
POCKET GUIDE FOR ASTHMA MANAGEMENT AND PREVENTION



A Pocket Guide for Physicians and Nurses

Revised 1998

BASED ON THE GLOBAL STRATEGY FOR ASTHMA MANAGEMENT AND PREVENTION NHLBI/WHO WORKSHOP REPORT



GLOBAL INITIATIVE FOR ASTHMA



**NATIONAL HEART, LUNG,
AND BLOOD INSTITUTE**



WORLD HEALTH ORGANIZATION

GLOBAL INITIATIVE FOR ASTHMA

National Heart, Lung, and Blood Institute: Claude Lenfant, M.D.

World Health Organization: Nikolai Khaltayev, M.D.

Mohamed Bartal, M.D., Morocco
William Busse, M.D., U.S.A
Jean Bousquet, M.D., Ph.D., France
Edgardo Carrasco, M.D., Chile
Yu-Zhi Chen, M.D., China
Alexander Chuchalin, M.D., Ph.D., Russia
T.J.H. Clark, M.D., England
Ronald Dahl, M.D., Ph.D., Denmark
Leonardo M. Fabbri, M.D., Italy
Stephen T. Holgate, M.D., D.Sc., England
Prasanta Mahapatra, M.B.B.S., India
Sohei Makino, M.D., Japan
Charles K. Naspitz, M.D., Brazil
Paul O'Byrne, MD, Canada

Martyn R. Partridge, M.D., England
Romain Pauwels, M.D., Ph.D., Belgium
Soren Pederson, MD, Denmark
Albert L. Sheffer, M.D., U.S.A.
Vaclav Spicak, M.D., Czech Republic
W.C. Tan, M.D., Singapore
John Warner, MD, England
Kevin B. Weiss, M.D., U.S.A.
Ann J. Woolcock, M.D., Australia
M.N. Xaba-Mokoena, M.D., South Africa
NanShan Zhong, M.D., China

Suzanne S. Hurd, Ph.D., NHLBI
Virginia S. Taggart, M.P.H., NHLBI
Robinson Fulwood, M.S.P.H., NHLBI

TABLE OF CONTENTS

| | |
|--|-------|
| PREFACE | 2 |
| TAKING A NEW LOOK AT ASTHMA | 4 |
| DIAGNOSING ASTHMA | 6 |
| Figure 1. Key Indicators for Diagnosing Asthma. | 6 |
| Figure 2. Peak Flow Meters: Uses and Technique | 8 |
| CONTROLLING ASTHMA | 9 |
| Select Medications | 10 |
| Figure 3. Glossary of Asthma Medications | 12-13 |
| Manage Asthma Long-Term | |
| Figure 4. Treatments in the Stepwise Approach to Long-Term Management of Asthma for Adults and Children Over 5 Years Old | 14-15 |
| Figure 5. Treatments in the Stepwise Approach to Long-Term Management of Asthma for Infants and Young Children (5 Years of Age & Younger). . . | 16-17 |
| Treat Attacks | 18 |
| Figure 6. Severity of Asthma Attacks | 20 |
| Figure 7. Management of an Asthma Attack: Home Treatment . | 21 |
| Figure 8. Management of Asthma Attacks: Hospital-Based Care | 22 |
| Identify and Avoid Triggers | 23 |
| Figure 9. Common Asthma Triggers and Avoidance Strategies. | 23 |
| Educate Patients | 24 |
| Monitor and Modify Asthma Care for Effective Long-Term Control | 26 |
| Figure 10. Questions for Monitoring Asthma Care | 27 |
| Figure 11. Factors Involved in Noncompliance | 28 |

PREFACE

Asthma is a serious health problem around the world. The **Global Initiative for Asthma** was created to help health care professionals and public health officials reduce asthma prevalence, morbidity, and mortality. It prepares scientific reports on asthma management and prevention, encourages dissemination and adoption of the reports, and promotes international collaboration on asthma research.

The Global Strategy for Asthma Management and Prevention Workshop is a joint effort of the National Heart, Lung, and Blood Institute and the World Health Organization. Publications include:

- *Global Strategy for Asthma Management and Prevention, NHLBI/WHO Workshop Report*, scientific information and recommendations for asthma programs
- *Asthma Management and Prevention: A Practical Guide for Public Health Officials and Health Care Professionals*, highlights from the workshop report
- *Pocket Guide for Asthma Management and Prevention*, a summary of patient care information for primary health care professionals
- *What You and Your Family Can Do About Asthma*, a patient information booklet.

These publications are available from the National Institutes of Health, National Heart, Lung, and Blood Institute, Bethesda, Maryland, USA 20892, and the Global Initiative for Asthma Secretariate, Department of Respiratory Diseases, University Hospital, Ghent, Belgium, and the internet (<http://www.ginasthma.com>).

This Pocket Guide has been condensed from the *Global Strategy for Asthma Management and Prevention, NHLBI/WHO Workshop Report*. Technical discussions of asthma, asthma management, and specific citations from the scientific literature are included in the complete report.

In January and September 1998, the Global Initiative for Asthma Executive Committee reviewed the Pocket Guide to assure that the recommendations for asthma management continue to reflect the current scientific literature. Revisions were agreed upon by the Executive Committee and are noted in this 1998 edition by an * in the margin. The 1995 Pocket Guide has been translated into fifteen languages and endorsed by professional associations, medical societies, and voluntary organizations.

Global Initiative for Asthma™ publications have provided the foundation for programs in more than 50 countries around the world that are dedicated to improving asthma care.

Acknowledgements

Grateful acknowledgement is given for the education grants from ASTA Medica, Astra, Bayer, Boehringer Ingelheim GmbH, Glaxo Wellcome, Mitsubishi Chemical Corporation, MSD, Novartis, Rhône-Poulenc Rorer Pharmaceuticals Inc., Schering-Plough International, 3M Pharmaceuticals, and Zeneca. The generous contributions of these companies assured that workshop members could meet together and publications could be printed for wide distribution. The workshop members, however, are solely responsible for the statements and conclusions in the publications.

TAKING A NEW LOOK AT ASTHMA

Unfortunately... asthma prevalence, particularly in children, is increasing worldwide. It is underdiagnosed and undertreated.

Fortunately...

- New methods are available for recognizing, diagnosing, treating, and controlling asthma.
 - Personal, social, and economic burdens of asthma can be minimized.
 - Patient education increases the likelihood of lifelong success.
 - *You can make a difference.*
- Asthma causes recurring episodes of coughing, wheezing, chest tightness, and difficult breathing. Asthma attacks can be life threatening. They can be prevented.
- Asthma is a **chronic inflammatory** disorder of the airways. Chronically inflamed airways are hyperresponsive; they become obstructed and airflow is limited (by bronchoconstriction, mucus plugs, and increased inflammation) when airways are exposed to various stimuli, or triggers.
- ★ ■ Common asthma triggers (that is, factors that make asthma worse) include viral infections; allergens such as domestic dust mites (in bedding, carpets, and fabric-upholstered furnishings), animals with fur, cockroach, pollens, and molds; tobacco smoke; air pollution; exercise; strong emotional expressions; chemical irritants; and drugs (aspirin and beta blockers)
- Asthma attacks (or exacerbations) are episodic, but airway inflammation is chronically present. Asthma is a chronic disorder requiring long-term management. For many patients, this means taking preventive medication every day.

-
- * ■ Asthma can change over time. Asthma can be mild, moderate or severe; asthma attacks can be life-threatening. The severity of asthma varies among individuals, and it can change in one individual over time. Treatment decisions are made based on the severity of asthma. See page 14 for a guide to classifying asthma severity.

 - * ■ Asthma can be treated and controlled so that almost all patients can:
 - Prevent troublesome symptoms night and day
 - Prevent serious attacks
 - Require little or no quick-relief medication
 - Have productive, physically active lives
 - Have (near) normal lung function.

 - Asthma is not a cause for shame. Olympic athletes, famous leaders, other celebrities, and ordinary people live successful lives with asthma.

 - Asthma may be preventable. For infants with a family history of asthma or atopy, it is highly likely that avoiding exposure to passive smoking and to domestic dust mite, cat, and cockroach allergens will help prevent the initial development of asthma. For adults, avoiding exposure to chemical sensitizers in the workplace is helpful.

DIAGNOSING ASTHMA

Figure 1. Is It Asthma?

(Consider asthma if *any* of the following signs or symptoms are present.)

- Wheezing — high-pitched whistling sounds when breathing out — especially in children. (A normal chest examination does not exclude asthma.)
- History of any of the following:
 - Cough, worse particularly at night
 - Recurrent wheeze
 - Recurrent difficult breathing
 - Recurrent chest tightness.

Note: Eczema, hay fever, or a family history of asthma or atopic diseases are often associated with asthma.

- Symptoms occur or worsen at night, awakening the patient.
- Symptoms occur or worsen in the presence of:
 - Exercise
 - Viral infection
 - Animals with fur
 - Domestic dust mites (in mattresses, pillows, upholstered furniture, carpets)
 - Smoke (tobacco, wood)
 - Pollen
 - Changes in temperature
 - Strong emotional expression (laughing or crying hard)
 - Aerosol chemicals.
 - Drugs (aspirin, beta blockers).
- Reversible and variable airflow limitation — as measured by using a peak expiratory flow (PEF) meter (see figure 2) in any of the following ways:
 - PEF increases more than 15 percent 15 to 20 minutes after inhalation of a short-acting beta₂-agonist, or
 - PEF varies more than 20 percent from morning measurement upon arising to measurement 12 hours later in patients taking a bronchodilator (more than 10 percent in patients who are not taking a bronchodilator), or
 - PEF decreases more than 15 percent after 6 minutes of running or exercise.

■ Diagnostic challenges include the following:

- Young children whose primary symptom is cough or who wheeze with respiratory infections are often misdiagnosed as having bronchitis or pneumonia (including acute respiratory infection — ARI) and thus ineffectively treated with antibiotics or cough suppressants. Treatment with asthma medication can be beneficial and diagnostic.
- * • Many infants and young children who wheeze with viral respiratory infections may not develop asthma that persists through childhood. But they may benefit from asthma medications for their wheezing episodes. There is no certain way to predict which children will have persistent asthma, but allergy, a family history of allergy or asthma, and perinatal exposure to passive smoke and allergens are more strongly associated with continuing asthma.
- Asthma should be considered if the patient's colds repeatedly "go to the chest" or take more than 10 days to clear up, or if the patient improves when asthma medication is given.
- Tobacco smokers and elderly patients frequently suffer from chronic obstructive pulmonary disease with symptoms similar to asthma. Yet they may also have asthma and benefit from treatment. Improvement in PEF after asthma treatment is diagnostic.
- Workers who are exposed to inhalant chemicals or allergens in the workplace can develop asthma and may be misdiagnosed as having chronic bronchitis or chronic obstructive pulmonary disease. Early recognition (PEF measurements at work and home), strict avoidance of further exposure, and early treatment are essential.
- * • Asthma attacks may be difficult to diagnose. For example, acute shortness of breath, chest tightness and wheezing can also be caused by croup, bronchitis, heart attacks, and vocal chord dysfunction. Using spirometry, establishing reversibility of symptoms with bronchodilators, and assessing the history of the attack (e.g. whether it was related to exposures that commonly make asthma worse) aid the diagnosis. A chest x-ray can help rule out infection, large airway lesions, congestive heart failure, or aspiration of a foreign object.

Figure 2. Peak Flow Meters: Uses and Technique

- Lung function measurements assess airflow limitation and help diagnose and monitor the course of asthma. Such objective measurements are important because patients and physicians often do not recognize asthma symptoms or their severity. Lung function measurements for asthma management are used in the same manner as blood pressure measurements for diagnosing and monitoring hypertension.
- Peak flow meters measure peak expiratory flow (PEF), the fastest rate at which air moves through the airways during a forced expiration.
- The accuracy of PEF measurement depends on patient effort and correct technique. Several kinds of peak flow meters are available; the technique for use is similar for all:
 - Stand up and hold the peak flow meter without restricting movement of the marker. Make sure the marker is at the bottom of the scale.
 - Take a deep breath, put the peak flow meter in your mouth, seal your lips around the mouthpiece, and breathe out as hard and fast as possible. Do not put your tongue inside the mouthpiece.
 - Record the result. Return the marker to zero.
 - Repeat twice more. Choose the highest of the three readings.
- Daily PEF monitoring for 2 to 3 weeks is useful, when it is available, for establishing a diagnosis and treatment. If during 2 to 3 weeks a patient cannot achieve 80 percent of predicted PEF (predicted values are provided with all peak flow meters), a course of corticosteroid tablets may be necessary to determine a patient's personal best value.
- Long-term PEF monitoring is useful, along with review of symptoms, for evaluating a patient's response to therapy. PEF monitoring can also help detect early signs of worsening before symptoms occur. See Monitor and Modify Asthma Care for Effective Long-Term Control.

CONTROLLING ASTHMA

- New approaches to asthma therapy help patients prevent most attacks, stay free of troublesome night and day symptoms, and keep physically active.

- *■ Achieving control of asthma requires:
 - Selecting appropriate medications
 - Managing asthma long term
 - Treating asthma attacks
 - Identifying and avoiding triggers that make asthma worse
 - Educating patients to manage their condition
 - Monitoring and modifying asthma care for effective long-term control.

- Most patients first go to the doctor during an asthma attack. See page 18 for recommendations on treating attacks. In addition, it is important at the outset to help patients learn how to prevent future attacks. For many patients, controlling asthma long term means taking daily medication.

SELECT MEDICATIONS

- Two types of medication help control asthma: **long-term preventive** medications (especially anti-inflammatory agents) that keep symptoms and attacks from starting, and **quick-relief** medications (short-acting bronchodilators) that work fast to treat attacks or relieve symptoms. See figure 3.

- **Inhaled medications** are preferred because of their high therapeutic ratio: high concentrations of drug are delivered directly to the airways with potent therapeutic effects and few systemic side effects.
 - Devices available to deliver inhaled medication include pressurized metered-dose inhalers (MDI's), breath-actuated metered dose inhalers, dry powder inhalers, and nebulizers. Spacer (or holding chamber) devices make inhalers easier to use. Spacers also reduce systemic absorption and side effects of inhaled corticosteroids.
 - For each patient, select the most appropriate devices. In general:
 - Children under 2 years of age should use a pressurized MDI with a spacer and a face mask, or a nebulizer.
 - Children 2 to 5 years of age should use a pressurized MDI with a spacer or, if necessary, a nebulizer.
 - For patients using spacers, the spacer must fit the inhaler. The size of the spacer must increase as a child grows and lung size increases.
 - Patients of any age over 5 years who have difficulty using pressurized MDI's should use a pressurized MDI with a spacer, a breath-actuated inhaler, a dry powder inhaler, or a nebulizer. Dry powder inhalers require an inspiratory effort that may be difficult during severe attacks and for children under 5.
 - Patients who are having severe attacks should use a pressurized MDI with a spacer or a nebulizer.
 - Teach patients (and parents) how to use inhaler devices. Different devices need different inhalation techniques.
 - Give demonstrations and illustrated instructions.
 - Ask patients to show their technique at every visit.

MANAGE ASTHMA LONG TERM

- A **stepwise approach** is used to classify asthma severity and guide treatment. See figures 4 and 5. The number and frequency of medications increase (step up) as the need for asthma therapy increases, and decrease (step down) when asthma is under control.

Persistent asthma is more effectively controlled by long-term treatment to suppress and reverse the inflammation than by only treating acute bronchoconstriction and related symptoms. **Anti-inflammatory agents, particularly inhaled corticosteroids, are currently the most effective long-term preventive medications.**

The recommended treatments are guidelines only. Local resources and individual patient circumstances determine specific therapy.

- * ■ **Gain control**—There are two approaches to gaining control of asthma. The first approach is preferred.
 - Establish control promptly with a high level of therapy (for example, add a short course of prednisolone or a higher dose of inhaled corticosteroids to the therapy that corresponds with the patient's level of asthma severity) and then step down.
 - Or • Start treatment at the step most appropriate to the level of asthma severity and step up if necessary.
- **Step up** if control is not achieved and sustained. Generally, improvement should be achieved within 1 month. But first review the patient's medication technique, compliance, and avoidance of triggers.
- * ■ **Step down** if control is sustained for at least 3 months; follow a gradual stepwise reduction in treatment. The goal is to decrease treatment to the least medication necessary to maintain control.
- **Review** treatment every 3 to 6 months once asthma is under control.
- Consult with an asthma specialist when clinical conditions complicate asthma (e.g., sinusitis), the patient does not respond optimally to therapy, or treatment at step 3 or 4 is required.

***Figure 3. Glossary of Asthma Medications**

| LONG-TERM PREVENTIVE MEDICATIONS | | | | |
|--|---|---|---|--|
| NAME and ALSO KNOWN AS | GENERIC NAME | MECHANISM OF ACTION | SIDE EFFECTS | COMMENTS |
| Corticosteroids adrenocorticoids glucocorticoids | Inhaled: beclomethasone budesonide fluticasone fluticasone triamcinolone Tablets or syrups: methylprednisolone prednisolone prednisone | Anti-inflammatory agent | Inhaled. >1 mg a day may be associated with skin thinning, easy bruising, adrenal suppression, and cataracts. Minor growth delay or suppression (ave. 1cm) may occur in children Tablets or syrups: Used long term, may lead to osteoporosis, hypertension, diabetes, cataracts, adrenal suppression, obesity, skin thinning or muscle weakness. Consider coexisting conditions that could be worsened by oral steroids, e.g. herpes virus infections, Varicella, tuberculosis, hypertension. | Inhaled: Potential but small risk of side effects is well balanced by efficacy. Spacer devices and mouth washing after inhalation decrease oral candidiasis. Preparations not equivalent on per puff or mcg basis. Tablet or syrup Long term use: alternate day am dosing produces less toxicity. Short term: 3-10 day "bursts" effective for gaining prompt control; administer until PEF >80% predicted or symptoms resolve. |
| Sodium cromoglycate cromolyn cromones | | Anti-inflammatory agent | Minimal side effects. Cough may occur upon inhalation. | May take 4-6 weeks to determine maximum effects. |
| Nedocromil cromones | | Anti-inflammatory agent | None known | _____ |
| Long-acting beta₂-agonists long-acting beta-adrenergics sympathomimetics | Inhaled: formoterol salmeterol Sustained-release tablets: salbutamol terbutaline | Bronchodilator | Inhaled beta ₂ -agonists have fewer, and less significant, side effects than tablets. Tablet beta ₂ -agonists may cause cardiovascular stimulation, anxiety, pyrosis, skeletal muscle tremor, headache, or hypokalemia. | NOT to be used to treat attacks. Always use in combination with anti-inflammatory therapy. Combining with low-medium dose of inhaled steroid usually gives more effective control than higher doses of inhaled steroid alone. |
| Sustained-release theophylline aminophylline methylxanthine xanthine | | Bronchodilator with uncertain anti-inflammatory effect. | Nausea and vomiting are most common. Serious effects occurring at higher serum concentrations include seizures, tachycardia, and arrhythmias. | Theophylline monitoring is often required. Absorption and metabolism may be affected by many factors, including febrile illness. |
| Ketotifen | | Antiallergic agent | May cause sedation and weight gain. | _____ |
| Anti-leukotrienes leukotriene modifiers | montelukast zafirlukast zileuton | Leukotriene receptor antagonist 5-lipoxygenase inhibitor | Data are limited; no specific adverse effects to date at recommended doses. Elevation of liver enzymes possible. Limited case reports of reversible hepatitis and hyperbilirubinemia. | The position of anti-leukotrienes in asthma therapy is not fully established; further study and clinical experience is required. |

***Figure 3. (continued)**

| QUICK-RELIEF MEDICATIONS | | | | |
|---|--|-----------------------|---|--|
| NAME and ALSO KNOWN AS | GENERIC NAME | MECHANISM OF ACTION | SIDE EFFECTS | COMMENTS |
| Short-acting beta₂-agonists adrenergics beta ₂ -stimulants sympathomimetics | albuterol bitolterol fenoterol isoetharine metaproterenol pirbuterol salbutamol terbutaline | Bronchodilator | Inhaled beta ₂ -agonists have fewer, and less significant, side effects than tablets or syrups. Tablet or syrup beta ₂ -agonists may cause cardiovascular stimulation, skeletal muscle tremor, headache, and irritability. | Drug of choice for acute bronchospasm. Inhaled route has faster onset and is more effective than tablet or syrup. Increasing use, lack of expected effect, or use of >1 canister a month indicate poor asthma control; adjust long term therapy accordingly. |
| Anticholinergics | ipratropium bromide oxitropium bromide | Bronchodilator | Minimal mouth dryness or bad taste in the mouth. | May provide additive effects to beta-agonist but has slower onset of action. Is an alternative for patients with intolerance for beta ₂ -agonists. Dose delivered by MDI is low. |
| Short-acting theophylline aminophylline | | Bronchodilator | Nausea, vomiting. At higher serum concentrations: seizures, tachycardia, and arrhythmias. | Theophylline may be considered if inhaled beta ₂ -agonists are not available. Theophylline monitoring may be required—see page 19. |
| Epinephrine/adrenaline injection | | Bronchodilator | Similar, but more significant effects than beta ₂ -agonist. In addition: convulsions, chills, fever, and hallucinations. | In general, not recommended for treating asthma attacks if beta ₂ -agonists are available. |

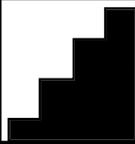
Figure 4. Treatments in the Stepwise Approach to Long-Term Management of Asthma For Adults and Children Over 5 Years Old

The aim of treatment is control of asthma:

- Minimal (ideally no) chronic symptoms, including nocturnal symptoms
- Minimal (infrequent) episodes
- No emergency visits
- Minimal need for prn β_2 -agonist
- No limitations on activities, including exercise
- PEF variability <20%
- (Near) normal PEF
- Minimal (or no) adverse effects from medicine.

Note:

- ★ Establish control as soon as possible (consider adding a short course of prednisolone or higher dose of inhaled steroids to the therapy that corresponds with initial level of asthma severity). Then decrease treatment to the least medication necessary to maintain control.
- Patients should avoid or control triggers at each step.
- ALL THERAPY MUST INCLUDE PATIENT EDUCATION.

|  | CLASSIFY SEVERITY Clinical Features Before Treatment | | |
|---|---|---------------------------|--|
| | Symptoms | Nighttime Symptoms | PEF |
| STEP 4 Severe Persistent | Continuous Limited physical activity | Frequent | ≤60% predicted Variability >30% |
| STEP 3 Moderate Persistent | Daily Use β_2 -agonist daily. Attacks affect activity | >1 time a week | >60%-<80% predicted Variability >30% |
| STEP 2 Mild Persistent | ≥1 time a week but <1 time a day | >2 times a month | ≥80% predicted Variability 20-30% |
| STEP 1 Intermittent | <1 time a week Asymptomatic and normal PEF between attacks | ≤2 times a month | ≥80% predicted Variability <20% |

- The presence of one of the features of severity is sufficient to place a patient in that category.
- ★ Patients at any level of severity- even intermittent asthma- can have severe attacks.

TREATMENT: ADULTS & CHILDREN OVER 5 YEARS OLD
 Preferred treatments are in bold print.
 *Patient education is essential at every step

| | Long-Term Preventive | Quick-Relief |
|---|---|---|
| * STEP 4 Severe Persistent | Daily medications: <ul style="list-style-type: none"> • Inhaled corticosteroid, 800-2,000 mcg or more, and • Long-acting bronchodilator: either long-acting inhaled β_2-agonist and/or sustained-release theophylline, and/or long-acting β_2-agonist tablets or syrup, and • Corticosteroid tablets or syrup long term. | <ul style="list-style-type: none"> • Short-acting bronchodilator: inhaled β_2-agonist as needed for symptoms. |
| * STEP 3 Moderate Persistent | Daily medications: <ul style="list-style-type: none"> • Inhaled corticosteroid, ≥ 500 mcg AND, if needed • Long-acting bronchodilator: either long-acting inhaled β_2-agonist, sustained-release theophylline, or long-acting β_2-agonist tablets or syrup. (Long-acting inhaled β_2-agonist may provide more effective symptom control when added to low-medium dose steroid compared to increasing the steroid dose). • Consider adding anti-leukotriene, especially for aspirin-sensitive patients and for preventing exercise-induced bronchospasm. | <ul style="list-style-type: none"> • Short-acting bronchodilator: inhaled β_2-agonist as needed for symptoms, not to exceed 3-4 times in one day. |
| * STEP 2 Mild Persistent | Daily medication: <ul style="list-style-type: none"> • Either inhaled corticosteroid, 200-500 mcg, or cromoglycate or nedocromil or sustained release theophylline. Anti-leukotrienes may be considered, but their position in therapy has not been fully established. | <ul style="list-style-type: none"> • Short-acting bronchodilator: inhaled β_2-agonist as needed for symptoms, not to exceed 3-4 times in one day. |
| STEP 1 Intermittent | <ul style="list-style-type: none"> • None needed. | <ul style="list-style-type: none"> • Short-acting bronchodilator: inhaled β_2-agonist as needed for symptoms, but less than once a week • Intensity of treatment will depend on severity of attack (see figures on management of asthma attacks) • Inhaled β_2-agonist or cromoglycate before exercise or exposure to allergen. |

MANAGE LONG TERM



Stepdown

Review treatment every 3 to 6 months. If control is sustained for at least 3 months, a gradual stepwise reduction in treatment may be possible.



Stepup

If control is not achieved, consider stepup. But first: review patient medication technique, compliance, and environmental control (avoidance of allergens or other trigger factors).

*Dosage note: Steroid doses are for Beclomethasone Dipropionate (on the WHO list of "Essential Drugs"). Other preparations have equal effect, but adjust the dose because inhaled steroids are not equivalent on a microgram or per puff basis.

Figure 5. Treatments in the Stepwise Approach to Long-Term Management of Asthma for Infants and Young Children (5 Years of Age & Younger)

The aim of treatment is control of asthma:

- Minimal (ideally no) chronic symptoms, including nocturnal symptoms
- Minimal (infrequent) episodes
- No emergency visits
- Minimal need for prn β_2 -agonist
- No limitations on activities, including exercise
- (Near) normal lung function
- Minimal (or no) adverse effects from medicine.

Note:

- Remember: There are very few studies on asthma therapy for infants.
- ★ Patients should start treatment at the step most appropriate to the initial severity of their condition. A short course of prednisolone may help establish control promptly.
- Patients should avoid or control triggers at each step.
- ALL THERAPY MUST INCLUDE PATIENT/PARENT EDUCATION.

| | CLASSIFY SEVERITY | |
|--------------------------------------|---|--------------------|
| | Clinical Features Before Treatment | |
| | Symptoms | Nighttime Symptoms |
| STEP 4 Severe Persistent | Continuous Limited physical activity | Frequent |
| STEP 3 Moderate Persistent | Daily Use β_2 -agonist daily. Attacks affect activity | >1 time a week |
| STEP 2 Mild Persistent | ≥1 time a week but <1 time a day | >2 times a month |
| STEP 1 Intermittent | <1 time a week Asymptomatic between attacks | ≤2 times a month |

The presence of one of the features of severity is sufficient to place a patient in that category.

Figure 5. (continued)

| TREATMENT FOR INFANTS AND YOUNG CHILDREN (5 YEARS OF AGE & YOUNGER) Preferred treatments are in bold print. *Patient education is essential at every step | | |
|--|--|--|
| | Long-Term Preventive | Quick-Relief |
| STEP 4 Severe Persistent | Daily medication: • Inhaled corticosteroid - MDI with spacer and face mask >1 mg daily or - Nebulized budesonide >1 mg bid - If needed, add oral steroids—lowest possible dose on an alternate-day, early morning schedule. | • Inhaled short-acting bronchodilator: inhaled β_2-agonist or ipratropium bromide, or β_2 -agonist tablets or syrup as needed for symptoms, not to exceed 3-4 times in one day. |
| STEP 3 Moderate Persistent | Daily medication: • Inhaled corticosteroid - MDI with spacer and face mask 400-800 mcg daily or - Nebulized budesonide \leq 1 mg bid | • Inhaled short-acting bronchodilator: inhaled β_2-agonist or ipratropium bromide, or β_2 -agonist tablets or syrup as needed for symptoms, not to exceed 3-4 times in one day. |
| STEP 2 Mild Persistent | Daily medication: • Either inhaled corticosteroid (200-400 mcg) or cromoglycate (use MDI with a spacer and face mask or use a nebulizer) | • Inhaled short-acting bronchodilator: inhaled β_2-agonist or ipratropium bromide, or β_2 -agonist tablets or syrup as needed for symptoms, not to exceed 3-4 times in one day. |
| STEP 1 Intermittent | • None needed. | • Inhaled short-acting bronchodilator: inhaled β_2-agonist or ipratropium bromide, as needed for symptoms, but not more than three times a week • Intensity of treatment will depend on severity of attack (see figures on management of asthma attacks). |



Stepdown

Review treatment every 3 to 6 months. If control is sustained for at least 3 months, a gradual stepwise reduction in treatment may be possible.



Stepup

If control is not achieved, consider stepup. But first: review patient medication technique, compliance, and environmental control (avoidance of allergens or other trigger factors).

* TREAT ATTACKS

- See page 7 for diagnosing asthma attacks.
- Do not underestimate the severity of an attack; severe asthma attacks are life threatening. See figure 6.
- Patients at high risk for asthma-related death include those with:
 - Current use of, or recent withdrawal from, systemic corticosteroids
 - * • Hospitalization or emergency visit for asthma within the past year, or prior intubation for asthma
 - * • History of psychosocial problems or denial of asthma or its severity
 - History of noncompliance with asthma medication plan.

■ Patients should immediately seek medical care if...

• The attack is severe:

- The patient is breathless at rest, is hunched forward, talks in words rather than sentences (infant stops feeding), agitated, drowsy or confused, has bradycardia, or a respiratory rate greater than 30 per minute.
- Wheeze is loud or absent.
- Pulse is greater than 120 per minute (greater than 160 per minute for infants).
- PEF is less than 60 percent of predicted or personal best even after initial treatment.

• The response to the initial bronchodilator treatment is not prompt and sustained for at least 3 hours.

• There is no improvement within 2 to 6 hours after systemic corticosteroid treatment is started.

• There is further deterioration.

■ Asthma attacks require prompt treatment:

- Inhaled short-acting beta₂-agonists in adequate doses are essential. Frequent doses may also be necessary.

-
- Corticosteroid tablets or syrup introduced early in the course of a moderate or severe attack help to reverse the inflammation and speed recovery.
 - Oxygen is given at health centers or hospitals if the patient is hypoxemic.
 - Theophylline or aminophylline is not recommended if it is used in addition to high doses of inhaled beta₂-agonist because it provides no additional benefit and increases the risk of side effects. However, theophylline can be used if inhaled beta₂-agonists are not available. If the patient is already taking theophylline on a daily basis, serum concentration should be measured before adding short-acting theophylline.
 - Epinephrine (adrenaline) may be indicated for acute treatment of anaphylaxis and angioedema.

■ Therapies **not recommended** for treating attacks include:

- Sedatives (strictly avoid)
- Mucolytic drugs (may worsen cough)
- Magnesium sulfate (no proven effect)
- Chest physical therapy (may increase patient discomfort)
- Hydration with large volumes of fluid for adults and older children (may be necessary for younger children and infants)
- Antibiotics (do not treat attacks but are indicated for patients who also have pneumonia or bacterial infection such as sinusitis).

■ Moderate attacks may require, and severe attacks usually require, care in a clinic or hospital. See figure 8.

■ Mild attacks can be treated at home if the patient is prepared and has an asthma management plan that includes action steps. See figure 7.

* ■ **Monitor Response to Treatment**

Evaluate symptoms and, as much as possible, peak flow. In hospital, also assess oxygen saturation; consider arterial blood gas measurement in patients with suspected hypoventilation, severe distress, or peak flow <30 percent predicted.

Figure 6. Severity of Asthma Attacks

| Parameter ¹ | Mild | Moderate | Severe | Respiratory arrest imminent |
|--|---|---|---|--|
| Breathless | Walking Can lie down | Talking Infant-softer shorter cry; difficulty feeding Prefers sitting | At rest Infant-stops feeding Hunched forward | |
| Talks in | Sentences | Phrases | Words | |
| Alertness | May be agitated | Usually agitated | Usually agitated | Drowsy or confused |
| Respiratory rate | Increased | Increased | Often >30/min | |
| Guide to rates of breathing associated with respiratory distress in awake children: <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <i>Age</i> <2 months 2-12 months 1-5 years 6-8 years </div> <div style="text-align: center;"> <i>Normal rate</i> <60/min <50/min <40/min <30/min </div> </div> | | | | |
| Accessory muscles and suprasternal retractions | Usually not | Usually | Usually | Paradoxical thoraco-abdominal movement |
| Wheeze | Moderate, often only end expiratory | Loud | Usually loud | Absence of wheeze |
| Pulse/min. | <100 | 100-120 | >120 | Bradycardia |
| * Guide to limits of normal pulse rate in children: <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> Infants Preschool School age </div> <div style="text-align: center;"> 2-12 months 1-2 years 2-8 years </div> <div style="text-align: center;"> -Normal rate <160/min -Normal rate <120/min -Normal rate <110/min </div> </div> | | | | |
| PEF after initial bronchodilator % predicted or % personal best | Over 80% | Approximately 60-80% | <60% predicted or personal best (100 L/min adults) or response lasts <2 hours | |
| PaO ₂ (on air)* and/or PaCO ₂ * | Normal Test not usually necessary <45 mm Hg | >60 mm Hg <45 mm Hg | <60 mm Hg Possible cyanosis >45 mm Hg: Possible respiratory failure (see text) | |
| SaO ₂ % (on air)* | >95% | 91-95% | <90% | |
| Hypercapnia (hypoventilation) develops more readily in young children than in adults and adolescents. | | | | |

¹Note: The presence of several parameters, but not necessarily all, indicate the general classification of the attack.

*Note: Kilopascals are also used internationally; conversion would be appropriate in this regard.

Figure 7. Management of an Asthma Attack: Home Treatment

Assess Severity

Cough, breathlessness, wheeze, chest tightness, use of accessory muscles, suprasternal retractions, and sleep disturbance. PEF less than 80% of personal best or predicted.

Initial Treatment

Inhaled short-acting beta₂-agonist up to three treatments in 1 hour.

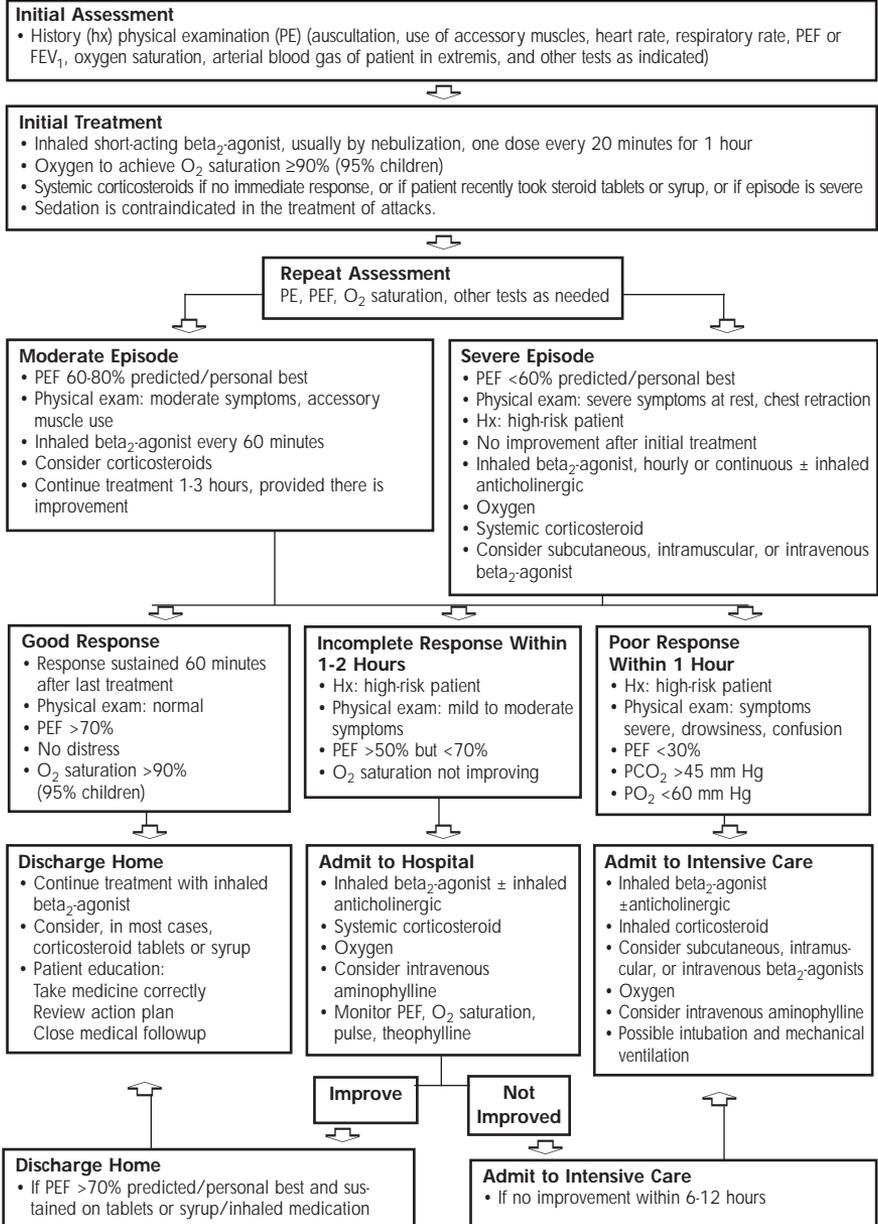
(Patients at high risk of asthma-related death should contact physician promptly after initial treatment.)

Response to Initial Treatment is...

| Good if... | Incomplete if... | Poor if... |
|---|--|---|
| <p>Symptoms subside after initial beta₂-agonist and relief is sustained for 4 hours.</p> <p>PEF is greater than 80% predicted or personal best.</p> <p>ACTIONS:</p> <ul style="list-style-type: none"> • May continue beta₂-agonist every 3-4 hours for 1-2 days • Contact physician or nurse for followup instructions. | <p>Symptoms decrease but return in less than 3 hours after initial beta₂-agonist treatment.</p> <p>PEF is 60-80% predicted or personal best.</p> <p>ACTIONS:</p> <ul style="list-style-type: none"> • Add corticosteroid tablets or syrup • Continue beta₂-agonist • Consult physician or nurse urgently for instructions. | <p>Symptoms persist or worsen despite initial beta₂-agonist treatment.</p> <p>PEF is less than 60% predicted or personal best.</p> <p>ACTIONS:</p> <ul style="list-style-type: none"> • Add corticosteroid tablets or syrup • Repeat beta₂-agonist immediately • Immediately transport to hospital emergency department (see figure 8). |

*

Figure 8. Management of Asthma Attacks: Hospital-Based Care



Note: Preferred treatments are inhaled beta₂-agonists in high doses and corticosteroids. If inhaled beta₂-agonists are not available, theophylline may be considered.

IDENTIFY AND AVOID TRIGGERS

- When patients avoid exposure to asthma triggers (allergens and irritants that make their asthma worse), asthma symptoms and attacks can be prevented and medications reduced. Common triggers are listed in figure 9.

Figure 9. Common Asthma Triggers and Avoidance Strategies

| | TRIGGER | TO AVOID |
|---|---|---|
| * | Domestic dust mite allergens (so small they are not visible to the naked eye) | Wash bed linens and blankets once a week in hot water and dry in a hot dryer or the sun. Encase pillows and mattresses in airtight covers. Remove carpets, especially in sleeping rooms. Use vinyl, leather, or plain wooden furniture instead of fabric-upholstered furniture. If possible, use vacuum cleaner with filters. |
| | Tobacco smoke (whether the patient smokes or breathes in the smoke from others) | Stay away from tobacco smoke. Patients and parents should not smoke. |
| | Allergens from animals with fur | Remove animals from the home, or at least from the sleeping area. |
| | Cockroach allergen | Clean the home thoroughly and often. Use pesticide spray—but make sure the patient is not at home when spraying occurs. |
| | Outdoor pollens and mold | Close windows and doors and remain indoors when pollen and mold counts are highest. |
| | Indoor mold | Reduce dampness in the home; clean any damp areas frequently |
| | Physical activity | Do not avoid physical activity. Symptoms can be prevented by taking a short- or long-acting inhaled beta2-agonist or sodium cromoglycate before strenuous exercise. |
| * | Drugs | Do not take aspirin or beta blockers if these medicines cause asthma symptoms. |

-
- When patients reduce exposure to tobacco smoke and indoor allergens, particularly domestic dust mites, they also help other members of their family. The initial development of asthma, especially in infants, may be prevented.
 - **Specific immunotherapy**, directed at treating an underlying allergy to grass and other pollen, domestic mites, animal dander, or *Alternaria*, may be considered when avoiding allergens is not possible or appropriate medications fail to control asthma symptoms. Specific immunotherapy should be performed only by health professionals trained in its use.

EDUCATE PATIENTS

- With your help, and the help of others on the health care team, patients can be actively involved in managing their asthma to prevent problems and can live productive, physically active lives.
- With your help, asthma patients can learn to:
 - Take medications correctly
 - Understand the difference between “quick-relief” and “long-term preventive” medications
 - Avoid triggers
 - Monitor their status using symptoms and, if available, PEF indicators
 - Recognize signs that asthma is worsening and take action
 - Seek medical help as appropriate.
- Working together, you and your patient should prepare a written asthma management plan that is not only medically appropriate but also practical.

■ **An asthma management plan should cover:**

- **Prevention steps** for long-term control
 - What daily medication to take
 - What asthma triggers to avoid.
- **Action steps** to stop attacks
 - **How to recognize worsening asthma.** List indicators such as increasing cough, chest tightness, wheeze, difficult breathing, sleep disturbance, or PEF measurements below personal best despite increased use of medications.
 - ★ – **How to treat worsening asthma.** List the names and doses of quick-relief bronchodilator medications and steroid tablets and when to use them.
 - **How and when to seek medical attention.** List indicators such as feeling panicky, an attack with sudden onset, shortness of breath while resting or speaking a few words, PEF readings below a specified level, or a history of severe attacks. List the name, location, and telephone number of the physician's office or clinic.

Sample management plans are in other Global Initiative for Asthma publications (see Preface).

- Educational methods should be appropriate for your patients. Using a variety of methods — discussions (with a physician, nurse, outreach worker, counselor, or educator), demonstrations, written materials, group classes, video or audio tapes, dramas, and patient support groups — helps reinforce your education.
- Ongoing education, presented at every patient visit, is the key to success in all aspects of asthma management.

MONITOR AND MODIFY ASTHMA CARE FOR EFFECTIVE LONG-TERM CONTROL

- Control of asthma requires continual long-term care and monitoring.
- Monitoring includes review of symptoms and, as much as possible, measurement of lung function.
 - ✱ • PEF monitoring at every physician visit, (spirometry is preferred but not always available), along with review of symptoms, helps in evaluating the patient's response to therapy and adjusting treatment accordingly. PEF consistently greater than 80 percent of the patient's personal best suggests good control.
 - Long-term PEF monitoring at home can help patients recognize early signs of worsening asthma (PEF less than 80 percent of personal best) before symptoms occur. Patients can act promptly according to their asthma management plan to avoid serious attacks. Home PEF monitoring is not always practical, but for patients who cannot perceive symptoms and for those who have ever been hospitalized, home PEF monitoring has a high priority.
- Regular visits (at 1- to 6-month intervals as appropriate) are essential, even after control of asthma is established. At each visit review the questions in figure 10.
- Compliance with asthma management plans is improved when patients have the opportunity to talk about their concerns, fears, and expectations related to their asthma. See figure 11 for common factors involved in noncompliance.

Figure 10. Questions for Monitoring Asthma Care

IS THE ASTHMA MANAGEMENT PLAN MEETING EXPECTED GOALS?

Ask the patient:

Has your asthma awakened you at night?

Are you participating in your usual physical activities?

Have you needed more quick-relief medications than usual?

Have you needed any urgent medical care?

Has your peak flow been below your personal best?

Action to consider:

Adjust medications and management plan as needed (step up or step down). But first, compliance should be assessed.

IS THE PATIENT USING INHALERS, SPACERS, OR PEAK FLOW METERS CORRECTLY?

Ask the patient:

Please show me how you take your medicine.

Action to consider:

Demonstrate correct technique. Have patient demonstrate back.

IS THE PATIENT TAKING THE MEDICATIONS AND AVOIDING TRIGGERS ACCORDING TO THE ASTHMA MANAGEMENT PLAN?

Ask the patient, for example:

So that we may plan therapy, please tell me how often you actually take the medicine.

What problems have you had following the management plan or taking your medicine?

During the last month, have you ever stopped taking your medicine because you were feeling better?

Action to consider:

Adjust plan to be more practical. Problem solve with the patient to overcome barriers to following the plan (see figure 11).

DOES THE PATIENT HAVE ANY CONCERNS?

Ask the patient:

What concerns might you have about your asthma, medicines, or management plan?

Action to consider:

Provide additional education to relieve concerns and discussion to overcome barriers.

Figure 11. Factors Involved in Noncompliance

| Medication-related factors | Nonmedication factors |
|--|--|
| Misunderstanding the need for both long-term preventive and quick-relief medications | Disbelief or denial of cause of symptoms or attacks |
| Impractical regimen (e.g., four times daily or multiple medications) | Misunderstanding of management plan |
| Difficulty with inhaler devices | Inappropriate expectations |
| Side effects | Lack of guidance for self-management |
| Fear of side effects or addiction | Dissatisfaction with health care professionals |
| Cost of medication | Unexpressed/undiscussed fears or concerns |
| Dislike of medication | Poor supervision, training, or followup |
| Distant pharmacies | Cultural issues (traditions, beliefs about asthma and treatment) |
| | Family issues (smokers, pets) |

REMEMBER...

GOALS OF LONG-TERM ASTHMA MANAGEMENT

- Minimal or no symptoms, including nighttime symptoms
- Minimal asthma episodes or attacks
- No emergency visits to doctors or hospitals
- Minimal need for quick-relief beta₂-agonist therapy
- No limitations on physical activities and exercise
- Nearly normal lung function
- Minimal or no side effects from medication.

ADAPTING GUIDELINES FOR LOCAL USE

- Local resources and cultural preferences determine how you use these guidelines in your community and must be considered as you:
 - Estimate the prevalence and costs of asthma in your community.
 - Consider the cost of medication and medical care and the costs of not controlling asthma (e.g., hospitalizations, lost productivity, absence from school, family disruption, lower quality of life).
 - Consider asthma prevention measures, especially for infants with a family history of atopy.
 - Choose treatments and medications based on local availability, the benefits and risks of different treatments, and the cost effectiveness in your area. (See Asthma Management and Prevention, A Practical Guide for Public Health Officials and Health Care Professionals, referred to in the Preface.)
 - Develop appropriate educational and outreach materials.

- * ■ Changes in medical practice to improve asthma care are more likely when:
 - Local community health care professionals review the guidelines and adopt them for their local setting.
 - Educational programs for physicians, nurses, respiratory therapists, and community health workers are held locally.
 - Physicians use audits of patient records to identify areas for improvement and learn ways to implement guidelines in their practice.
 - Physicians use patient treatment records during the clinical visit that are designed to prompt use of guidelines.

Discrimination Prohibited: Under provisions of applicable public laws enacted by Congress since 1964, no person in the United States shall, on the grounds of race, color, national origin, handicap, or age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity (or, on the basis of sex, with respect to any education program or activity) receiving Federal financial assistance. In addition, Executive Order 11141 prohibits discrimination on the basis of age by contractors and subcontractors in the performance of Federal contracts and Executive Order 11246 states that no federally funded contractor may discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. Therefore, the National Heart, Lung, and Blood Institute must be operated in compliance with these laws and Executive Orders.

The Global Initiative for Asthma is supported by educational grants from:



Boehringer
Ingelheim



Schering-Plough
International

GlaxoWellcome

3M Pharmaceuticals

MITSUBISHI
CHEMICAL

ZENECA

U.S. Department of Health and Human Services
Public Health Service
National Institutes of Health
National Heart, Lung, and Blood Institute

NIH Publication No. 96-3659B
November 1998