
OVERCOMING BARRIERS TO USING ASTHMA CLINICAL PRACTICE GUIDELINES

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Over the last decade, clinical practice guidelines have become a common method for improving the quality of patient care [1]. The Institute of Medicine defines guidelines as “systematically developed statements to assist practitioners and patients about appropriate medical care for specific circumstances” [2]. Guidelines can impact the quality of medical care in 2 ways.

First, guidelines should decrease the amount of inappropriate variation in patient care [3]. Because no standard or typical patient exists, variation in medical care will always be present. Unexplained or inappropriate variation, however, is a well-documented phenomenon in clinical practice. For example, Chassin et al [4] analyzed medical and surgical procedures (eg, cholecystectomy, bronchoscopy, carotid endarterectomy) performed for Medicare patients in 13 geographic sites in the United States and, for 67 of the 123 procedures analyzed, found up to threefold differences in the procedure rates between the sites with the lowest and highest rates.

A second way clinical practice guidelines can impact the quality of care is by helping to expedite the application of new clinical advances [2,3]. The diffusion of new innovations in medicine sometimes is slow [5]. For example, Lamas et al [6] studied the effects of the publication of 2 randomized clinical trials that reported the beneficial effects of aspirin following myocardial infarction (MI) on physicians' approach to managing patients after MI. Although prescribing patterns changed dramatically during a 3-year period, physicians' prescription of aspirin was incomplete, as only 72% of MI patients were using aspirin.

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A common topic for clinical practice guidelines is asthma, which has become a major public health concern in the United States in recent decades. In 1994, an estimated 13 million persons reported having asthma [7]. Prevalence and death rates for asthma have increased over the past 15 years [7], despite recent advances in our understanding of asthma pathophysiology and treatment strategies useful for reducing asthma morbidity. The high prevalence of asthma coupled with continued advances have sparked interest in developing and updating clinical practice guidelines for the diagnosis and management of asthma. Several national and international organizations have authored asthma guidelines (Table 1), which are in common use. In addition, local health care institutions, medical societies, and managed care organizations are developing and implementing asthma guidelines.

This article uses scenarios illustrating specific elements of the National Heart, Lung, and Blood Institute (NHLBI) asthma guidelines (Table 2) [8] to examine ways in which physician practice may not always match guideline recommendations. Reasons why physicians may have difficulty applying guidelines to everyday practice are explored (Table 3), and suggestions for overcoming these barriers are offered. As a caveat, guidelines should only *assist* physicians and patients in making clinical care decisions; physicians still must develop care plans tailored to their individual patient's needs and situation.

Lack of Agreement with Guidelines

A 9-year-old boy is brought by his mother for evaluation of worsening asthma symptoms. The patient was diagnosed with asthma several years ago by your partner. The patient has been using an inhaled short-acting bronchodilator (β_2 agonist) as needed for symptoms of wheezing and shortness of breath. The patient and his mother now report that he has daily symptoms and nighttime symptoms approximately 3 times per week. Based on this information, you decide to:

1. Make no change in therapy (ie, continue the short-acting β_2 agonist as needed).

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Table 1. Commonly Used Asthma Clinical Practice Guidelines

Guideline Sponsor	Internet Address
Global Initiative for Asthma (National Heart, Lung, and Blood Institute and World Health Organization Study Group on the Global Strategy for Asthma Management and Prevention)	www.ginasthma.com/xprac.htm
The British Thoracic Society, The National Asthma Campaign, The Royal College of Physicians of London, et al	thorax.bmjournals.com/cgi/reprint/52/suppl_1/S1.pdf
National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program	www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf
American Academy of Pediatrics, Provisional Committee on Quality	www.aap.org/policy/asthmaref.html
Joint Task Force on Practice Parameters, representing the American Academy of Allergy Asthma and Immunology, the American College of Allergy, Asthma and Immunology, and the Joint Council of Allergy, Asthma and Immunology	www.jcaai.org/Param/Asthma.htm

2. Continue the short-acting β_2 agonist as needed and add daily inhaled cromolyn.
3. Continue the short-acting β_2 agonist as needed and add a daily inhaled corticosteroid.
4. Continue the short-acting β_2 agonist as needed and add a daily leukotriene modifier.

NHLBI Recommendation: Use Medications Appropriately

This scenario highlights the variable nature of asthma and the need to tailor pharmacologic management to the needs of a given patient at a given time. Because asthma may improve or worsen over time, the NHLBI guidelines recommend regular monitoring of patients so that treatment can be adjusted as needed to gain and then maintain control of asthma symptoms. The guidelines clearly distinguish medications used to achieve control of persistent asthma (ie, inhaled corticosteroids, inhaled long-acting bronchodilators) from those used to provide prompt symptom relief (ie, short-acting β_2 agonists). To guide decisions regarding treatment, NHLBI suggests a system for classifying asthma severity based on the frequency of symptoms, the occurrence of symptoms at night, and/or the results of lung function tests (Table 4) [8].

According to the NHLBI severity classification system, this patient's daily symptoms place him in the category of moderate persistent asthma, for which he requires a daily long-term control medication to better control his symptoms. The NHLBI guidelines recommend a stepwise approach to the use of medications and state a clear preference for initiating therapy at a more intense level in attempt to rapidly suppress airway inflammation

(Figure 1) [8]. Following this approach, the preferred medication regimen for the patient in this scenario is a daily inhaled corticosteroid (answer #3). Corticosteroids are recognized by many asthma experts, including those who developed the NHLBI guidelines, as the most effective anti-inflammatory medication available (Figure 2) [9,10]. An inhaled long-acting bronchodilator also may be useful for this patient's nighttime symptoms.

Barrier to Adherence

Reflecting on the scenario and the options for treating this young asthma patient, you may have selected the addition of daily inhaled cromolyn (answer #2). Although cromolyn can be effective for patients with mild persistent asthma, its usefulness for patients with more prominent symptoms is limited. Nevertheless, evidence suggests that many physicians do not follow the recommendation to use daily inhaled corticosteroids for patients with moderate persistent asthma, despite wide distribution of the NHLBI asthma guidelines. For example, analysis of physician prescribing patterns revealed that the use of anti-inflammatory asthma medication was not consistent with this NHLBI recommendation [11,12].

Focus group discussions with physicians suggest that 1 reason for poor adherence to the NHLBI recommendation to use inhaled corticosteroids is a lack of agreement [13]. Specifically, some physicians may be concerned about the safety of these medications—especially the risk of possible growth retardation—in young asthma patients such as the patient presented in the preceding scenario.

Possible local side effects of inhaled corticosteroids include oral candidiasis and reflex cough; potential

systemic side effects include linear growth retardation, effects on bone metabolism (eg, osteoporosis), and depressed function of the hypothalamic-pituitary axis [14]. However, the possible adverse effects of inhaled corticosteroids must be balanced against the potential long-term physiologic effects of uncontrolled asthma, such as airway remodeling [15], as well as the impact that asthma may have on quality of life, such as school or work absenteeism, decreased physical activity, and disruption of family activity [16]. The NHLBI guidelines state that “the potential but small risk of adverse events from the use of inhaled corticosteroids is well balanced by their efficacy” [8]. Of note, recent studies have shown that steroids prescribed in appropriate doses have minimal systemic side effects [17,18].

Overcoming the Barrier

Get involved with guidelines. Active physician participation in the development of clinical practice guidelines should lead to greater agreement with and subsequent adoption of those guidelines [19]. This phenomenon may be due to an increased attitude of ownership or improved knowledge of the evidence behind a guideline. For whatever reason, the trend for individual institutions, hospitals, and managed care groups to develop their own (“local”) clinical practice guidelines has been accompanied by reports that attribute greater physician adherence to guidelines to the meaningful involvement of those physicians in their development and implementation [20,21].

Picken et al [22] documented the effects of physician participation in the creation of local asthma guidelines compared with existing national asthma guidelines. When there was strong evidence to support the guidelines and physicians had the opportunity to review such evidence, physicians agreed with national experts. For example, locally developed guidelines were similar to national guidelines with respect to recommendations accompanied by strong, evidence-based support in the literature (eg, pharmacotherapy with anti-inflammatory medications) [23].

Learn to evaluate guidelines. Despite the trend to develop local guidelines, many physicians are not in a position to be involved in this process. As a result, as end-users of guidelines, physicians may disagree with or have concerns about the validity of guideline recommendations. Reasons may include differences in interpretation, lack of confidence in the guideline developer, or lack of applicability to specific patients in their practice [24]. Thus, it is important for physicians to be able to critically evaluate the quality of evidence presented in guidelines [25] as well as the validity and applicability of

Table 2. Major Recommendations from the NHLBI Asthma Guidelines

Diagnose asthma and initiate partnership with patient

Diagnose asthma

- Establish a history of recurrent symptoms
- Establish reversible airflow obstruction using spirometry
- Exclude alternative diagnoses

Establish patient-clinician partnership

- Address the patient’s concerns
- Agree upon the goals of asthma therapy
- Agree upon a written action plan for patient self-management

Reduce inflammation, symptoms, and exacerbations

Prescribe anti-inflammatory medications (ie, inhaled steroids, cromolyn, nedocromil) to patients with mild, moderate, or severe persistent asthma

Reduce exposures to precipitants of asthma symptoms

- Assess the patient’s exposure and sensitivity to individual precipitants (eg, allergens, irritants)
- Provide written and verbal instructions on how to avoid or reduce factors that exacerbate the patient’s asthma

Monitor and manage asthma over time

Train all patients to monitor their asthma

- All patients should monitor symptoms
- Patients with moderate to severe persistent asthma also should be instructed to monitor their peak flow

See patients at least every 1 to 6 months

- Assess the patient’s concerns and attainment of goals of asthma therapy
- Adjust treatment, if needed
- Review the action plan with the patient
- Check the patient’s inhaler and peak flow technique

Treat asthma episodes promptly

Prescribe short-acting inhaled β_2 agonists promptly

If episode is moderate to severe, initiate a 3- to 10-day course of oral steroids

Ensure prompt communication and follow-up between the patient and clinician

Adapted with permission from National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program. Practical guide for the diagnosis and management of asthma. Based on the Expert Panel report 2: guidelines for the diagnosis and management of asthma. Bethesda (MD): U.S. Department of Health and Human Services, National Institutes of Health; 1997:3. NIH Publication No. 97-4053.

guidelines to their individual patients. Evaluation also is important because guidelines can come from many different sources and be of variable quality.

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Table 3. Major Barriers to Physician Adherence to Guidelines

Barrier	Comments
Lack of awareness	Guidelines have little impact if physicians are not aware of them. More than 2000 guidelines are listed in the <i>Clinical Practice Guidelines Directory, 2000 Edition</i> (Chicago [IL]: American Medical Association; 2000), and more than 820 are included in the National Guidelines Clearinghouse™ (www.guidelines.gov).
Lack of familiarity	Physicians not only must have copies of guidelines, but they also must be familiar enough with their details to use them correctly.
Lack of agreement	Physicians may disagree with the concept of guidelines in general. Physicians also may disagree with a guideline's recommendations because of their interpretation of the evidence, the guideline's applicability to their patients, or their lack of confidence in the guideline's author(s).
Lack of self-efficacy	Physicians may believe that they cannot perform the recommendations of a guideline because they lack appropriate training or experience. This barrier often is associated with preventive health guidelines that recommend that physicians counsel or educate patients.
Lack of outcome expectancy	Even if physicians believe that they can perform a guideline recommendation, they may not believe that it will affect patient outcomes. This barrier may result from a physician previously obtaining underwhelming outcomes following performance of guideline recommendations. This barrier also is associated with preventive health guidelines that recommend that physicians counsel or educate patients.
The inertia of previous practice	Physicians may not follow guidelines that recommend changes in practice (ie, modifying habits or old routines), despite their proper knowledge of and attitudes about a guideline.
External or practice-related barriers	Physicians may be unable to overcome barriers in their practice environment, such as lack of time, lack of reimbursement for following guidelines, or limited staff to carry out guidelines. Physicians may be unable to reconcile patient preferences with guideline recommendations. Guidelines themselves may be confusing or unclear.

Adapted with permission from Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PA, Rubin HR. Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA* 1999;282:1458-65.

Physicians must feel comfortable that a guideline, like any published study, is rigorous and up-to-date before using it to guide patient care decisions. Physicians should consider the following when evaluating a guideline:

- What diagnostic and therapeutic options were considered by the guideline?
- What process was used to develop the guideline (ie, an evidence-based approach or an informal consensus of experts)?
- What is the impact of uncertainty on the evidence used for the guidelines? In many cases, evidence is not available to answer a specific guideline question. As a result, guideline authors may qualify the strength of their recommendations.
- How applicable are the recommendations to a physician's patients?
- What values were used to develop the guidelines? For example, was the guideline developed solely to

improve quality of care or also to promote cost-effective care? If cost-effectiveness was a criterion for the guideline recommendations, was this evaluated from a patient, health system, or societal point of view? The explicit or implicit criteria used, as well as the perspective taken, can influence a guideline's formal recommendations.

Low Outcome Expectancy

A 19-year-old college student comes in for a routine follow-up visit for asthma. The patient was diagnosed when she was 8 years old and has been taking moderate-dose inhaled corticosteroids and a long-acting bronchodilator for several years. She has been hospitalized multiple times, including 1 admission earlier this year when she presented to the emergency department with severe symptoms and required intubation. At that time, she reported that she did not feel symptoms of her asthma until a few hours before she went to the hospital.

When asked about her current level of symptoms, she replies that she "feels fine" and is not bothered by

Table 4. Classification of Asthma Severity Based on Clinical Features Before Treatment

Severity Level	Days with Symptoms	Nights with Symptoms	PEF or FEV ₁ *	PEF Variability
Step 4: Severe persistent	Continual	Frequent	≤ 60%	> 30%
Step 3: Moderate persistent	Daily	≥ 5/mo	> 60% to < 80%	> 30%
Step 2: Mild persistent	3 to 6/wk	3 to 4/mo	≥ 80%	20% to 30%
Step 1: Mild intermittent	≤ 2/wk	≤ 2/mo	≥ 80%	< 20%

NOTE. Patients should be assigned to the most severe step in which any feature occurs. Clinical features for individual patients may overlap across steps. An individual's classification may change over time. Patients at any level of severity of chronic asthma can have mild, moderate, or severe exacerbations of asthma. Some patients with intermittent asthma experience severe and life-threatening exacerbations separated by long periods of normal lung function and no symptoms. (Adapted with permission from National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program. Practical guide for the diagnosis and management of asthma. Based on the Expert Panel report 2: guidelines for the diagnosis and management of asthma. Bethesda [MD]: U.S. Department of Health and Human Services, National Institutes of Health; 1997:10. NIH Publication No. 97-4053.)

*Percent predicted values for percent of personal best for peak expiratory flow (PEF) and forced expiratory volume in 1 second (FEV₁), which are relevant for children aged 6 years or older who can use the appropriate devices.

her asthma. On further questioning, however, you learn that she recently dropped out of the school band because she is having trouble marching and playing her trumpet at the same time. She also is doing poorly in her first class of the day because she has difficulty waking up in time to attend lecture. She states that sometimes this results from staying up late to talk with friends, but at other times she “tosses and turns all night coughing.” She thinks that the coughing at night is worse now compared with the beginning of the semester but cannot be more specific about the frequency or severity of this symptom.

You are concerned that her asthma is poorly controlled and decide to increase her dose of inhaled steroids. You schedule a follow-up visit in 3 weeks to evaluate the change in therapy. At the next visit you plan to:

1. Review a daily symptom diary you've asked the patient to fill out over the next 3 weeks.
2. Ask the patient about any school absences, reduction in activity, or sleep disturbances over the 3-week period.
3. Ask the patient how often she needed to use a short-acting β_2 agonist over the 3-week period.
4. Review a daily diary of peak flow meter readings you've asked the patient to fill out over the next 3 weeks.

NHLBI Recommendation: Establish a Partnership Through Patient Education and Shared Monitoring

This scenario highlights the importance of periodic clinical assessment of asthma patients and the value that

effective patient self-monitoring can bring to these visits. Patients must be taught many essential concepts about asthma to be active partners in their own care, including understanding how to accurately assess their asthma. Several methods of self-monitoring may be used, including tracking symptoms and other effects of asthma (eg, missed work or school, sleep disturbance), monitoring the amount of quick-relief medication (short-acting β_2 agonist) used per month, and tracking peak flow measurements daily.

All patients should be taught to recognize asthma symptoms. However, some patients are less perceptive about changes in pulmonary function than others and are considered “poor perceivers.” Patients at risk for being poor perceivers include those who have had poorly controlled airway inflammation for an extended period of time and those who have had near-fatal exacerbations [26,27]. In the case of this patient, the combination of her near-fatal exacerbation and indications from her history that she is unaware of having asthma symptoms should heighten concern about the need for an objective method to monitor her pulmonary function. All of the listed approaches are useful for evaluating changes in clinical status. Properly performed peak flow monitoring (answer #4) is particularly useful because it offers a very sensitive and objective measure of the effects of changing the patient's therapy. Peak flow meters are useful for providing simple, quantitative measures of airflow obstruction and, in this case, may be more sensitive to airway changes that could signal an oncoming exacerbation.

The NHLBI guidelines recommend daily peak flow monitoring for all patients with moderate to severe

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Long-Term Control	
	Preferred treatments are in bold print.
Step 4: Severe Persistent	Daily medications: <ul style="list-style-type: none">• Anti-inflammatory: inhaled steroid (high dose) AND• Long-acting bronchodilator: either long-acting inhaled β_2 agonist (adult: 2 puffs q 12 hr; child: 1–2 puffs q 12 hr), or sustained-release theophylline, or long-acting β_2 agonist tablets AND• Steroid tablets or syrup long term; make repeated attempts to reduce systemic steroid and maintain control with high-dose inhaled steroid.
Step 3: Moderate Persistent	Daily medications: <ul style="list-style-type: none">• Anti-inflammatory: inhaled steroid (medium dose) OR• Inhaled steroid (low-to-medium dose), and add a long-acting bronchodilator, especially for nighttime symptoms: either long-acting inhaled β_2 agonist (adult: 2 puffs q 12 hr; child: 1–2 puffs q 12 hr), or sustained-release theophylline, or long-acting β_2 agonist tablets.• If needed:<ul style="list-style-type: none">→ Anti-inflammatory: inhaled steroids (medium-to-high dose) AND→ Long-acting bronchodilator, especially for nighttime symptoms: either long-acting inhaled β_2 agonist, or sustained-release theophylline, or long-acting β_2 agonist tablets.
Step 2: Mild Persistent	Daily medication: <ul style="list-style-type: none">• Anti-inflammatory: either inhaled steroid (low dose), or cromolyn (adult: 2–4 puffs tid–qid; child: 1–2 puffs tid–qid), or nedocromil (adult: 2–4 puffs bid–qid; child: 1–2 puffs bid–qid). (Children usually begin with a trial of cromolyn or nedocromil.)• Sustained-release theophylline to serum concentration of 5 to 15 $\mu\text{g/mL}$ is an alternative, but not preferred, therapy. Zafirlukast or zileuton also may be considered for patients aged ≥ 12 years, although their position in therapy is not completely established.
Step 1: Mild Intermittent	No daily medication needed.

Quick Relief	
All Patients	Short-acting bronchodilator: inhaled β_2 agonist (2–4 puffs) as needed for symptoms. Intensity of treatment will depend on severity of exacerbation.

Figure 1. Stepwise approach to pharmacologic treatment of asthma in adults and children older than age 5 years. The stepwise approach presents general guidelines to assist clinical decision-making. Asthma is highly variable, so clinicians should tailor medication plans to the needs of individual patients. Clinicians should attempt to gain control of a patient's asthma symptoms as quickly as possible. Begin with aggressive therapy (eg, add oral steroids or higher dose of inhaled steroids to a regimen that corresponds to a patient's initial step of severity), or begin at the step corresponding to a patient's initial severity. *Step up* or *step down* therapy as necessary, based on review of patient use of prescribed medications and review of patient inhaler technique, compliance, and environmental control (ie, avoidance of allergens or other precipitant factors). (Adapted with permission from National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program. Practical guide for the diagnosis and management of asthma. Based on the Expert Panel report 2: guidelines for the diagnosis and management of asthma. Bethesda [MD]: U.S. Department of Health and Human Services, National Institutes of Health; 1997:11. NIH Publication No. 97-4053.)

persistent asthma (ie, daily or more frequent symptoms) and for any patient who has experienced a severe asthma exacerbation. In addition to assessing response to changes in long-term therapy, peak flow readings are useful for evaluating the severity of asthma symptoms to help guide self-management. The guidelines offer explicit recommendations for teaching and using peak flow monitoring in practice as well as a suggested patient education handout (**Figure 3**).

Barriers to Adherence

Reflecting on the scenario and the options for monitoring the patient's response to new therapy, you may have overlooked using a peak flow meter for several reasons. As in the first example, despite wide dissemination of the NHLBI guidelines, ample evidence exists that many physicians do not follow the recommendation to use peak flow monitoring. For example, the low percentage of families (30%) who reported having peak flow meters

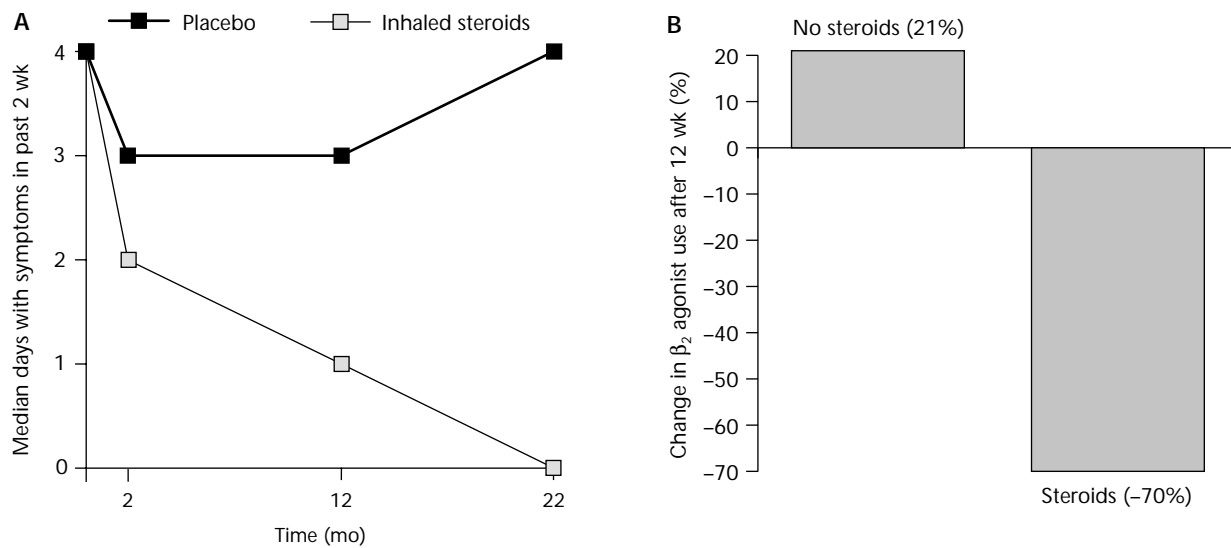


Figure 2. Inhaled steroids have proved to be the most effective long-term control medication for asthma. (A) Daily use of inhaled steroids in children aged 7 to 16 years with moderate persistent asthma resulted in reduced symptomatic days, with gradual improvement in symptoms over 22 months [9]. (B) Daily use of inhaled steroids in adults resulted in significant reduction in the need for quick-relief medication, with persistence of this effect during the 2 years of study [10]. Additional effects of daily inhaled steroids include significant reduction in severe exacerbations and significant improvement in lung function, as measured by peak flow, forced expiratory volume in 1 second (FEV₁), and airway hyperresponsiveness. (Adapted with permission from National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program. Practical guide for the diagnosis and management of asthma. Based on the Expert Panel report 2: guidelines for the diagnosis and management of asthma. Bethesda [MD]: U.S. Department of Health and Human Services, National Institutes of Health; 1997:8. NIH Publication No. 97-4053.)

following hospitalization of an asthmatic child at 1 inner-city medical center indirectly suggests poor physician adoption of this recommendation [28]. In a survey-based study of patients with moderate to severe asthma in Oregon, less than half (44%) of patients indicated that they were prescribed a peak flow meter [29].

Focus group discussions with physicians suggest that several factors can contribute to poor physician adherence to recommendations to teach and use peak flow monitoring [13]. For example, older physicians may be inadequately trained in the use of peak flow meters, particularly if their clinical training occurred before these devices were commonly used. Also, some physicians report that patients may be unable to obtain peak flow meters for their patients due to lack of insurance coverage. In addition, physicians note that peak flow meter readings can be inconsistent depending on patient technique.

However, because peak flow meters must be used consistently by patients to be helpful, physicians most often mention patient nonadherence as a reason for not following the NHLBI recommendation for peak flow monitoring [13]. A single peak flow reading is not as useful as several readings over time, because the changes in peak flow readings can signal a need to change ther-

apy. As a result, the value of peak flow meters depends on consistent use by the patient at home.

Poor patient adherence to using peak flow meters has been documented [30]. As a result, convincing patients to use peak flow meters appropriately can be frustrating and cause low outcome expectancy, the belief that performing a behavior (teaching use of peak flow meters) will lead to a desired outcome (patient use of peak flow meters) [31]. If outcome expectancy is low, the likelihood of performing a behavior is low. In this case, physicians are less likely to instruct patients in the use of peak flow meters, because they do not believe their patients will actually use them.

It is important to note that perceived patient disinterest or noncompliance may actually result from poor patient health literacy or poor physician cultural competency [32-34]. Before blaming poor outcomes on patient disinterest or nonadherence, when prescribing this or any treatment physicians should be aware of their patient's economic status, cultural mores, and ability to comprehend the therapeutic regimen.

Overcoming the Barriers

Many components of effective asthma care, such as peak flow monitoring, rely on patient adherence to

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How to Use Your Peak Flow Meter

A peak flow meter is a device that measures how well air moves out of your lungs. During an asthma episode, the airways of the lungs usually begin to narrow slowly. The peak flow meter may tell you if there is narrowing in the airways hours—sometimes even days—before you have any asthma symptoms.

By taking your medicine(s) early (before symptoms), you may be able to stop the episode quickly and avoid a severe asthma episode. Peak flow meters are used to check your asthma the way that blood pressure cuffs are used to check high blood pressure.

The peak flow meter also can be used to help you and your doctor:

- Learn what makes your asthma worse
- Decide if your treatment plan is working well
- Decide when to add or stop medicine
- Decide when to seek emergency care

A peak flow meter is most helpful for patients who must take asthma medicine daily. Patients age 5 and older are usually able to use a peak flow meter. Ask your doctor or nurse to show you how to use a peak flow meter.

How to Use Your Peak Flow Meter

Do the following 5 steps with your peak flow meter:

1. Move the indicator to the bottom of the numbered scale.
2. Stand up.
3. Take a deep breath, filling your lungs completely.
4. Place the mouthpiece in your mouth, and close your lips around it. Do not put your tongue inside the hole.
5. Blow out as hard and fast as you can in a single blow.

Write down the number you get. If you cough or make a mistake, don't write down the number. Do it over again.

Repeat the above 5 steps 2 more times, and write down the best of the 3 blows in your asthma diary.

Find Your Personal Best Peak Flow Number

Your personal best peak flow number is the highest peak flow number you can achieve over a 2- to 3-week period when your asthma is under good control. Good control is when you feel good and do not have any asthma symptoms.

Each patient's asthma is different, and your best peak flow may be higher or lower than the peak flow of someone of your same height, weight, and sex. This means that it is important for you to find your own personal best peak flow number. Your treatment plan must be based on your own personal best peak flow number.

To determine your personal best peak flow number, take peak flow readings:

- At least twice a day for 2 to 3 weeks
- When you wake up and between 12 noon and 2:00 PM
- Before and after you take your short-acting inhaled β_2 agonist for quick relief, if you take this medicine
- As instructed by your doctor

The Peak Flow Zone System

Once you know your personal best peak flow number, your doctor will give you the numbers that tell you what to do. The peak flow numbers are put into zones that are set up like a traffic light. This will help you know what to do when your peak flow number changes. Record your personal best peak flow number and peak flow zones in your asthma diary.

Green Zone: More than ___ L/min (80% to 100% of your personal best number). Signals *good control*. No asthma symptoms are present. Take your medicines as usual.

Yellow Zone: Between ___ L/min and ___ L/min (50% to 79% of your personal best number). Signals *caution*. You must take a short-acting inhaled β_2 agonist (quick-relief medicine) right away. Also, your asthma may not be under good day-to-day control. Ask your doctor if you need to change or increase your daily medicines.

Red Zone: Below ___ L/min (below 50% of your personal best number). Signals a *medical alert*. You must take a short-acting inhaled β_2 agonist (quick-relief medicine) right away. Call your doctor or emergency room and ask what to do, or go directly to the hospital emergency room.

Use the Diary to Keep Track of Your Peak Flow

Measure your peak flow when you wake up, before taking medicine. Write down your peak flow number in the diary every day, or as instructed by your doctor.

Actions to Take When Peak Flow Numbers Change

- Peak flow goes between ___ L/min and ___ L/min (50% to 79% of personal best, *Yellow Zone*).
ACTION: Take a short-acting inhaled β_2 agonist (quick-relief medicine) as prescribed by your doctor.
- Peak flow increases 20% or more when measured before and after taking a short-acting inhaled β_2 agonist (quick-relief medicine).
ACTION: Talk to your doctor about adding more medicine to control your asthma better (for example, an anti-inflammatory medication).

Figure 3. Example of a handout for educating patients to use peak flow meters. (Adapted with permission from National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program. Expert Panel report 2: guidelines for the diagnosis and management of asthma. Bethesda [MD]: U.S. Department of Health and Human Services, National Institutes of Health; 1997. NIH Publication No. 97-4051.)

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physician recommendations, but effective asthma management is more than just telling the patient what to do. By not taking into account the importance of ensuring patient adherence, physicians may have difficulty carrying out many of the NHLBI guideline recommendations.

Build a partnership. A cardinal element of the NHLBI guidelines is the recommendation to provide essential patient education to forge a care partnership between the physician and the patient and, if the patient is a child, his or her family. The success of this partnership depends on adherence to asthma care recommendations. Simple techniques such as attentive listening, praising effective self-management, and asking open-ended questions can promote open communication to elicit patient perceptions or questions about asthma. Because nonadherence can originate from lingering questions or misperceptions, patients are more likely to follow physician recommendations if such issues are elicited and addressed [35]. Assessing and encouraging family awareness and involvement is similarly important to the care of pediatric patients.

To further strengthen the physician-patient partnership, the NHLBI guidelines recommend working together to develop individualized goals of asthma treatment. A key to success in involving patients is tailoring the message to the patient, such as by eliciting the patient's personal goals. Whereas the physician may wish to achieve improved lung function, decreased or no emergency department visits, and less reliance on inhaled short-acting β_2 agonists, these goals may be too abstract for the patient. To establish joint goals of treatment, the patient should be encouraged to talk about how asthma interferes with his or her life, and those comments should be incorporated into goal planning. Thus, additional goals might be full participation in basketball games, sleeping soundly through the night, or not missing work due to asthma in the next year.

A written asthma action plan that is jointly negotiated with the patient also can promote adherence. This plan should include instructions for taking daily control medications and monitoring peak flows. Rather than dictating specific times, the physician might ask the patient, "When is a good time for you to use your control medication and to measure your peak flow? What will be easy for you to remember?" Allowing the patient to tailor his or her plan to accommodate school, work, or home routines will help ensure adherence.

The jointly developed action plan also should include a blueprint to help the patient make decisions during an asthma exacerbation. For example, the plan might list warning signs such as a cough or wheeze, dif-

ficulty at work or play, waking up at night, or a peak flow that is 50% to 80% of expected. In response to such signs, the plan might instruct the patient to start using an inhaled short-acting β_2 agonist and, with worsening symptoms, to take the β_2 agonist more frequently, start the first dose of an oral steroid, or contact the physician's office.

Make patient education a practical goal. Although patient education is perceived as time intensive, several studies have shown asthma education to be cost-effective [36,37]. In addition, Clark et al [38] demonstrated that physicians who incorporated many of these techniques in their asthma management were more efficient and spent less time on average with patients.

Several techniques can minimize physician time and labor. First, patients should not be inundated with every educational point in a single visit. Rather, these messages can be reinforced over 2 or 3 visits as part of the follow-up for an initial diagnosis or exacerbation. In addition, a team effort using office staff, nurse educators, and other clinicians (eg, pharmacists and respiratory therapists during a hospitalization) can be an efficient way to educate patients. Although the physician need not be the primary educator, the physician should initiate patient education and allow the rest of the team to reinforce the messages. According to the NHLBI guidelines, clinicians who take the time to provide education send "a powerful message to patients and family" [8]. Patient education can be supplemented with written or audiovisual materials, some of which are available from medical societies and other organizations concerned with asthma care (eg, American Lung Association, NHLBI, Asthma Allergy Foundation of America). In addition, many health systems and managed care organizations have instituted disease management programs for asthma [39], which often incorporate patient educational components.

In general, establishing patient education as early as possible can help patients manage their asthma more quickly and effectively. As a result, time during follow-up visits can be focused on preventive issues as opposed to managing asthma symptoms that have spun out of control.

Low Self-Efficacy

A 24-year-old man presents for removal of stitches from a laceration that was treated a week ago in the local emergency department. As an aside, he asks for a refill prescription for 1 of his asthma medications. The patient, who is well known to you, has a history of mild intermittent asthma (no hospitalizations or

emergency department visits) and has been using an inhaled short-acting β_2 agonist as needed for occasional asthma symptoms.

The patient also has a 5-year history of cigarette smoking (about 1 pack per day). During many past visits, you have pursued smoking cessation counseling without any success. The patient has a routine appointment scheduled for next month, when he turns 25. You remember his smoking habit, but also consider your previous lack of success in counseling. You decide to:

1. Mention smoking cessation only if he raises the subject.
2. Mention smoking cessation only if he has an urgent medical visit or hospitalization related to his smoking.
3. Make a note to discuss smoking cessation at his routine examination next month.
4. Mention smoking cessation again today and make a note to revisit the subject at any appointment or hospitalization.

NHLBI Recommendation: Control Factors Contributing to Asthma Severity

The NHLBI guidelines recommend that all asthma patients be asked about exposure to environmental irritants and other factors (eg, allergens, tobacco smoke) that may provoke or worsen asthma symptoms [8]. In addition to its direct inflammatory effects on the lower respiratory tract, tobacco smoke is a common trigger of symptoms in all asthma patients [40,41]. Any physician encounter with an asthma patient who smokes represents an opportunity to initiate smoking cessation counseling to mitigate the deleterious effects of tobacco smoke on asthma and overall health. Physician counseling performed on a regular basis, at any appointment or hospitalization (answer #4), is the best strategy for improving the chances of smoking cessation in this patient.

The importance of consistent, frequent physician messages about the merits of smoking cessation is echoed in other clinical practice guidelines. For example, the United States Preventive Services Task Force (USPSTF) guidelines state that “the most effective clinician message is a brief, unambiguous, and informative statement on the need to stop using tobacco” and that “repeated messages over long periods of time are associated with the greatest success in helping patients achieve abstinence” [42]. Similarly, the recently updated smoking cessation guideline published by the U.S. Public Health Service recommends that “clinicians and

health care delivery systems institutionalize the consistent identification, documentation, and treatment of every tobacco user at every visit” [43].

Because the patient is seen infrequently and is unlikely to bring up the subject of quitting smoking, the physician should seize every opportunity for counseling him to quit smoking. However, despite the importance of this intervention, many physicians do not counsel smoking cessation on a regular basis [44].

Barriers to Adherence

This scenario highlights common reasons why physicians may not adhere to guidelines that require patient education and counseling. In this case, the patient has a history of being recalcitrant to advice to quit smoking. In addition, he has only mild asthma and no history of hospitalizations or even emergency department visits. Many physicians feel that, despite their best efforts to counsel asthma patients about smoking cessation, they rarely have much influence on patient health behavior [13]. In addition, physicians may focus only on patients with more severe asthma [13].

Infrequent counseling may be due to low self-efficacy or low outcome expectancy. Self-efficacy is the belief that one has the ability perform a behavior [45]. In this case, it is the physician’s belief that he or she has counseling skills for smoking cessation. Outcome expectancy is the belief that performing a behavior will lead to a desired outcome [45]. In this case, it is the physician’s belief that counseling the patient actually will lead him to quit smoking. These concepts also apply to patient behavior. Thus, for a patient to adopt a behavior (quit smoking), the patient must believe that he or she has the ability to quit (self-efficacy) and that smoking cessation leads to improved health (outcome expectancy).

Although the terms *self-efficacy* and *outcome expectancy* may be unfamiliar to clinicians, a review of studies investigating physician self-efficacy shows its value as a concept in physician behavior. For example, Hyman et al [46] surveyed 119 primary care physicians about adherence to the National Cholesterol Education Program and noted that high physician self-efficacy in prescribing cholesterol-lowering medication was associated with the initiation of therapy consistent with national guidelines. Cheng et al [47] surveyed 556 pediatricians about preventive care counseling and found that physician self-efficacy and outcome expectancy were associated with pursuing counseling consistent with preventive care guidelines. In addition, Pololi and Potter [48] demonstrated that physician self-efficacy in preventive medicine counseling could be improved with an educational intervention involving standardized patients.

When counseling is performed consistently by a physician, 2 or 3 persons out of a group of 100 smokers will quit [49]. From a population perspective, even this small change has important public health implications. Because physicians see patients individually, however, they may not discern success at the population level. Warner and Warner [50] describe this low self-efficacy and perceived lack of outcome expectancy from the individual physician's perspective. They report that physicians are uncomfortable delivering a message (to quit smoking) that makes patients "squirm" and about which they have received little training (ie, in behavioral counseling). Because the vast majority of patients counseled to quit smoking remain smokers after 1 year, many physicians may deem the intervention to be an "abject failure" or "waste of time."

Low self-efficacy may result in part because smoking cessation training is not included in most medical school curricula. Most medical schools (70%) do not require clinical training in smoking cessation [51]. Surveys of recently trained physicians also document a perceived lack of formal training in this area [52].

Overcoming the Barriers

Look at the big picture. In this scenario, the physician has had a history of failure in getting his asthma patient to quit smoking, and the patient now presents for an unrelated problem. The prospect of success seems slim. Why should the physician even try to change this patient's behavior?

When physicians consider themselves as part of a greater health care system, or are able to consider the effects of interventions on a greater scale, the value of consistent smoking cessation counseling becomes clearer. Despite physician perception that counseling is ineffective, a meta-analysis of 39 controlled studies showed that the impact of even brief physician cessation counseling was effective [53]. For example, at first glance, a quit rate of 5% may seem dismal. Of 100 patients, 95 did not quit. However, the additional "quitters" might avoid a smoking-related illness and theoretically save up to 20 years of life expectancy [50]. In addition, helping a smoker to quit benefits other household members who have been exposed to second-hand smoke [54]. From this public health perspective, the importance of physician counseling in triggering this change is crucial.

Physicians also should appreciate that patients move through stages of change. The "readiness to change" model proposed by Prochaska and DiClemente [55] suggests that patients progress through a continuum of steps in the process of quitting smoking: precontemplation (have not considered), contemplation (have considered),

preparation (considered and made plans), action (have attempted quitting), and maintenance (have successfully quit). Rather than measuring the success of counseling only by the number of patients who quit smoking, an alternative measure of success might be the number of patients who have "progressed" to the next step toward quitting.

A quick chart note (eg, "considering, but no plans") to track a patient's progress can be used as a starting point when the topic is revisited. At the next visit, the physician might initiate a discussion by saying, "I remember you were considering quitting but hadn't made any plans. Have you thought about any plans to quit?" This technique preserves continuity in the message, allows for easy repetition (an important component for success), and allows the physician to tailor the message to the patient.

Develop necessary new skills. Physicians must continually seek ways to develop and refine their clinical skills. By participating in effective continuing medical education programs and continuous quality improvement activities in their own practice settings [56], physicians can identify and overcome deficiencies in their training.

Lack of Awareness or Confusion About Guidelines

After seeing several patients with asthma, you decide to do some research into current asthma guidelines. Having heard about the NHLBI guidelines, you ask a partner if she has a copy. But she replies that she threw her copy out because it was published in 1991 and was out of date. Several colleagues claim they've never heard of the guidelines. When you ask a pediatrician colleague, he states that you must be mistaken, because the asthma guidelines were written not by NHLBI but by the American Academy of Pediatrics (AAP). Another partner claims that the guidelines actually were written by the American Academy of Allergy Asthma and Immunology (AAAAI). A colleague trained outside the United States mentions asthma guidelines developed by the British Thoracic Society (BTS).

Barriers to Adherence

Lack of awareness of guidelines is a common reason for nonadherence. Despite major efforts to develop and implement clinical practice guidelines, the constant changes in medical knowledge make it difficult for any physician to know of every applicable guideline. It is estimated that the typical physician has only 3 hours per week to read any of the 4000 medical journals in circulation [57]. In an analysis of 46 surveys that measured physician awareness of certain published guidelines, most surveys showed that at least 10% of respondents were not aware of the guidelines in question [24].

Another factor that may contribute to nonadherence is confusion caused by multiple sources of guidelines on a given clinical topic. As suggested in this scenario, asthma guidelines are available from NHLBI [8], AAP [58], AAAAI [59], and BTS [60]. In addition, local medical societies and managed care organizations may develop their own guidelines for asthma management. Although most asthma guidelines tend to include similar recommendations, differences may exist, for example, in how to classify asthma severity, modify medication doses, or use peak flow meters [61].

Overcoming the Barriers

Tips for staying up-to-date. Although guidelines should help consolidate new medical information and, as a result, help physicians stay up-to-date, the number of guidelines can be overwhelming. When faced with a specific clinical issue, health care providers can use the following resources to search for applicable clinical practice guidelines:

- The National Guideline Clearinghouse™ (www.guidelines.gov), established by the Agency for Healthcare Quality and Research, provides a database of clinical practice guidelines.
- The American Medical Association publishes a *Clinical Practice Guidelines Directory* [62].
- The USPSTF *Guide to Clinical Preventive Services* covers 70 different preventive medicine topics and for each section offers a comparison of its recommendation with that of other guidelines [42].

The credibility of the authoring or sponsoring organization can be a factor in how physicians evaluate a guideline. Not surprisingly, in repeated studies, physicians have indicated more confidence in guidelines developed by their own specialty organizations [63,64]. However, all guidelines, including those authored by physicians in the same specialty, should be held up to equally rigorous standards.

Improving the Quality of Your Patient Care

Day-to-day application of guideline recommendations by physicians in practice is critical for translating research findings into improved patient care. However, several factors may prevent physicians from applying guideline recommendations to everyday practice, such as lack of awareness, lack of agreement, low self-efficacy, and low outcome expectancy. It is important that physicians overcome these barriers to ensure delivery of state of the art patient care.

As illustrated in the asthma guideline examples, some barriers to applying guidelines may be beyond a physician's control. For example, an asthma patient

may be unable to implement methods to control allergens that trigger asthma (eg, removing carpets, purchasing mattress covers) due to financial constraints. In these cases, awareness of the community resources and patient advocacy groups available to the patient may lead to a solution that would allow adherence to guideline recommendations.

Understanding how to apply clinical practice guidelines can improve the quality of care physicians deliver to their patients. However, just as a complete disregard for guidelines can compromise patient care, rigid adherence also can be hazardous. Practice guidelines quickly can become obsolete, given the time needed to develop and implement guidelines and the rapid rate at which medical advances occur and new evidence is published. Guideline developers are challenged to reassess recommendations regularly to prevent guidelines from becoming outdated and counterproductive.

Blindly applying guidelines to all patients also is a hazard. For example, Nutting et al [65] used decision analysis to examine the outcomes associated with applying a uniform mammography policy for breast cancer screening to a population served by the Indian Health Service. Because the stage at which breast cancer typically is diagnosed and the survival rates are different in this unique population, health outcomes could be improved by applying screening strategies different than those used in the uniform policy.

As an added benefit, a thorough, well-researched, and well-formatted clinical practice guideline should be able to detail its limits for everyday application. Sox and Griner [66] comment that a vigorous and critical debate about a clinical practice guideline is a sign of a healthy profession. However, lack of agreement that is reflexive (ie, due to nonacceptance of evidence-based medicine or clinical practice guidelines in general) rather than reflective (ie, due to an understanding of the limitations of a specific guideline) also can paralyze the improvement of medical practice. Although lack of agreement with a recommendation is a common barrier to following guidelines, a well-presented guideline should offer a rigorous and valid explanation of how such a recommendation was developed. The thoughtful application of guidelines by physicians is a key component in improving patient care.

References

1. Woolf SH. Practice guidelines: a new reality in medicine. *Arch Intern Med* 1993;153:2646-55.
2. Field MJ, Lohr MJ, editors. *Clinical practice guidelines: directions for a new program*. Washington (DC): National Academy Press; 1990.

3. Jones K. How clinical practice guidelines can improve medical practice. *Semin Med Pract* 1999;2:3-10.
4. Chassin MR, Brook RH, Park RE, Keeseey J, Fink A, Kosecoff J, et al. Variations in the use of medical and surgical services by the Medicare population. *N Engl J Med* 1986;314:285-90.
5. Rogers EM. Diffusion of innovations. 4th ed. New York: Free Press; 1995.
6. Lamas GA, Pfeffer MA, Hamm P, Wertheimer J, Rouleau JL, Braunwald E. Do the results of randomized clinical trials of cardiovascular drugs influence medical practice? The SAVE Investigators. *N Engl J Med* 1992;327:241-7.
7. Mannino DM, Homa DM, Pertowski CA, Ashizawa A, Nixon LL, Johnson CA, et al. Surveillance for asthma—United States, 1960-1995. *Mor Mortal Wkly Rep CDC Surveill Summ* 1998;47:1-27.
8. National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program. Expert Panel report 2: guidelines for the diagnosis and management of asthma. Bethesda (MD): U.S. Department of Health and Human Services, National Institutes of Health; 1997. NIH Publication No. 97-4051.
9. van Essen-Zandvliet EE, Hughes MD, Waalkens HJ, Duiverman EJ, Pocock SJ, Kerrebijn KF. Effects of 22 months of treatment with inhaled corticosteroids and/or beta-2-agonists on lung function, airway responsiveness, and symptoms in children with asthma. The Dutch Chronic Non-Specific Lung Disease Study Group. *Am Rev Respir Dis* 1992;146:547-54.
10. Haahtela T, Jarvinen M, Kava T, Kiviranta K, Koskinen S, Lehtonen K, et al. Comparison of a beta 2-agonist, terbutaline, with an inhaled corticosteroid, budesonide, in newly detected asthma. *N Engl J Med* 1991;325:388-92.
11. Goodman DC, Lozano P, Stukel TA, Chang CH, Hecht J. Has asthma medication use in children become more frequent, more appropriate, or both? *Pediatrics* 1999;104:187-94.
12. Grant EN, Moy JN, Turner-Roan K, Daugherty SR, Weiss KB. Asthma care practices, perceptions, and beliefs of Chicago-area primary-care physicians. Chicago Asthma Surveillance Initiative Project Team. *Chest* 1999;116(4 Suppl 1):145S-54S.
13. Cabana MD, Ebel BE, Cooper-Patrick L, Powe NR, Rubin HR, Rand CS. Barriers that pediatricians face when using asthma practice guidelines. *Arch Pediatr Adolesc Med* 2000;154:685-93.
14. Boorsma M, Andersson N, Larsson P, Ullman A. Assessment of the relative systemic potency of inhaled fluticasone and budesonide. *Eur Respir J* 1996;9:1427-32.
15. Djukanovic R, Roche WR, Wilson JW, Beasley CR, Twentyman OP, Howarth RH, Holgate ST. Mucosal inflammation in asthma. *Am Rev Respir Dis* 1990;142:434-57.
16. Benson V, Marano MA. Current estimates from the National Health Interview Survey, 1995. *Vital Health Stat* 10 1995;199:1-428.
17. Barnes PJ. Inhaled glucocorticoids for asthma. *N Engl J Med* 1995;332:868-75.
18. Kamada AK, Szeffler SJ, Martin RJ, Boushey HA, Chinchilli VM, Drazen JM, et al. Issues in the use of inhaled glucocorticoids. The Asthma Clinical Research Network. *Am J Respir Crit Care Med* 1996;153(6 Pt 1):1739-48.
19. Wise CG, Billi JE. A model for practice guideline adaptation and implementation: empowerment of the physician. *Jt Comm J Qual Improv* 1995;21:465-76.
20. Lagoe RJ, Aspling DL. Enlisting physician support for practice guidelines in hospitals. *Health Care Manag Rev* 1996;21:61-7.
21. Putnam RW, Curry L. Physicians' participation in establishing criteria for hypertension management in the office: will patient outcomes be improved? *Can Med Assoc J* 1989;140:806-9.
22. Picken HA, Greenfield S, Teres D, Hirway PS, Landis JN. Effect of local standards on the implementation of national guidelines for asthma: primary care agreement with national asthma guidelines. *J Gen Intern Med* 1998;13:659-63.
23. Weiss KB. Practice guidelines for practicing doctors. *J Gen Intern Med* 1998;13:714-5.
24. Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PA, Rubin HR. Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA* 1999;282:1458-65.
25. Hayward RS, Wilson MC, Tunis SR, Bass EB, Guyatt G. Users' guides to the medical literature. VIII. How to use clinical practice guidelines. Are the recommendations valid? The Evidence-Based Medicine Working Group. *JAMA* 1995;274:570-4.
26. Barnes PJ. Blunted perception and death from asthma. *N Engl J Med* 1994;330:1383-4.
27. Bijl-Hofland ID, Cloosterman SG, Folgering HT, Akkermans RP, van Schayck CP. Relation of the perception of airway obstruction to the severity of asthma symptoms. *Thorax* 1999;54:15-9.
28. Warman KL, Silver EJ, McCourt MP, Stein RE. How does home management of asthma exacerbations by parents of inner-city children differ from NHLBI guideline recommendations? National Heart, Lung and Blood Institute. *Pediatrics* 1999;103:422-7.
29. Mendenhall AB, Tsien AY. Evaluation of physician and patient compliance with the use of peak flow meters in commercial insurance and Oregon health plan asthmatic populations. *Ann Allergy Asthma Immunol* 2000;84:523-7.
30. Redline S, Wright EC, Kattan M, Kerckmar C, Weiss K. Short-term compliance with peak flow monitoring: results from a study of inner city children with asthma. *Pediatr Pulmonol* 1996;21:203-10.
31. Bandura A. Social foundations of thought and action: a social cognitive theory. Englewood Cliffs (NJ): Prentice-Hall; 1986.
32. Davis TC, Mayeaux EJ, Fredrickson D, Bocchini JA Jr,

- Jackson RH, Murphy PW. Reading ability of parents compared to reading level of pediatric patient education materials. *Pediatrics* 1994;93:460-8.
33. Massett HA. Appropriateness of Hispanic print materials: a content analysis. *Health Educ Res* 1996;11:231-42.
 34. Zwiefler J, Gonzalez AM. Teaching residents to care for culturally diverse populations. *Acad Med* 1998;73:1056-61.
 35. Milgrom H, Bender B. Nonadherence with the asthma regimen. *Pediatr Asthma Allergy Immunol* 1997;11:3-8.
 36. Clark NM, Feldman CH, Evans D, Levinson MJ, Wasilewski Y, Mellins RB. The impact of health education on frequency and cost of health care use by low-income children with asthma. *J Allergy Clin Immunol* 1986;78:108-15.
 37. Bolton MB, Tilley BC, Kuder J, Reeves T, Schultz LR. The cost and effectiveness of an education program for adults who have asthma. *J Gen Intern Med* 1991;6:401-7.
 38. Clark NM, Gong M, Schork MA, Evans D, Rolloff D, Hurwitz M, et al. Impact of education for physicians on patient outcomes. *Pediatrics* 1998;101:831-6.
 39. Homer CJ. Asthma disease management. *N Engl J Med* 1997;337:1461-3.
 40. Jindal SK, Gupta D, Singh A. Indices of morbidity and control of asthma in adult patients exposed to environmental tobacco smoke. *Chest* 1994;106:746-9.
 41. Joad JP. Smoking and pediatric respiratory health. *Clin Chest Med* 2000;21:37-46, vii-viii.
 42. Guide to clinical preventive services. U. S. Preventive Services Task Force. 2nd ed. Baltimore (MD): Lippincott Williams & Wilkins; 1996.
 43. Fiore MC, Bailey WC, Cohen SJ, Dorfman SF, Goldstein MD, Gritz ER, et al. Treating tobacco use and dependence. Clinical practice guideline. Rockville (MD): U.S. Department of Health and Human Services. Public Health Service. Jun 2000. AHRQ Publication No. 00-0032.
 44. Anda RF, Remington PL, Sienko DB, Davis RM. Are physicians advising smokers to quit? The patient's perspective. *JAMA* 1987;257:1916-19.
 45. Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the Health Belief Model. *Health Educ Q* 1988;15:175-83.
 46. Hyman DJ, Maibach EW, Flora JA, Fortman SP. Cholesterol treatment practices of primary care physicians. *Public Health Rep* 1992;107:441-8.
 47. Cheng TL, DeWitt TG, Savageau JA, O'Connor KG. Determinants of counseling in primary care pediatric practice: physician attitudes about time, money, and health issues. *Arch Pediatr Adolesc Med* 1999;153:629-35.
 48. Pololi LH, Potter S. Behavioral change in preventive medicine. An efficacy assessment of a physician education module. *J Gen Intern Med* 1996;11:545-7.
 49. Cummings SR, Rubin SM, Oster G. The cost-effectiveness of counseling smokers to quit. *JAMA* 1989;261:75-9.
 50. Warner KE, Warner PA. Is an ounce of prevention worth a pound of cure? Disease prevention in health care reform. *J Ambulatory Care Manage* 1993;16:38-49.
 51. Ferry LH, Grissino LM, Runfola PS. Tobacco dependence curricula in US undergraduate medical education. *JAMA* 1999;282:825-9.
 52. Cantor JC, Baker LC, Hughes RG. Preparedness for practice. Young physicians' views on their professional education. *JAMA* 1993;270:1035-40.
 53. Kottke TE, Battista RN, DeFries GH, Brekke ML. Attributes of successful smoking cessation interventions in medical practice. A meta-analysis of 39 controlled trials. *JAMA* 1998;259:2283-9.
 54. Murray AB, Morrison BJ. The decrease in severity of asthma in children of parents who smoke since the parents have been exposing them to less cigarette smoke. *J Allergy Clin Immunol* 1993;91(1 Pt 1):102-10.
 55. Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: toward an integrative model of change. *J Consult Clin Psychol* 1983;51:390-5.
 56. Heinrich P, Homer CJ. Improving the care of children with asthma in pediatric practice: the HIPPO project. Helping Improve Pediatric Practice Outcomes. *Pediatr Ann* 1999;28:64-72.
 57. Shell ER. The hippocratic wars. *N Y Times Magazine*. 28 Jun 1998;28:34-8.
 58. Provisional Committee on Quality Improvement. American Academy of Pediatrics. Practice parameter: the office management of acute exacerbations of asthma in children. *Pediatrics* 1994;93:119-26.
 59. Joint Task Force on Practice Parameters, representing the American Academy of Allergy Asthma and Immunology, the American College of Allergy, Asthma and Immunology, and the Joint Council of Allergy, Asthma and Immunology. Practice parameters for the diagnosis and treatment of asthma. *J Allergy Clin Immunol* 1995;96:707-80.
 60. British Thoracic Society. Guidelines for management of asthma in adults: chronic persistent asthma. Statement by the British Thoracic Society, Research Unit of the Royal College of Physicians of London, King's Fund Centre, National Asthma Campaign. *BMJ* 1990;301:651-3.
 61. Meijer RJ, Kerstjens HA, Postma DS. Comparison of guidelines and self-management plans in asthma. *Eur Respir J* 1997;10:1163-72.
 62. American Medical Association. Department of Clinical Quality Improvement. Clinical practice guidelines directory, 2000 ed. Chicago: The Association; 2000.
 63. Tunis SR, Hayward RS, Wilson MC, Rubin HR, Bass EB, Johnston M, Steinberg EP. Internists' attitudes about clinical practice guidelines. *Ann Intern Med* 1994;120:956-63.
 64. James PA, Cowan TM, Graham RP, Majeroni BA. Family physicians' attitudes about and use of clinical practice guidelines. *J Fam Pract* 1997;45:341-7.
 65. Nutting PA, Calonge BN, Iverson DC, Green LA. The danger of applying uniform clinical policies across populations: the case of breast cancer in American Indians. *Am J Public Health* 1994;84:1631-6.
 66. Sox HC, Griner P. An invitation to join a controversy. *Ann Intern Med* 1992;116:422-3.