intervention studies that include only a limited number of patients, post-hoc or subgroup analysis of RCTs or meta-analysis of such RCTs. Category B pertains when few randomized trials exist, they are small in size, they were undertaken in a population that differs from the target population of the recommendation, or the results are somewhat inconsistent.
C	Nonrandomized trials; observational studies	Evidence is from endpoints of uncontrolled or nonrandomized trials, or from observational studies.
D	Panel consensus judgement	This category is used only in cases where the provision of some guidance was deemed valuable but the clinical literature addressing the subject was insufficient to justify placement in one of the other categories. The panel consensus is based on clinical experience or knowledge that does not meet the above criteria.

Abbreviations: RCT, randomized clinical trial

Definition and epidemiology of asthma exacerbations

Exacerbations of asthma are episodes characterized by worsening in symptoms (dyspnea, cough, wheeze, and chest tightness), which represent a change from the patient's usual status that is sufficient to require a change in treatment. The status asthmaticus (acute severe asthma, J46 according to the *International Classification of Diseases, Tenth Revision*) is defined as an episode of severe, life-threatening exacerbation of asthma.

The epidemiologic data is limited. In 2010, an estimated 8.2% of adults from the United States had current asthma, and approximately 50% of those had had an asthma attack in the past year.[4]

Risk factors for asthma exacerbations

The key aspect in preventing asthma exacerbations is the awareness of risk factors, which include[5-9]:

1 Uncontrolled asthma symptoms (the key risk factor)

2 High use of short-acting β_2-agonist (SABA), which indicates uncontrolled asthma symptoms; mortality increased if one 200-dose canister is used per month

3 Inadequate use of inhaled corticosteroids (ICSs), nonadherence, poor inhaler technique

4 Low forced expiratory volume in 1 second (FEV_1), especially if less than 60% predicted

5 Excessive (>10%) variability of peak expiratory flow (PEF); daily diurnal PEF variability should be calculated using the following formula: [PEFmax – PEFmin] / PEFmean; and averaged over 1 week.

6 Major psychological or socioeconomic problems

7 Exposures: smoking, allergen exposure if sensitized

8 Comorbidities: obesity, rhinosinusitis, confirmed food allergy

9 Sputum or blood eosinophilia, elevated fractional exhaled nitric oxide (in adults on long-term ICS)

10 Pregnancy

11 Ever intubated or in intensive care unit for asthma

12 One or more severe exacerbation in last 12 months

Items 1 to 9 are considered modifiable risk factors.

Clinical presentation: diagnosing exacerbations

Asthma exacerbation manifests as an increased severity of dyspnea, cough, wheeze, and chest tightness that exceeds usual day-to-day variability.[10] The symptoms are usually accompanied by a decline in lung function (decreased PEF or FEV_1) compared with the patient's previous lung function or predicted values (or maximum values for that patient). Lung function measurements enable objective assessment of exacerbation severity. Some patients (more often men or those with near-fatal asthma) may perceive symptoms poorly. The asthma control test is not a reliable tool to make a diagnosis of exacerbation.

Exacerbations usually occur in response to: exposure to an external agent (eg, viral upper respiratory tract infection, pollen, or pollution) and/or poor adherence with controller medication.[11] Some patients present more acutely and without exposure to known risk factors. Severe exacerbation can occur in patients with mild or well-controlled asthma.

History and physical examination

The history taken from a patient with asthma exacerbation (or their next of kin in patients with severe exacerbation) should ascertain the following:

- Duration of exacerbation
- Potential causes if known (eg, allergen exposure or viral respiratory tract infection)
- Severity of asthma symptoms
- Presence and severity of other symptoms, in particular anaphylaxis

TABLE 2 Factors that increase the risk of exacerbations and asthma-related death

- History of asthma exacerbation requiring intubation and mechanical ventilation
- Hospitalization or emergency care (emergency department) visit for asthma exacerbation in the past year
- Current or recent use of oral CS
- Not currently using ICS
- Overuse of SABA (using >1 × 200-dose canister/mo is a red flag)
- History of psychiatric disease and/or psychosocial problems
- Poor adherence to asthma medications or poor adherence to (or lack of) a written asthma action plan
- Symptoms of food allergy

Abbreviations: CS, corticosteroid; ICS, inhaled corticosteroid; SABA, short-acting β_2-agonist

TABLE 3 Asthma exacerbation severity assessment criteria according to the Global Initiative for Asthma 2018[3]

Parameter	Exacerbation severity		
	Mild/moderate	Severe	Life-threatening
Dyspnea/body position	Sits upright	Sits hunched forwards	Sits hunched forwards
Speech	Talks in phrases	Talks in words	Talks in words
Level of consciousness	Normal	Agitated	Drowsy, confused
Respiratory rate	Increased but ≤30 breaths/min	>30 breaths/min	>30 breaths/min
Accessory muscles in use	No	Yes	Paradoxical breathing
Heart rate	100–120 bpm	>120 bpm	>120 bpm or bradycardia
PEF, % predicted	>50%	≤50%	optionally
SpO_2 (on air)	90%–95%	<90%	<90%

Abbreviations: PEF, peak expiratory flow; SpO_2, peripheral capillary oxygen saturation

- Risk factors for exacerbations and asthma-related death (see TABLE 2)
- All current medications, including doses and devices prescribed, adherence pattern, any recent dose changes and response to current therapy

The physical examination of a patient with asthma exacerbation should assess[12,13]:

- Vital signs: level of consciousness, temperature, heart rate, respiratory rate, blood pressure
- Signs of bronchoconstriction (prolonged expiration, wheezing, rhonchi) and other abnormal findings of chest assessment (suggesting alternative conditions which may explain worsened patient's status, eg, pneumonia, pneumothorax, or heart failure)
- Additional findings, which facilitate objective assessment of exacerbation severity, such as ability to complete sentences or utter words, which may be impaired due to dyspnea, and use of accessory muscles
- Nonrespiratory signs suggesting alternative explanations of acute breathlessness (eg, stridor, rash, lower extremity edema)

The sensitivity of assessment based only on history and physical examination is limited, as symptom severity may not always accurately reflect the degree of bronchoconstriction in some patients.

Additional investigations The following tests should be performed in a patient with asthma exacerbation in a primary care setting.

Peak expiratory flow measurement or spirometry Lung function tests (PEF and spirometry) are intended for the assessment of exacerbation severity and treatment efficacy.[14] They facilitate the decision to send patient home (eg, with PEF >60%–80% of predicted or personal best). In patients with asthma exacerbation, current PEF or FEV_1 values should be compared with previous measurements (if available) and with predicted or personal best values.

Lung function tests enable more objective, reliable assessment of exacerbation severity than clinical presentation.

Comment: Lung function tests should not be performed in patients who present with signs of severe exacerbation (see TABLE 3). PEF measurement can be preferred as easier and less demanding of a patient, except for the mildest cases, in which accurate lung function assessment may affect subsequent management.

Pulse oximetry Pulse oximetry facilitates assessing exacerbation severity.[15] Saturation levels (SpO_2) of less than 90% signal the need for aggressive therapy. Pulse oximetry is useful for titrating oxygen therapy (target SpO_2 is 93%–95%) as well as for reviewing the response and the possibility to send the patient home (whereby SpO_2 of >94% when on air is required).

Assessing the severity of exacerbation Assessment of exacerbation severity should be based

on the degree of dyspnea, respiratory rate, heart rate, SpO_2, and PEF (or FEV_1). See TABLE 3.

Criteria for hospitalization The decision about hospitalization should be based on:

- Clinical status
- Lung function
- Response to treatment
- Recent and past history of exacerbations
- Ability to manage at home

Patients with severe or life-threatening exacerbation should be immediately transferred to the hospital. Whilst awaiting the transfer, the treatment outlined below should be initiated.

Comment: The decision to admit or discharge should be based on the clinical status (including the ability to lie flat) and lung function 1 hour after commencement of treatment rather than the patient's status on arrival.

The risk factors mentioned below should be considered to inform the decision to admit or discharge[16]:

- Female sex, older age, and nonwhite race
- Use of more than eight SABA puffs in the previous 24 hours
- Cardiopulmonary resuscitation or other emergency medical intervention at the emergency department
- Severe exacerbation (respiratory rate >30 breaths/min, oxygen saturation <90%, final PEF <50% predicted)
- Past history of severe exacerbations (eg, intubation)
- Previous unscheduled office and emergency department visits requiring use of oral CS.

Patients who are at risk of severe exacerbation and asthma-related death require prompt medical intervention and close monitoring (see TABLE 2).

Management of asthma exacerbation **Management of mild/moderate asthma exacerbation** Patients with mild/moderate asthma exacerbation can be managed by a general practitioner in a primary care setting. They should remain in the primary care facility for at least 1 hour after initial treatment. If there is an improvement in vital signs and PEF (>60%–80% of predicted or personal best), the patient does not need SABA, and has SpO_2 >94% when on air, they can be sent home after arranging follow-up visits.

Comment: Maintenance controller treatment with ICS at the dose 2- to 4-fold higher than the usual dose should be continued for 10 to 14 days.[17] With OCS, the maintenance treatment should be continued for 5 to 7 days.

Short-acting β_2-agonist Treatment of asthma exacerbation should start with SABA. It can be delivered by a pressurized metered-dose inhaler (pMDI) with a spacer or by a nebulizer.[18,19] The efficacy of both is comparable in patients with mild/moderate exacerbation (level of evidence, A). No additional SABA is needed if there is a good (PEF >60%–80% of predicted or personal best), long-lasting (3–4 hours) response to initial treatment.

Dosage with pMDI with a spacer should be 4 to 10 puffs repeated every 20 minutes for 1 hour. After the first hour, depending on the response, the dose of SABA required varies from 4 to 10 puffs every 3 to 4 hours up to 6 to 10 puffs every 1 to 2 hours (or more often if needed). No additional SABA is needed if there is a good response to initial treatment (eg, PEF >60%–80% of predicted or personal best for 3–4 hours).

Dosage with nebulizer should be 2.5 to 5 mg of salbutamol, with the dose depending on the severity of exacerbation. A single dose of 2.5 to 5 mg administered over 30 minutes is usually sufficient. If needed, it can be repeated up to 4 times a day. Higher doses, up to 40 mg, can only be used in an inpatient setting.

Drugs available in Poland are: fenoterol (pMDI 100 μg per puff), salbutamol (pMDI and DPI 100 μg per puff and 200 μg per puff, nebulizer solution 2.5 g/2.5 ml and 5 mg/2.5 ml, respectively).

Oxygen therapy Oxygen therapy should be used, if available, and titrated to maintain SpO_2 at 93% to 95%.[20,21] Such modality gives better clinical outcomes and is safer than high-flow 100% oxygen therapy (level of evidence, B). The unavailability of pulse oximeter is not a contraindication for oxygen therapy.

Oral corticosteroids Oral corticosteroids (OCSs) should be used in all patients, except for those with mildest exacerbations, especially if they fail to respond to an increase in reliever and controller medications after 2 to 3 days, deteriorate rapidly, have PEF or FEV_1 of less than 60% of their personal best or predicted value, or have a history of sudden severe exacerbations.

Prompt administration of systemic corticosteroids (oral or intravenous) improves clinical outcomes in patients with asthma exacerbation.[22] Systemic corticosteroids should be administered within 1 hour of presentation,[23] followed by a 5- to 7-day course with once a day (a.m.) administration (level of evidence, B). Oral administration is as effective as intravenous. Systemic corticosteroids enhance resolution of exacerbations and prevent relapse.

Dosage of prednisolone should be 1 mg/kg/d (maximum dose is 50 mg/d) or an equivalent dose of another OCS.

Drugs that are available in Poland are as follows: prednisone (tablets 1, 5, 10, and 20 mg), prednisolone (tablets 5 mg), methylprednisolone (tablets 4, 8, and 16 mg), triamcinolone (tablets 4 mg).

Management of severe asthma exacerbation Patients presenting with life-threatening asthma exacerbation/impaired consciousness should be transferred to the emergency department by the Advanced Life Support ambulance (the "S" category ambulance in Poland). In the remaining cases,

the Basic Life Support ambulance (the "P" category ambulance in Poland) is appropriate.

Short-acting bronchodilator Short-activng bronchodilators are best administered via an oxygen-powered nebulizer. If a nebulizer is not available, a pMDI with a spacer is the preferred delivery method.

Dosage of SABA should be 2.5 to 5 mg of salbutamol via a nebulizer (consider continuous nebulization at 10 mg/h or up to 10 doses administered every 20 minutes via a pMDI + spacer).

Dosage of short-acting muscarinic antagonist should be 0.5 to 0.75 mg of ipratropium bromide via a nebulizer or up to 10 doses administered via a pMDI with a spacer.

Ipratropium (pMDI 20 μg per puff, nebulizer solution 0.25 mg/ml) is available in Poland.

Oxygen therapy Oxygen therapy should be titrated to maintain SpO_2 at 93% to 95%.[21]

Systemic corticosteroids Systemic corticosteroids, oral or intravenous (comparable efficacy), should be administered within the first hour of treatment, dosage as in mild / moderate exacerbation.[23]

Management of exacerbations in patients with asthma–chronic obstructive pulmonary disease overlap The treatment should be in line with the guidance for the management of asthma and chronic obstructive pulmonary disease, including systemic corticosteroids administered shortly after presentation, stepped up inhaled bronchodilators (both SABA and short-acting muscarinic antagonist should be used; dosage, as above), controlled oxygen therapy, and antibiotics (if indicated).

Adverse effects of drugs used for the management of asthma exacerbations Although drugs used for the management of asthma hardly give systemic adverse effects, the risk of adverse effects increases with higher doses of medications administered to patients with exacerbations.

Comment: Hypoxemia, which may occur in patients with asthma exacerbation, may increase the risk of adverse effects of β_2-agonists. The most common adverse effects of β_2-agonists include: tachycardia and less often other arrhythmias (ectopic beats, atrial fibrillation); skeletal muscle tremor; hypokalemia; hyperglycemia.

Their presence and severity depend on the dose of a medication and the degree of hypoxemia. Therefore, high doses of β_2-agonists necessary to produce optimum bronchodilation should be used alongside oxygen therapy and corticosteroids, which can reduce the risk of adverse effects. The need to administer corticosteroids is likely to be overlooked due to the short-term bronchodilation effect of β_2-agonists, which may mask the severity of exacerbation.

Medications not to be routinely used in the management of asthma exacerbation Medications that should not be routinely used in the management of asthma exacerbation include:

- Theophylline (due to low efficacy and high risk of adverse effects)[25]
- Antibiotics (unless there is a bacterial lower respiratory tract infection or pneumonia)
- Sedatives (contraindicated in asthma exacerbation)
- Adrenaline (except for patients whose bronchoconstriction is secondary to anaphylaxis)

Assessing treatment response in patients with asthma exacerbation The following should be monitored in patients with asthma exacerbation as a part of treatment response assessment: level of consciousness, respiratory rate, heart rate, SpO_2, severity of dyspnea and other signs of exacerbation.

The patients should be periodically followed-up for the presence and severity of signs of exacerbation and changes in lung function (PEF measurement 1 hour after treatment commencement or earlier).

Patients with little or slow response to SABA treatment should be closely monitored.

Additional treatment should continue until PEF reaches a plateau or (ideally) returns to the patient's previous best.

Patients who fail to respond to treatment or who continue to deteriorate should be transferred immediately to an acute care facility.

Follow-up after asthma exacerbation In patients in whom a good control of exacerbation was achieved in a primary-care setting, a follow-up appointment should be arranged about 2 to 7 days later (level of evidence, D).

Once symptom control has been achieved, adherence should be assessed, and maintenance treatment planned.[26] Maintenance treatment should include initiation or stepping up the controller for 2 to 4 weeks or 2 to 3 months, depending on the cause of exacerbation). Most patients not currently taking controller medication should usually be commenced on regular ICS-containing therapy, as an exacerbation requiring medical care indicates that the patient is at increased risk of future exacerbations (level of evidence, B).

Individualized asthma action plan All patients should be provided with a written, individualized asthma action plan that includes current therapies and is appropriate for the patient's education and understanding.[27] The asthma action plan enables the patient to self-manage and respond appropriately to worsening symptoms of exacerbation and / or changes in PEF, providing guidance as to changes in reliever and controller medications, how to use OCSs, and when and how to access medical care (general practice / ambulance).[28]

After a self-managed exacerbation, patients should see their primary care healthcare provider within 1 to 2 weeks to assess symptom control and additional risk factors for exacerbations, and

TABLE 4 Treatment modifications in adults with worsening asthma to be used in a written asthma action plan

Medications	Short-term change (1–2 weeks) for worsening asthma	Level of evidence
Increase usual reliever		
SABA	For pMDI, add spacer	A
Low-dose ICS/formoterol	Increase formoterol as needed up to the maximum of 72 μg/d	A
Usual controller, step-up treatment		
Maintenance and reliever ICS/formoterol	Continue maintenance ICS/formoterol and increase ICS/formoterol reliever (maximum formoterol total 72 μg/d)	A
Maintenance ICS + SABA as reliever	At least double ICS, consider increasing ICS to high dose (to maximum total of 2000 μg/d BDP equivalent)	B
Maintenance ICS/formoterol + SABA as reliever	Quadruple maintenance ICS/formoterol (maximum formoterol 72 μg/d)	B
Maintenance ICS/other LABA + SABA as reliever	Step up to higher dose formulation of ICS/other LABA or consider adding a separate ICS inhaler (to maximum total of 2000 μg/d BDP equivalent)	D
OCS (prednisone or prednisolone)	Add OCS in severe exacerbations (PEF or FEV_1 <60% personal best or predicted) or patient not responding to treatment over 48 hours	A
	Prednisolone 1 mg/kg/d (maximum 50 mg), usually for 5–7 d	D
	Tapering is not needed if a short-term (<2 weeks) OCS course is prescribed	B

Abbreviations: BDP, beclometasone dipropionate; FEV_1, forced expiratory volume in 1 second; LABA, long-acting β_2-agonist; OCS, oral corticosteroid; PEF, peak expiratory flow; pMDI, pressurized metered-dose inhaler; others, see TABLE 2

to identify the potential cause of the exacerbation. Patients should contact their doctor if they start taking OCS.

During the follow-up appointment after a self-managed exacerbation, the written asthma action plan should be reviewed to see whether an update is needed.

Possible options for treatment modification as a part of self-management of asthma exacerbations are presented in TABLE 4.

Treatment modifications as part of self-management of exacerbations **Short-acting β_2-agonist** Repeated dosing with inhaled SABA bronchodilators provides temporary relief until the cause of the symptom worsening passes or treatment with an increased-dose controller has had time to take effect. SABA should be delivered via pMDI with a spacer or via a nebulizer. The need for repeated doses over more than 1 to 2 days signals the need to review, and possibly increase, controller treatment.

Rapid-onset long-acting β_2-agonists (formoterol) The use of the rapid-onset long-acting β_2-agonist, formoterol, in a separate inhaler is not recommended in order to avoid the possibility of it being used without the concomitant ICS.

Inhaled corticosteroids At least doubling the ICS dose as a part of asthma action plan–based self-management of exacerbation improves asthma outcomes and reduces healthcare utilization. Quadrupling the ICS dose (to an average of 2000 μg/d beclometasone dipropionate equivalent) in response to a decrease in PEF limits the need for OCS.[29]

In patients with an acute deterioration, high-dose ICS for 7 to 14 days (500–1600 μg beclometasone dipropionate equivalent) is as effective as a short course of OCS (level of evidence, A).

Combination inhaled corticosteroids with long-acting β_2-agonist The combination of rapid-onset long-acting β_2-agonist (formoterol) and low-dose ICS (budesonide or beclomethasone) in a single inhaler as both the controller and the reliever medication is effective in improving asthma control and reduces exacerbations requiring OCS and hospitalizations. The maximum total formoterol dose is 72 μg/d.[30]

The ICS dose may be further increased by adding a separate ICS inhaler.

Patient education Patients after exacerbations are more likely to implement behavioral changes. They should be referred to an asthma education program, if one is available.[31] It is particularly true for patients discharged following an emergency department presentation or hospitalization for asthma. Patients who were hospitalized may be particularly receptive to information and advice about their illness.

An educational program should contain in particular:

- Training aiming at effective use of inhaler devices (up to 70%–80% of patients are unable to use their inhaler correctly—poor inhaler technique leads to poor asthma control)
- Encouraging adherence (up to 50% of patients fail to take medications as directed at least part of the time)

TABLE 5 Treating modifiable risk factors to reduce exacerbations

Patient group/risk factor	Treatment strategy	Level of evidence[a]
Any patient with ≥1 risk factor for exacerbations (including poor symptom control)	Regular use of ICS	A
	A written action plan for the management of asthma	A
	More frequent reviews	A
	Regular control of inhaler technique	A
	Identification of modifiable risk factors	D
≥1 severe exacerbation in last year	Consider alternative controller regimens to reduce exacerbation risk, eg, ICS/formoterol maintenance and reliever regimen	A
	Consider stepping up treatment if no modifiable risk factors	A
	Identify any avoidable triggers for exacerbations	C
Exposure to tobacco smoke	Encourage smoking cessation	A
	Consider higher dose of ICS if asthma poorly-controlled	B
Low FEV_1, especially if <60% predicted	Consider trial of 3-month treatment with high-dose ICS or 2-week treatment with OCS	B
	Exclude other lung disease, eg, COPD	D
	Refer for expert advice if no improvement	D
Obesity	Suggest weight loss	B
	Distinguish asthma symptoms from symptoms due to restrictive lung diseases and/or obstructive sleep apnea	D
Major psychological problems	Consider mental health assessment	D
	Help patient to distinguish between symptoms of anxiety and asthma; educate the patient how to manage panic attacks	D
Major socioeconomic problems	Offer less expensive medications	D
Confirmed food allergy	Advise appropriate food avoidance and remind the patient to have injectable epinephrine on them at all times[b]	A
Allergen exposure if sensitized	Consider possibility of reducing allergen exposure (consider cost)	C
	Consider stepping up of controller treatment	D
	Consider adding allergy immunotherapy, which is effective, but is associated with a risk of serious systemic adverse effects when administered subcutaneously	A
Sputum eosinophilia	Increase ICS dose independent of level of symptom control	A

a Level of evidence in the table applies to the efficacy of a given treatment in the management of asthma (assessed by means of different endpoints) rather than risk reduction in patients after exacerbations.

b Comment: The patient and their next of kin should be provided with detailed, preferably written, instructions for how and when to use the prescribed medications.

Abbreviations: COPD, chronic obstructive pulmonary disease; others, see **TABLES 2** and **4**

It should also include information regarding:

- Asthma
- The causes of asthma exacerbations and the ways to prevent them
- The actions the patient needs to take to respond to symptom worsening or a subsequent exacerbation

The strategies to reduce the risk of exacerbations are shown in **TABLE 5**.

Review and update plan The current document will be reviewed and updated as new important research data and the updated version of the GINA global strategy containing significant changes to the recommendations regarding management of asthma exacerbations become available.

ARTICLE INFORMATION

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