

# Attaining optimal asthma control: A practice parameter

**Chief Editors:** James T. Li, MD, PhD, John Oppenheimer, MD, I. Leonard Bernstein, MD, and Richard A. Nicklas, MD

**Joint Task Force Reviewers:** David A. Khan, MD, Joann Blessing-Moore, MD, David M. Lang, MD, Jay M. Portnoy, MD, Diane E. Schuller, MD, Sheldon L. Spector, MD, Stephen A. Tilles, MD, and Dana V. Wallace, MD

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## Published practice parameters of the Joint Task Force on Practice Parameters for Allergy & Immunology include the following:

1. Practice parameters for the diagnosis and treatment of asthma. *J Allergy Clin Immunol* 1995;96(suppl): S707-S870.
2. Practice parameters for allergy diagnostic testing. *Ann Allergy* 1995;75:543-625.

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Reprints requests: Joint Council of Allergy, Asthma and Immunology, 50 N Brockway St, #3-3, Palatine, IL 60067.

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18. Immunodeficiency update. *Ann Allergy* 2005; 94(suppl):S1-S63.

These parameters are also available on the Internet at <http://www.jcaai.org>.

## CONTRIBUTORS

The Joint Task Force has made a concerted effort to acknowledge all contributors to this parameter. If any

contributors have been excluded inadvertently, the Task Force will ensure that appropriate recognition of such contributions is made subsequently.

## CHIEF EDITORS

### **James T. Li MD, PhD**

Division of Allergic Diseases and Internal Medicine  
Mayo Clinic  
Rochester, Minn

### **John Oppenheimer, MD**

Department of Internal Medicine  
New Jersey Medical School  
Pulmonary and Allergy Associates  
Morristown, NJ

### **I. Leonard Bernstein, MD**

Department of Medicine and Environmental Health  
University of Cincinnati College of Medicine  
Cincinnati, Ohio

### **Richard A. Nicklas, MD**

Clinical Professor of Medicine  
George Washington Medical Center  
Washington, DC

## JOINT TASK FORCE REVIEWERS

### **David A. Khan, MD**

Department of Internal Medicine  
University of Texas Southwestern Medical Center  
Dallas, Tex

### **Joann Blessing-Moore, MD**

Departments of Medicine and Pediatrics  
Stanford University Medical Center  
Department of Immunology  
Palo Alto, Calif

### **David M. Lang, MD**

Allergy/Immunology Section  
Division of Medicine  
Director, Allergy and Immunology Fellowship Training  
Program

Cleveland Clinic Foundation  
Cleveland, Ohio

### **Jay M. Portnoy, MD**

Section of Allergy, Asthma & Immunology  
The Children's Mercy Hospital  
Professor of Pediatrics  
University of Missouri-Kansas City School of Medicine  
Kansas City, Mo

### **Diane E. Schuller, MD**

Department of Pediatrics  
Pennsylvania State University Milton S. Hershey  
Medical College  
Hershey, Pa

### **Sheldon L. Spector, MD**

Department of Medicine  
UCLA School of Medicine  
Los Angeles, Calif

### **Stephen A. Tilles, MD**

Department of Medicine  
University of Washington School of Medicine  
Redmond, Wash

### **Dana V. Wallace, MD**

Nova Southeastern University  
Davie, Fla

## REVIEWERS

John Cohn, MD, Philadelphia, Pa  
A. Gilbert, MD, Dallas, Tex  
Andy Nish, MD, Gainesville, Ga  
Bruce Prenner, MD, San Diego, Calif  
David Stempel, MD, Bellevue, Wash  
Steven Weinstein, MD, Huntington Beach, Calif  
Brock Williams, MD

## CLASSIFICATION OF RECOMMENDATIONS AND EVIDENCE

### Category of Evidence

- Ia Evidence from meta-analysis of randomized controlled trials
- Ib Evidence from at least one randomized controlled trial
- IIa Evidence from at least one controlled study without randomization
- IIb Evidence from at least one other type of quasiexperimental study
- III Evidence from nonexperimental descriptive studies, such as comparative studies, correlation studies, and case-control studies
- IV Evidence from expert committee reports, opinions or clinical experiences of respected authorities, or both

### Strength of Recommendation

- A Directly based on category I evidence
- B Directly based on category II evidence or extrapolated recommendation from category I evidence
- C Directly based on category III evidence or extrapolated recommendation from category I or II evidence
- D Directly based on category IV evidence or extrapolated recommendation from category I, II, or III evidence

NR Not rated

## PREFACE

The Joint Task Force on Practice Parameters developed "Practice parameters for the diagnosis and treatment of asthma" in 1995.<sup>1</sup> The first focused update was published in 1998.<sup>2</sup> This publication, "Attaining optimal asthma control: a practice parameter," represents the second focused update.

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In 1991, the National Heart, Lung, and Blood Institute (NHLBI) published its first set of guidelines for the diagnosis and management of asthma.<sup>3</sup> This publication introduced the concept of classification of asthma by asthma severity (mild, moderate, and severe) and linked asthma severity to a stepwise guide to pharmacotherapy of asthma. "Attaining optimal asthma control: a practice parameter" builds on the foundation of the NHLBI asthma report and extends the concept of guideline-driven asthma management. The development of these practice parameters included a MEDLINE search using the key words "asthma control" with selection of articles on the basis of expert opinion. "Attaining optimal asthma control: a practice parameter" recommends assessment of asthma control at every clinic visit, with a physician's\* determination of asthma control as either well controlled or not well controlled. As detailed in the algorithm, management decisions are then driven by the level of asthma control.

Asthma management driven by assessment of asthma control emphasizes and operationalizes the goals of asthma therapy, as originally listed in the NHLBI Expert Panel Report. Assessment and targets of asthma control also builds on the step-up and step-down guideline, as recommended in the NHLBI report. Perhaps more importantly, control-driven asthma guidelines encompass the principles of chronic disease management, including periodic assessment, goal (outcome) orientation, and individualization of therapy. An algorithm for attaining asthma control is shown in Fig 1.

## SUMMARY STATEMENTS

Summary Statement 1. Asthma symptoms do not always correlate with asthma severity. There are limitations to classifying asthma severity in patients already being treated. (B)

Summary Statement 2. Management on the basis of asthma control encompasses the principles of chronic disease management, including periodic assessment, goal (outcome) orientation, and individualization of therapy. (B)

Summary Statement 3. Asthma control can be expected to change over time. Asthma control should be assessed at every clinical encounter for asthma, and management de-

terminations should be based on the level of asthma control. (B)  
Summary Statement 4. Asthma control is based on asthma symptoms, sleep disturbance, use of rescue medication, limitations of daily activity, patient and physician overall assessment, and lung function. (A)

Summary Statement 5. Asthma should be considered well controlled if (1) asthma symptoms are twice a week or less; (2) rescue bronchodilator medication is used twice a week or less; (3) there is no nocturnal or early morning awakening; (4) there are no limitations of work, school, or exercise; (5) the patient and physician consider their asthma well controlled; and (6) the patient's peak expiratory flow (PEF) or FEV<sub>1</sub> is normal or his or her personal best. (B)

Summary Statement 6. Complete or total control of asthma can be defined as (1) no asthma symptoms; (2) no rescue bronchodilator use; (3) no nighttime or early morning awakening; (4) no limitations on exercise, work, or school; (5) complete control of asthma by patient and physician assessment; and (6) normal or personal best PEF or FEV<sub>1</sub>. (A)

Summary Statement 7. In addition to the assessment of asthma control, there are several important activities that should be accomplished during the periodic visit for asthma, including assessment of psychosocial status, assessment of adherence-compliance, assessment of medication use and side effects, assessment of asthma triggers, review of written asthma action plan (as appropriate), and confirmation of asthma diagnosis. (B)

Summary Statement 8. A patient's asthma control for a specific clinical encounter should be determined as well controlled or not well controlled. (B)

Summary Statement 9. A more detailed assessment of asthma should be conducted, especially for patients whose asthma is not well controlled. (B)

Summary Statement 10. The step care of asthma should be based on asthma control. (A)

Summary Statement 11. Asthma management driven by level of asthma control demands a close partnership between physician and patient. (B)

## ASTHMA SEVERITY AND ASTHMA CONTROL

### Summary Statement 1. Asthma symptoms do not always correlate with asthma severity. There are limitations to classifying asthma severity in patients already being treated. (B)

In 1991, the NHLBI published its first set of guidelines for the diagnosis and management of asthma.<sup>3</sup> This publication introduced the concept of classification of asthma by asthma severity (mild, moderate, and severe) and linked asthma severity to a stepwise guide to pharmacotherapy of asthma. Because the criteria of classification of asthma severity included asthma symptoms and objective measures of airway obstruction, this scheme highlighted the importance of a detailed asthma history (eg, frequency of symptoms, sleep disturbance, frequency of asthma exacerbations, and frequency of rescue

\*Although these practice parameters were developed for physicians, the guideline content might be useful for other health professionals.

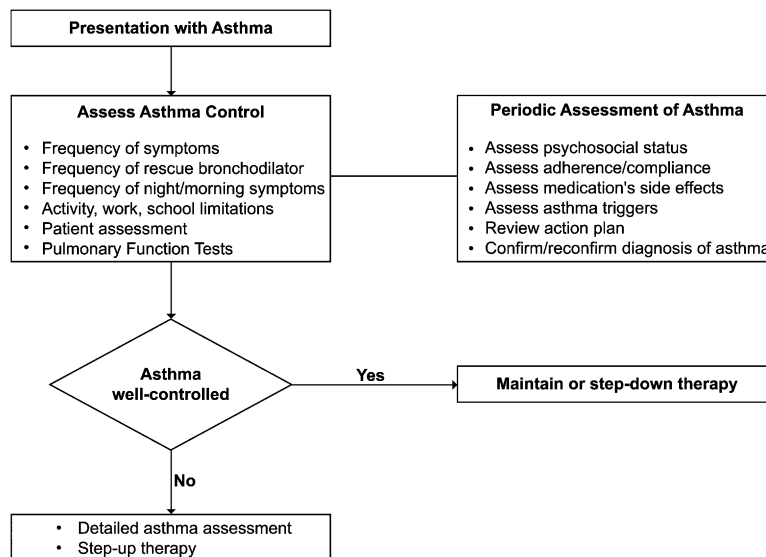


FIG 1. Algorithm for attaining optimal asthma control.

bronchodilator use), as well as the importance of peak flow measurement and spirometry.

Furthermore, the guidelines for pharmacotherapy established a stepwise progression of pharmacologic treatment of asthma, with emphasis of anti-inflammatory treatment for all but the mildest asthma. The published guideline also included a list of goals of asthma management, an important but often overlooked component of asthma management (Table I).

Thus the 1991 NHLBI asthma guidelines introduced several key components to guideline-driven asthma management, namely the following:

- the importance of taking a history of asthma symptoms, sleep disturbance, and rescue bronchodilator use;
- appreciation of asthma as a chronic inflammatory disorder;
- preferred use of anti-inflammatory therapy, especially inhaled corticosteroids;
- the importance of objective measures of airway obstruction;
- step care of asthma; and
- goals of asthma management.

These principles remain essential to guideline-driven asthma management. However, several limitations to full implementation of these asthma guidelines have surfaced over the years. The 1991 NHLBI asthma guidelines base the classification of asthma severity on assessment before treatment. Thus classification of asthma severity while the patient is receiving therapy is problematic. Subsequent revisions of these guidelines introduced the idea of “medication requirement” to address this concern.<sup>4,5</sup> Furthermore, asthma symptoms do not correlate well with classification of asthma severity.<sup>6</sup>

**Summary Statement 2. Management based on asthma control encompasses the principles of chronic disease management, including periodic assessment, goal (outcome) orientation, and individualization of therapy. (B)**

The present classification of asthma severity promotes the erroneous idea that asthma “class” is static. In fact, asthma symptoms, sleep disturbance, rescue medication use, and pulmonary function might change significantly over time,<sup>7</sup> which highlights the need for continual clinical reassessment and the need for possible medication adjustment.<sup>8-10</sup> The strategy of reaching or attaining the goals of asthma management has been de-emphasized by users of the guideline. For example, limitations on exercise, work, or school have not been emphasized in guideline-driven asthma management, perhaps because these criteria are not components of asthma severity classification.

In 1996, Cockcroft<sup>11</sup> noted the conflation of asthma severity and asthma control in previously published asthma guidelines and recommended that asthma control be separated from asthma severity. Osborne et al<sup>6</sup> found a lack of correlation between symptoms and long-term asthma severity. This publication (“Attaining optimal asthma control: a practice parameter”) builds on the foundation of the NHLBI asthma report and extends the concept of guideline-driven asthma management, as suggested by Cockcroft.<sup>11</sup> The components of asthma control, as elaborated below, include asthma symptoms, sleep disturbance, rescue medication use, measures of lung function, limitations on daily activity, and patient assessment of asthma control.

Measures of asthma control typically reflect the burden of asthma over a relatively short period of time (up to 4

**TABLE I.** Goals of asthma treatment

Prevent chronic and troublesome symptoms
Maintain (near-) normal pulmonary function
Maintain normal activity levels
Prevent recurrent exacerbations of asthma
Provide optimal pharmacotherapy with minimal or no adverse effects
Meet patients' and families' expectations

Based on "Expert Panel Report 2: guidelines for the diagnosis and management of asthma."<sup>5</sup>

weeks).<sup>12</sup> The long-term burden of asthma (eg, unscheduled visits for exacerbations or use of rescue systemic corticosteroids) is also important. Current controller asthma therapy, although important, does not directly contribute to the assessment of asthma control.

The severity of asthma generally is not reclassified at every clinical encounter. On the other hand, asthma control can be expected to change over time<sup>7</sup> and should be assessed by the patient and physician periodically, at every clinical encounter for asthma, and at acute care and scheduled visits. Because assessment of asthma control is independent of current medication, asthma control is dissociated from asthma severity classification. This facilitates individualization of treatment. For example, patients differ in how they respond to and tolerate asthma medications (not all patients with asthma have symptoms that can be controlled with identical treatment).<sup>13-18</sup> Furthermore, patients with more severe asthma can (and should) have symptoms that are very well controlled with appropriate treatment.

It is not surprising that the care of the asthmatic patient is a complex intervention. Asthmatic patients differ in their sensitivity to triggers, such as seasonal and occupational allergens. Beyond the plethora of potential triggers, recent studies have highlighted the heterogeneity of disease. This heterogeneity might be a consequence of variability in inflammatory cell milieus,<sup>19,20</sup> genetic polymorphisms,<sup>17,18,21</sup> and results in variability in response to antiasthma medicines.<sup>13-16</sup>

Asthma management driven by assessment of asthma control emphasizes and operationalizes the goals of asthma therapy, as originally listed in the NHLBI publication. Assessment and targets of asthma control also build on the step-up and step-down guideline, as recommended in the NHLBI report. Perhaps more importantly, control-driven asthma guidelines encompass the principles of chronic disease management, including periodic assessment, goal (outcome) orientation, and individualization of therapy.

## ASSESSMENT OF ASTHMA CONTROL

**Summary Statement 3. Asthma control can be expected to change over time. Asthma control should be assessed at every clinical encounter for asthma, and management**

**TABLE II.** Definition of well-controlled asthma

Asthma symptoms twice a week or less
Rescue bronchodilator use twice a week or less
No nighttime or early morning awakening
No limitations on exercise, work, or school
Well-controlled asthma by patient and physician assessment
Normal or personal best PEF or FEV <sub>1</sub>

Modified from "National Asthma Education and Prevention Program Expert Panel Report: guidelines for the diagnosis and management of asthma,"<sup>3</sup> Bateman et al,<sup>22</sup> and Nathan et al.<sup>23</sup>

## decisions should be based on the level of asthma control. (B)

Asthma control should be assessed at every clinical encounter for asthma, and management decisions should be based on the level of asthma control. The components of asthma control assessment roughly follow the NHLBI criteria for classification of asthma severity, with several additions and modifications (Table II, see below).<sup>3,5,22,23</sup>

## Summary Statement 4. Asthma control is based on asthma symptoms, sleep disturbance, use of rescue medication, limitations of daily activity, patient and physician overall assessment, and lung function. (A)

The interim medical history and assessment of asthma control should include determination of frequency and intensity of asthma symptoms (typically shortness of breath, wheeze, and cough), with particular attention to nighttime or early morning symptoms.<sup>22-26</sup> The frequency of rescue bronchodilator use should be determined through the history (and pharmacy use, if possible). The effect or burden of asthma on exercise, work, school, and recreation should be inquired about directly. The patient's assessment, caregiver's assessment, or both of asthma control is an important component of control assessment and should be inquired about directly. However, physicians and patients often underestimate the level of asthma control.<sup>27-30</sup> Interim health care use<sup>25,26</sup> (eg, emergency department visits, hospitalizations, health care costs,<sup>31</sup> and quality of life<sup>32,33</sup>) are correlated with the level of asthma control. The level of asthma control in children correlates with lost workdays of caregivers.<sup>34</sup>

Because symptoms and patients' reports do not always accurately reflect airway obstruction, peak flow measurement or spirometry should be performed. Some patients can be described as "poor perceivers" of airway obstruction. For these patients, spirometry and biomarkers of inflammation might be particularly important. Other patients might report significant symptoms or medication use in the face of good lung function test results. The physician's role (see below) is to assess the asthma control data to make a judgment about asthma control. In short, physician assessment of asthma control includes both historical and spirometric data, which are sometimes conflicting.

**Summary Statement 5. Asthma should be considered well controlled if (1) asthma symptoms are twice a week or less; (2) rescue bronchodilator medication is used twice a week or less; (3) there is no nocturnal or early morning awakening; (4) there are no limitations of work, school, or exercise; (5) the patient and physician consider their asthma well controlled; and (6) the patient's PEF or FEV<sub>1</sub> is normal or his or her personal best. (B)**

In clinical practice asthma control assessment usually will encompass the entire interim between periodic visits. The goal of asthma treatment is well-controlled asthma, which can be defined as follows<sup>3,22,23</sup>:

- asthma symptoms twice a week or less;
- rescue bronchodilator use twice a week or less;
- no nighttime or early morning awakening;
- no limitations on exercise, work, or school;
- well-controlled asthma by patient and physician assessment; and
- normal or personal best (after aggressive therapy) PEF or FEV<sub>1</sub>.

Surveys indicate that a large proportion of patients with asthma experience poor control of asthma.<sup>25,26,30,35-37</sup>

**Summary Statement 6. Complete or total control of asthma can be defined as (1) no asthma symptoms; (2) no rescue bronchodilator use; (3) no nighttime or early morning awakening; (4) no limitations on exercise, work, or school; (5) complete control of asthma by patient and physician assessment; and (6) normal or personal best PEF or FEV<sub>1</sub>. (A)**

Complete or total control of asthma can be defined as no asthma symptoms; no rescue bronchodilator use; no nighttime or early morning awakening; no limitations on exercise, work, or school; complete control of asthma by patient assessment; and normal or personal best (after aggressive therapy) PEF or FEV<sub>1</sub>. Although well-controlled<sup>22</sup> asthma is the recommended target for all patients with asthma, complete control might be attainable and appropriate for many patients. As discussed below, the goals of well-controlled or totally controlled asthma must be balanced against the cost and potential adverse effects of asthma medications.

There are published but proprietary questionnaire instruments that might be useful in assessing asthma control. The Asthma Control Questionnaire,<sup>24</sup> the Asthma Therapy Assessment Questionnaire (ATAQ),<sup>25,26</sup> and the Asthma Control Test,<sup>23</sup> have been studied, validated, and published. Well-controlled asthma corresponds to a score of zero (control problems) for the ATAQ (range, 0-4 control problems) and 20 or higher for the Asthma Control Test (range, 0-25). Retrospective and prospective studies of the ATAQ instrument of asthma control show a strong

correlation between the level of asthma control and health care use for asthma.<sup>25</sup> That is, patients with poorly controlled asthma were more likely to require urgent or emergency treatment for asthma exacerbations.<sup>26</sup>

An area of current research focuses on the development of more novel measures of asthma control. Sputum eosinophils,<sup>38,39</sup> bronchial hyperresponsiveness,<sup>40,41</sup> and other markers of airway inflammation, such as exhaled nitric oxide,<sup>42-45</sup> have been evaluated as potentially useful markers of asthma control. In the future, assessment of asthma control will include parameters beyond medical history and lung function tests.

**Summary Statement 7. In addition to the assessment of asthma control, there are several important activities that should be accomplished during the periodic visit for asthma, including assessment of psychosocial status, assessment of adherence-compliance, assessment of medication use and side effects, assessment of asthma triggers, review of written asthma action plan (as appropriate), and confirmation of asthma diagnosis. (B)**

In addition to the assessment of asthma control, there are several important activities that are important for the periodic visit for asthma.<sup>3,5</sup> These include development of an asthma action plan, assessment and management of psychosocial issues, adherence-compliance, and patient-specific education. Complicating or coexisting medical problems should be assessed and managed, including adverse effects of medications. Because erroneous diagnosis is a leading cause of poor asthma control, attention to the diagnosis of asthma is important to revisit during the periodic clinical encounter. Examples of conditions that might be confused with asthma include vocal cord dysfunction, cardiovascular disorders, emphysema, cystic fibrosis, and hyperventilation. Spirometry with and without a bronchodilator or consideration of tests for nonspecific bronchial hyperresponsiveness are appropriate for most patients. Interpretation of methacholine bronchial challenge testing can be complex and is usually done by allergists and pulmonologists. Because exposure to asthma triggers (eg, allergens and infections) is an important contributor to poorly controlled asthma, assessment and instruction on avoidance of triggers should be conducted during periodic visits.<sup>46</sup>

## STEP CARE BASED ON ASTHMA CONTROL

**Summary Statement 8. A patient's asthma control for a specific clinical encounter should be determined as well controlled or not well controlled. (B)**

On the basis of the criteria of asthma control as outlined above, a patient's asthma control for a specific clinical

encounter can be determined as well controlled or not well controlled. This dichotomous determination then drives the clinical decision to maintain treatment unchanged or to step up or step down treatment.<sup>47</sup> In short, asthma that is completely or well controlled generally warrants unchanged or step-down therapy, whereas asthma that is not well controlled warrants re-evaluation and a step up or change in therapy.<sup>22,47,48</sup>

**Summary Statement 9. A more detailed assessment of asthma should be conducted, especially for patients whose asthma is not well controlled. (B)**

In practice a more detailed assessment of asthma should be conducted, especially for patients whose asthma is not well controlled. There might be a number of factors behind asthma that is not well controlled, and each should be considered during the periodic visit. Examples include poor adherence-compliance, exposure to allergic triggers, inability to afford medications, respiratory infection, psychological or emotional problems, complicating medical disorders, drug interactions, and erroneous diagnosis.<sup>3,5</sup> Identification of allergic and occupational triggers, with appropriate education and intervention, is important for many patients.<sup>3,5,46</sup>

**Summary Statement 10. The step care of asthma should be based on asthma control. (A)**

The step care of asthma based on asthma control mirrors that of the NHLBI asthma guidelines, which are based on classification of severity.<sup>3,5</sup> The steps labeled mild intermittent, mild persistent, moderate persistent, and severe persistent in the NHLBI guideline are relabeled as steps 1, 2, 3, and 4, respectively, in this control-driven guideline (see Table III for a simplified version). The physician (in partnership with the patient) should develop an individualized management plan on the basis of the level of asthma control and using nonpharmacologic and pharmacologic therapeutic modalities. Pharmacologic agents effective in the management of asthma include short- and long-acting inhaled  $\beta$ -agonists; inhaled and systemic corticosteroids; leukotriene modifiers; theophylline, cromolyn, and nedocromil; and inhaled anticholinergic agents. Immunologic therapies include monoclonal anti-IgE and specific allergen immunotherapy.<sup>49</sup>

A more detailed assessment might be useful, even for patients whose asthma is well controlled. The history of prior asthma exacerbations, more detail on possible activity limitations, and the presence or absence of adverse effects of medication should help the clinician and patient decide whether step-down therapy or maintenance of the asthma treatment program is appropriate.<sup>47</sup> A step down in treatment usually includes decreasing the dose or frequency of medication use, switching from more medications with a higher risk of adverse effects to those with a lower risk of adverse effects, or discontinuing a medication. Assessment of asthma control should allow for individualization of therapy, taking individual response to treatment into account.<sup>13,14</sup>

**TABLE III.** Simplified guidelines for the pharmacotherapy of asthma

Step 1	Short-acting $\beta$ -agonist as needed (indicated for all patients)
Step 2	Low-dose ICSs, leukotriene modifiers, theophylline, cromolyn, or nedocromil
Step 3	Low-dose/medium-dose ICSs plus inhaled LABA or medium-dose ICSs; low-dose/medium-dose ICSs plus either leukotriene modifier or theophylline
Step 4	High-dose ICSs and LABA plus systemic corticosteroids if needed (consider monoclonal anti-IgE)

Modified from "National Asthma Education and Prevention Program Expert Panel Report 2: guidelines for the diagnosis and management of asthma."<sup>5</sup> ICS, Inhaled corticosteroid; LABA, long-acting  $\beta$ -agonist.

An asthma management intervention based on assessment of asthma control (using the ATAQ instrument) showed improvement in emergency department use and hospitalizations for asthma.<sup>48</sup> A randomized controlled study showed that asthma management guided by assessment of asthma control can result in improved control of asthma.<sup>22</sup> The study also showed that well-controlled asthma could be attained in the majority of patients. At the same time, about one third of participants in the study were not able to attain well-controlled asthma, highlighting the importance of individualization of asthma management.

**PHYSICIAN'S ROLE IN ATTAINING ASTHMA CONTROL**

**Summary Statement 11. Asthma management driven by level of asthma control demands a close partnership between physician and patient. (B)**

Asthma management driven by level of asthma control demands a close partnership between physician and patient. In partnership with the patient, the physician should set a realistic target for asthma control while balancing the risks and benefits of therapy. Well-controlled asthma, as defined above, is a realistic target for most, but not all, patients.<sup>22</sup> However, both the treatment goals and the treatment program should be individualized. Some patients are not fully satisfied with well-controlled asthma and might wish to attain complete control of asthma. Other patients might be able to attain well-controlled asthma only with high doses of asthma medication or with medications that cause significant adverse effects and might accept a lower level of asthma control. Some patients, for example those with steroid-resistant asthma or fixed airway obstruction, might be able to attain only partially controlled asthma, although management should still be directed at attaining the patient's personal best. Patients with frequent asthma exacerbations or who are at high risk for a fatal asthma exacerbation might require more intensive pharmacotherapy of asthma and more frequent clinic visits, even if the asthma is well controlled between flare-ups.

For these reasons, the physician should be attentive to the possibility of overtreating and undertreating asthma and to the cost and adverse effects of medication. This should include consideration of allergen immunotherapy that has been shown to be effective and safe in properly selected patients with asthma.<sup>49</sup> Smoking cessation and avoidance of environmental smoke and allergens are appropriate for many patients.

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