

SECTION 3, COMPONENT 2: EDUCATION FOR A PARTNERSHIP IN ASTHMA CARE

KEY POINTS: EDUCATION FOR A PARTNERSHIP IN ASTHMA CARE

- Asthma self-management education is essential to provide patients with the skills necessary to control asthma and improve outcomes (Evidence A).
- Asthma self-management education should be integrated into all aspects of asthma care, and it requires repetition and reinforcement. It should:
 - Begin at the time of diagnosis and continue through followup care (Evidence B).
 - Involve all members of the health care team (Evidence B).
 - Introduce the key educational messages by the principal clinician, and negotiate agreements about the goals of treatment, specific medications, and the actions patients will take to reach the agreed-upon goals to control asthma (Evidence B).
 - Reinforce and expand key messages (e.g., the patient's level of asthma control, inhaler techniques, self-monitoring, and use of a written asthma action plan) by all members of the health care team (Evidence B).
 - Occur at all points of care where health professionals interact with patients who have asthma, including clinics, medical offices, EDs and hospitals, pharmacies, homes, and community sites (e.g., schools, community centers) (Evidence A or B, depending on point of care).
 - ◆ Strong evidence supports self-management education in the clinic setting (Evidence A).
 - ◆ Observational studies and limited clinical trials support consideration of focused, targeted patient education in the ED setting (e.g., teaching inhaler technique and providing an ED asthma discharge plan with instructions for discharge medications and for increasing medication or seeking medical care if asthma should worsen). Studies demonstrate the benefits of education in the hospital setting (Evidence B).
 - ◆ Studies of pharmacy-based education directed toward understanding medications and teaching inhaler and self-monitoring skills show the potential of using community pharmacies as a point of care for self-management education. Studies report difficulties in implementation, but they also demonstrate benefits in improving asthma self-management skills and asthma outcomes (Evidence B).
 - ◆ Studies demonstrate the benefits of programs provided in the patient's home for multifaceted allergen control, although further evaluation of cost-effectiveness and feasibility for widespread implementation will be helpful (Evidence A).

- ◆ Some, but not all, school-based programs have demonstrated success in reducing symptoms and urgent health care use and in improving school attendance and performance. Proven school-based programs should be considered for implementation because of their potential to reach large numbers of children who have asthma and provide an “asthma-friendly” learning environment for students who have asthma (Evidence B).
- ◆ Emerging evidence suggests the potential for using computer and Internet programs incorporated into asthma care (Evidence B).
- Provide all patients with a written asthma action plan that includes two aspects: (1) daily management and (2) how to recognize and handle worsening asthma. Written action plans are particularly recommended for patients who have moderate or severe persistent asthma, a history of severe exacerbations, or poorly controlled asthma (Evidence B).
- Regular review, by an informed clinician, of the status of the patient’s asthma control is an essential part of asthma self-management education (Evidence B). Teach and reinforce at every opportunity (EPR—2 1997):
 - Basic facts about asthma
 - What defines well-controlled asthma and the patient’s current level of control
 - Roles of medications
 - Skills: e.g., inhaler technique, use of a valved holding chamber (VHC) or spacer, and self-monitoring
 - When and how to handle signs and symptoms of worsening asthma
 - When and where to seek care
 - Environmental exposure control measures
- Develop an active partnership with the patient and family by (EPR—2 1997):
 - Establishing open communications.
 - Identifying and addressing patient and family concerns about asthma and asthma treatment.
 - Identifying patient/parent/child treatment preferences regarding treatment and barriers to its implementation.
 - Developing treatment goals together with patient and family.
 - Encouraging active self-assessment and self-management of asthma.

- Encourage adherence by:
 - Choosing a treatment regimen that achieves outcomes and addresses preferences that are important to the patient/caregiver (Evidence B).
 - Reviewing the success of the treatment plan with the patient/caregiver at each visit and making adjustments as needed (Evidence B).
- Tailor the asthma self-management teaching approach to the needs of each patient. Maintain sensitivity to cultural beliefs and ethnocultural practices (Evidence C).
- Encourage development and evaluation of community-based interventions that provide opportunities to reach a wide population of patients and their families, particularly those patients at high risk of asthma morbidity and mortality (Evidence D).
- Asthma self-management education that is provided by trained health professionals should be considered for policies and reimbursements as an integral part of effective asthma care; the education improves patient outcomes (Evidence A) and can be cost-effective in improving patient outcomes (Evidence B).

KEY POINTS: PROVIDER EDUCATION

- Implement multidimensional, interactive clinician education in asthma care including, for example, case discussions involving active participation by the learners (Evidence B).
- Consider participation in programs to enhance skills in communicating with patients (Evidence B).
- Encourage development and use of clinical pathways for management of acute asthma (Evidence B).
- Develop, implement, and evaluate system-based interventions to support clinical decisionmaking and to support quality care for asthma (Evidence B).

KEY DIFFERENCES FROM 1997 AND 2002 EXPERT PANEL REPORTS

Patient Education:

- Emphasis on the many potential points of care and sites available in which to provide asthma education, including review of new evidence regarding the efficacy of asthma self-management education outside the usual office setting.
- Greater emphasis on the two aspects of the written asthma action plan—(1) daily management, and (2) how to recognize and handle worsening asthma. Use of the terminology “written asthma action plan” encompasses both aspects. This change addresses confusion over the previous guidelines’ use of different terms. One term is now used for the written asthma action plan, although in some studies cited, investigators may have used a variation of this term.
- New sections on the impact of cultural and ethnic factors and health literacy that affect delivery of asthma self-management education.

Provider Education:

- New section with review of system-based interventions to improve the quality of asthma care, to support clinical decisionmaking, and to enhance clinical information systems
- Review of tested programs that use effective strategies to provide clinician education in asthma care, e.g., multidimensional approaches, interactive formats, and practice-based case studies

Introduction

See section 1, “Overall Methods Used To Develop This Report,” for literature search strategy and tally of results for EPR—3: Full Report 2007 on this component, Education for a Partnership in Asthma Care. Six Evidence Tables were prepared: 3, Asthma Self-Management Education for Adults; 4, Asthma Self-Management Education for Children; 5, Asthma Self-Management Education in Community Settings; 6, Cost-Effectiveness of Asthma Self-Management Education; 7, Methods for Improving Clinical Behaviors: Implementing Guidelines; 8, Methods for Improving Systems Support.

Education for a Partnership in Asthma Care requires education for the patient or caregiver about asthma self-management as well as education for clinicians to enhance skills in teaching patients self-management and provide support to implement guidelines-recommended practices. In this component, recommendations are presented on asthma self-management education at multiple points of care, tools for asthma self-management, and provider education.

Evidence is now abundant that asthma self-management education is effective in improving outcomes of chronic asthma. Specific training in self-management skills is necessary to produce behavior that modifies the outcomes of chronic illnesses such as asthma. Expert care, with regular review by health professionals, is necessary but not sufficient to improve outcomes. Patients must actively participate in their own care, which means consciously using strategies and taking actions to minimize exposure to factors that make asthma harder to control and adjusting treatments to improve disease control.

The ultimate goal of both expert care and patient self-management is to reduce the impact of asthma on related morbidity, functional ability, and quality of life. The benefits of educating people who have asthma in the self-management skills of self-assessment, use of medications, and actions to prevent or control exacerbations, include reduction in urgent care visits and hospitalizations, reduction of asthma-related health care costs, and improvement in health status (Bartholomew et al. 2000; Cicutto et al. 2005; Cordina et al. 2001; Cowie et al. 1997; Gibson et al. 2000; Guevara et al. 2003; Krieger et al. 2005; Krishna et al. 2003; Madge et al. 1997; MeGhan [sic] et al. 2003; Morgan et al. 2004; Powell and Gibson 2003; Teach et al. 2006; Wesseldine et al. 1999). Other benefits of value from self-management education are reduction in symptoms, less limitation of activity, improvement in quality of life and perceived control of asthma, and improved medication adherence (Bonner et al. 2002; Christiansen et al. 1997; Clark et al. 2004; Evans et al. 1999a; Janson et al. 2003; McLean et al. 2003; Perneger et al. 2002; Saini et al. 2004; Thoonen et al. 2003). Cost-analysis studies have shown that asthma education can be delivered in a cost-effective manner and that morbidity is reduced as a result, especially in high-risk subjects (Gallefoss and Bakke 2001; Kattan et al. 1997; Powell and Gibson 2003; Schermer et al. 2002; Sullivan et al. 2002).

Although not all controlled trials of asthma self-management education have shown positive results, it is notable that controlled studies have demonstrated benefit from patient education programs delivered in a wide range of points of care, including clinics, EDs, hospitals, pharmacies, doctors' offices, schools, and community settings. These results have been achieved through face-to-face educational strategies and the use of new electronic technologies. Referenced studies are from multiple countries. Some outcomes may be dependent on the context of care and may not be completely generalizable.

Asthma Self-Management Education at Multiple Points of Care

The Expert Panel recommends that patients be educated at multiple points of care where health professionals and health educators may interact with patients who have asthma (Evidence A or B, depending on point of care). For people who have asthma, many points of care exist outside traditional clinic, office, or hospital settings. An emerging body of evidence suggests that educating people at these points of care creates opportunities to provide an essential link between the patient and the primary clinician, forming a network of support for the patient and clinician outside the clinician's office. In this way, a network of asthma education capability is built that ensures no person who has asthma is left without knowledge or skills.

Although it is beyond the scope of this document to address the issues of asthma education of persons who are not family members and are not health care professionals, those individuals who come into contact with persons with asthma on a regular basis (e.g., teachers, coaches, daycare workers, employers, etc.) should receive some basic education about asthma. Education of these individuals about asthma may help reduce asthma morbidity and mortality and may contribute to earlier diagnosis of this disease. Teachers and coaches should know how to recognize worsening asthma, administer quick-relief medications, and know how and when to call for emergency services.

CLINIC/OFFICE-BASED EDUCATION

Adults—Teach Asthma Self-Management Skills To Promote Asthma Control

The Expert Panel recommends that:

- **Clinicians provide to patients asthma self-management education that includes the following essential items: asthma information and training in asthma management skills (Evidence A), self-monitoring (either symptom- or peak flow-based) (Evidence A), written asthma action plan (Evidence B), and regular assessment by a consistent clinician (Evidence B).** (See Evidence Table 3: Asthma Self-Management Education for Adults.)
- **Clinicians involve patients in decisions about the type of self-monitoring of asthma control that they will do (Evidence B)**
- **Clinicians provide all patients with a written asthma action plan that includes instructions for (1) daily management, and (2) recognizing and handling worsening asthma, including self-adjustment of medications in response to acute symptoms or changes in PEF measures. Written asthma action plans are particularly recommended for patients who have moderate or severe persistent asthma, a history of severe exacerbations, or poorly controlled asthma (Evidence B).**

- **Clinicians involve adult patients in the treatment decisionmaking within the context of a therapeutic partnership (Evidence B).**
- **Health professionals and others trained in asthma self-management education be used to implement and teach asthma self-management programs (Evidence B).**
- **Because poor attendance at multiple sessions may be a problem in some populations, consider introducing key messages and essential skills of self-management in the first session and adjusting subsequent sessions to the needs of the patients in the groups (Evidence D). Research comparing lengthy versus condensed or shorter sessions is encouraged.** (See Evidence Table 3, Asthma Self-Management for Adults.)

Written Asthma Action Plans, Clinician Review, and Self-Monitoring

In a large, scientific review of 36 RCTs involving 6,090 adults who had asthma, asthma self-management—accompanied by regular review of medications and asthma control by a medical practitioner—improved health outcomes significantly more than usual care (Gibson et al. 2003). All interventions included education, while 15 tested “optimal self-management” that included self-monitoring of symptoms and/or peak flow, regular review by a clinician, and a written asthma action plan. These intervention trials were conducted in primary care, specialty care, hospital inpatient, or community settings. The results of the statistical analysis overall, including meta-analysis where possible, showed self-management education significantly reduced hospitalizations, unscheduled acute visits, and missed work days, as well as improving quality of life. Subgroup analyses compared the intensity of the intervention (optimal self-management with regular review, self-monitoring, and a written asthma action plan versus self-monitoring and regular review versus self-monitoring only versus regular review only versus written asthma action plan with either self-monitoring or regular review). Optimal self-management, including self-monitoring of symptoms and/or peak flow and a written asthma action plan, significantly reduced hospitalizations and ED visits for asthma. There was insufficient power to compare the subgroups with less intensive interventions. There was little effect on lung function: FEV₁ did not change. A statistically significant small mean increase (14.5 L/min, $p < 0.05$) in PEF occurred, however.

Self-management education that included a written asthma action plan appeared more effective than other forms of self-management education. The intensity (number of sessions) of teaching and the number of different components taught had little impact.

Regular review of progress by a concerned clinician is the basis for the patient–clinician partnership necessary to achieve asthma control. In another scientific review, the equivalence and efficacy of different options for asthma self-management were analyzed in 15 RCTs (Powell and Gibson 2003). In six studies, regular clinical review by physicians who adjusted ICS medications was compared to self-management education allowing self-adjustment of medications by using a written asthma action plan. These two methods for achieving asthma control were found to be equivalent. No significant differences in hospitalization, ED visits, unscheduled doctor’s visits, or frequency of nocturnal asthma symptoms were found between patients who self-adjusted their medication and those whose medications were adjusted by their physicians. Two of three studies found no difference between clinician review and self-management in the days lost from work or school, while the third study reported a significant effect of peak-flow-based self-management on work or school absenteeism. Lung

function, as measured by FEV₁, was not significantly improved with peak-flow-based self-adjustment of medications as compared to physician adjustment of medications.

The evidence from this analysis indicates that these two methods of adjusting medications for asthma control (change by physician during office visit or patient self-management according to a written asthma action plan) are equivalent, and the choice depends on the comfort and agreement between the clinician and the patient. Patient self-monitoring is an important tool for patients to assess the level of their asthma control and to adjust treatment according to their action plan.

When self-management is the chosen method for maintaining asthma control, peak-flow-based self-management is equivalent to symptom-based self-management as long as either method also includes a written asthma action plan with instructions on how to recognize and handle worsening asthma, including self-adjustment of medications. In three studies, both methods were found to have an equal impact on ED visits, and one study found peak flow monitoring was more effective in reducing ED visits (Powell and Gibson 2003). As noted in “Component 1: Measures of Asthma Assessment,” the important point is for patients to have a plan for monitoring their asthma, regardless of whether it is peak flow or symptom based. Therefore, the Expert Panel recommends that clinicians involve patients in decisions about the type of self-monitoring they will do. All patients may benefit from a written asthma action plan that includes instructions for (1) daily management, and (2) recognizing and handling worsening asthma, including self-adjustment of medications in response to acute symptoms or changes in PEF measures. Written action plans are particularly recommended for patients who have moderate or severe asthma, a history of severe exacerbations, or poorly controlled asthma. (See “Component 1: Measures of Asthma Assessment” for further discussion of tools for assessing asthma control.)

Other studies offer evidence of varying effectiveness of patient education. Those studies conducted as RCTs with positive findings confirm the results of the large scientific reviews (Janson et al. 2003; Magar et al. 2005; Marabini et al. 2002; Perneger et al. 2002; Thoonen et al. 2003). In these trials, one conducted across multiple practices in primary care settings (Thoonen et al. 2003), providing self-management education including an asthma action plan for exacerbations resulted in reduced symptoms, fewer days of restricted activity, and improvement in quality of life. Self-management education also resulted in improved self-confidence to manage asthma (Perneger et al. 2002) and improved adherence to ICS therapy (Janson et al. 2003; Magar et al. 2005) (Evidence B).

Education that provides information only, without skills training, improves knowledge but does not reduce hospitalizations, ED visits, unscheduled doctor’s visits, or lost work days; nor does it improve lung function and medication use (Gibson et al. 2002). In this review, patients’ reports of symptoms improved in only 2 of the 12 RCTs of information-only programs.

Patient–Provider Partnership

The value of establishing the patient–clinician partnership when teaching asthma self-management was shown in another RCT of asthma education (Marabini et al. 2002) in which investigators purposely formed partnerships with patients in the intervention group. The control group received education on medication use, role of environmental triggers, and metered-dose inhaler (MDI) technique but no partnership. The educational intervention delivered in the context of the therapeutic relationship produced improved symptom control, quality of life, and lung function measured as FEV₁ in patients in the group who had moderate or

severe asthma only. This finding suggests asthma self-management education, reinforced in the context of a therapeutic partnership between clinician and patient, may be especially valuable in patients who have moderate or severe asthma.

Another recent RCT (Wilson et al. 2005, 2006) used the context of the patient-clinician partnership to test the impact of shared decisionmaking about asthma treatment, compared to guideline-based clinician decisionmaking and usual care, in adults who had poorly controlled asthma. Clinician care managers (nurse practitioners, pharmacists, respiratory therapists) met with the patients to adjust therapy in two visits, 1 month apart, followed by three brief telephone calls (at 3, 6, and 9 months) to assess patients' progress in both intervention groups. The unique features of shared decisionmaking included identifying patients' goals and preferences regarding treatment and negotiating a treatment regimen to accommodate best each patient's goals and preferences. Establishing rapport, providing educational information, teaching inhaler technique, writing the prescription, and preparing a written asthma action plan for the patient occurred in both the guidelines and shared-decision groups. The shared-decision group had significantly greater adherence to long-term control medication compared to the guidelines group, and both interventions produced significantly better adherence to asthma control medications than usual care over 12 months of followup.

The results of these two important RCTs suggest the value of shared decisionmaking about asthma treatment in adults. Therefore, the Expert Panel concludes that clinicians should involve adult patients in the treatment decisionmaking within the context of a therapeutic partnership.

Health Professionals Who Teach Self-Management

A variety of health professionals deliver health education effectively. Recent studies have focused on nurse-educators. Often, specially trained nurses provide asthma education. Three RCTs and three observational studies used advanced practice nurses trained in asthma to deliver self-management education to adults in outpatient settings. In one RCT, a hospital-based nurse specialist delivered self-management education during three sessions (Levy et al. 2000). Compared to patients receiving usual care, the educated patients significantly increased use of ICS; decreased use of SABA for quick relief of symptoms; achieved higher mean and less variable PEF; and had significantly lower symptom scores, doctor visits, and urgent care visits for asthma after 6 months. The reduction in asthma morbidity in this study may have been related to the strong emphasis, during the educational sessions, placed on improving asthma self-management skills during exacerbations. In another RCT, self-management education with peak flow monitoring and a written asthma action plan, individualized to the patient's severity, was delivered in one session that was then reinforced in two subsequent visits (Janson et al. 2003). Compared to the control condition (monitoring only), self-management education significantly improved adherence to ICS medications, quality of life, and perceived control of asthma. In an attempt to reduce high hospitalization rates and health care utilization, another RCT (Urek et al. 2005) examined the effectiveness of three educational interventions in adults: "asthma school," an educational booklet, and individual verbal instruction. Asthma school, which included three 4-hour sessions of group education, produced the most significant improvement in quality of life; individual verbal instruction produced the best overall response in terms of both asthma control and quality of life.

Hopman and colleagues (2004) used nurse specialists to educate children and adults who had asthma through a standardized 2-hour asthma education program given across seven clinical centers in a large, multisite observational study. The program resulted in significant

improvements (decreases) in hospital utilization and missed activity days over 6 months. Two other observational studies of adults who had asthma, in which patients were taught and cared for by specially trained asthma nurses (Lindberg et al. 2002), showed significantly reduced symptoms and days of activity limitation as well as significantly decreased markers of airway inflammation (Janson et al. 2001). In an attempt to reduce sick days lost from work, a 4-week inpatient asthma rehabilitation program was tested in an observational study that included asthma education, pharmacological optimization, physical training, and coping skill training. The program resulted in significantly reduced sick leave over 3 years (Nathell 2005). Rehabilitation programs that require patients to live in the treatment setting are expensive and rare in the United States, but such programs may be useful for those who have severe asthma and are significantly limited by their asthma.

Respiratory therapists also provide asthma education in hospital, ED, and clinic settings and may direct clinical pathways and algorithms in hospital settings. There are no published RCTs of asthma education programs delivered by respiratory therapists. An observational trial of 60 pediatric patients who attended a special clinic focusing on inhaler technique demonstrated that MDI technique improved significantly after MDI demonstration, teaching, and reinforcement (Minai et al. 2004). Respiratory therapists also participate actively in clinical protocols or pathways that are implemented in acute care settings for management of acute exacerbations in hospitalized patients. Studies of the efficacy and value of clinical pathways is reviewed in the “Provider Education Section: Methods of Improving System Supports—Clinical Pathways.”

The Expert Panel encourages using health professionals and others trained in asthma self-management education to implement and teach asthma self-management programs.

Education With Multiple Sessions

Negative studies that found little or no benefit of asthma self-management education frequently contained significant design flaws or methodological errors. Several were underpowered to detect significant differences between groups (Couturaud et al. 2002; Cowie et al. 2002; Neri et al. 2001) due to small sample size and significant attrition. (See Evidence Table 3, Asthma Self-Management for Adults.) Cowie and colleagues (2002) modified the education according to age level but found no incremental benefit from this adjustment. Many of these patients were recruited from EDs immediately after treatment for an acute exacerbation, when they were presumably more open to education, but significant attrition from or no attendance at the educational sessions scheduled outside of the medical care context occurred (Bolton et al. 1991; Ford et al. 1997). Taken together, these studies demonstrate the problems that are created when education programs are not integrated into the patient’s regular medical care as well as the low participation of intervention patients in educational programs designed with multiple sessions over time. Because poor attendance at multiple sessions may be a problem in some populations, the Expert Panel’s opinion is that the key messages and essential skills of self-management should be introduced in the first session and that subsequent sessions should be adjusted to the needs of the patients in the groups.

Children—Teach Asthma Self-Management Skills To Promote Asthma Control

The Expert Panel recommends that asthma self-management education be incorporated into routine care for children who have asthma (Evidence A). (See Evidence Table 4, Asthma Self-Management Education for Children.)

A meta-analysis of 32 controlled trials of educational interventions for self-management in children and adolescents, involving 3,706 patients, showed significant effects of education in improving the child's self-efficacy and lung function as well as in reducing days with restricted activity, school absences, and ED visits (Guevara et al. 2003). No effects were seen on hospitalizations (Guevara et al. 2003; Wolf et al. 2003). The authors conducted subgroup analyses to determine the effect of peak flow versus symptom-based monitoring strategies, individual versus group format, single versus multiple sessions, and moderate or severe asthma versus mild or moderate asthma, but the small number of studies in each subgroup did not provide sufficient statistical power to detect significant differences.

Several other controlled studies have also shown positive effects for self-management education in children. A multicenter RCT of education delivered by asthma counselors through group sessions, individual meetings, and telephone followup showed that education significantly reduced days with asthma symptoms (Evans et al. 1999a). An RCT of education that combined group sessions, individual meetings, and having the family accompany the patient during doctor visits both decreased frequency of symptoms and activity restriction and increased the families' ability and confidence to self-manage asthma (Bonner et al. 2002). A small RCT ($N = 33$) with minority families found that group education that emphasized collaborative learning and use of cultural resources increased asthma knowledge and reduced ED visits significantly compared to more didactic group education and to a no-intervention control (La Roche et al. 2006). A trial of training to improve children's technique in using a breath-activated inhalation device showed that individual training provided by nurses in a single visit improved inhalation technique and that instructions to practice at home for 2 weeks resulted in further improvements (Agertoft and Pedersen 1998). These studies provide strong evidence for the benefit of providing structured self-management education to children who have asthma as well as their families in conjunction with ambulatory care for asthma.

EMERGENCY DEPARTMENT/HOSPITAL-BASED EDUCATION

Adults

The Expert Panel recommends that:

- **At the time of discharge from the ED, clinicians offer brief and focused asthma education (Evidence D) and provide patients with an ED asthma discharge plan with instructions to the patients and family for how to use it (Evidence B).**
- **Before patients are discharged home, assess inhaler techniques for all prescribed medications and reinforce correct technique (Evidence B).**
- **At the time of discharge from the ED, patients be referred for followup asthma care appointment (either PCP or asthma specialist) within 1–4 weeks (Evidence B). If appropriate, consider referral to an asthma self-management education program (Evidence B).**
- **Before patients are discharged from a hospitalization for asthma exacerbations, give them asthma self-management education (Evidence B).**

Emergency Department Asthma Education

Visits to the ED for asthma exacerbation have been characterized as a moment of opportunity for providing asthma education, inhaler technique training, and referral for followup with the PCP; yet there are very few RCTs of asthma education in the ED for patients who have exacerbations. Previous asthma guidelines (EPR 1991; EPR—2 1997) have recommended at least some asthma education at the time of discharge from the ED for an exacerbation. One observational study conducted in the EDs of a province of Canada found that only 78 percent of patients received even brief education, and the focus was usually on medicines (46 percent) or inhaler technique (73 percent). Only 38 percent were counseled on triggers of exacerbations, and only 32 percent were referred to an asthma education program (Gervais et al. 2005).

Patients who present to the ED with acute asthma are a source for identifying self-management problems. Observational studies (Griswold et al. 2005; Radeos et al. 2001) show that many of these patients have poor knowledge of self-management and have a high frequency of ED visits (Boulet et al. 1996; Griswold et al. 2005). Moreover, many adults seem to delay seeking care for acute asthma for a variety of reasons, including fear of being treated with systemic steroids (Janson and Becker 1998). These observations suggest a role for asthma education, yet there is little evidence from RCTs of the benefit of targeted education in the ED setting. A survey of 77 asthma researchers based in EDs showed that, despite agreeing that patient education was very important, few EDs have or use asthma education programs (Emond et al. 2000).

Targeting high-risk patients for asthma education at the ED visit has been explored in two RCTs (Bolton et al. 1991; Cote et al. 2001) and in two observational studies (Kelso et al. 1995, 1996). In one RCT, limited education in the ED in inhaler technique and use of a written asthma action plan was compared to a comprehensive, structured educational program and usual care (Cote et al. 2001). ED revisits were not different among the groups in the first 6 months after the intervention, but revisits declined significantly more in the structured education group by 12 months; however, reinforcement of self-management education was provided at the 6-month point only to the structured education group. In a second RCT, Bolton and coworkers (1991) provided three asthma education sessions to patients after a visit to the ED. Despite significant attrition from attendance at sessions, followup was completed with 76 percent of the study sample, and, adjusting for baseline differences, the intervention group had fewer ED visits than controls at 12-month followup ($p = .06$). In a race-specific reanalysis of the Bolton and colleagues (1991) study data, Ford and coworkers (1997) found that African American and Caucasian patients experienced similar benefits from the program.

Teaching Inhaler Technique in the Emergency Department

Most other RCTs of education for adults in the ED setting focus on teaching inhaler technique for delivery of SABA. Numata and coworkers (2002) conducted an RCT in the ED to compare teaching MDI technique to 61 adults who had asthma and nebulizer delivery of bronchodilator to 32 adults who had COPD. Median teaching time required to teach and administer MDI-delivered bronchodilator medication was 6.5 minutes. The authors concluded that teaching use of MDI with spacer delivery of bronchodilator is feasible in the ED for treatment of acute asthma exacerbation. This study suggests that patients can learn about and use MDIs in the acute care setting and that the ED provides an opportunity to teach correct inhaler technique.

Despite being provided with MDIs and instructions for using them, a significant proportion of children continue to use nebulizers at home after discharge from the ED (Cheng et al. 2002). Use of MDIs by children may be complicated, however, by numerous errors in technique,

potentially rendering the devices ineffective. Scarfone and colleagues (2002) evaluated children's skills in using an MDI and a peak flow meter in the ED and found a significant proportion were using these devices incorrectly with a large number of errors. Dry-powder inhaler (DPI) use appears to be associated with a rate of poor inhalation technique similar to that of the use of MDIs (Melani et al. 2004). Inhaler technique may be improved with tailored educational interventions aimed at specific problems (Hesselink et al. 2004).

The Expert Panel concludes that it is important to assess inhaler techniques for all prescribed medications and reinforce correct technique before patients are discharged home.

Referral for Followup Care

ED clinicians encourage patients seen for acute exacerbation to follow up with their PCPs, and ED clinicians often encourage participation in an asthma education program. Robichaud et al. (2004) found that ED clinicians can motivate some patients to attend an asthma educational program following discharge from the ED by giving a brief educational message and facilitating followup attendance at the educational program. However, others have found that ED discharge instructions that include recommending attendance at an educational session and keeping an appointment with a PCP are not adhered to in any consistent way, and even when appointments are kept, there is no impact on long-term outcomes (Baren et al. 2001, 2006). In one RCT, however, the short-term outcome of contact with the PCP did improve (Baren et al. 2001). These studies refer specifically to referral to the PCP.

The findings may not be true for facilitated referrals to an asthma specialist. Both an observational study (Schatz et al. 2005) and an interventional study (Zeiger et al. 1991) suggest that better outcomes may result for patients referred from the ED to asthma specialists.

Although evidence from RCTs is limited regarding the optimal referral site (e.g., PCP or asthma specialist), the Expert Panel concludes that patients should be referred for a followup asthma care appointment within 1–4 weeks of discharge from the ED. The followup appointment should include patient education; if appropriate, consider referral to an asthma self-management education program. Because there are so few studies of self-management education in the ED setting, and because the several interventions to improve patient followup have not demonstrated benefit, more research is needed to understand how to make education effective at this point of care.

Hospital-Based Asthma Education

Patients who are admitted to the hospital for acute severe asthma exacerbations represent another opportunity for teaching asthma self-management. Castro and colleagues (2003) conducted an RCT to determine if an intensive asthma intervention program led by specially trained nurses could prevent readmissions of adult patients who were noted to be high users of health care. The multiple-component intervention included asthma education, a written asthma action plan, extra social support, and telephone followup calls after discharge. The combination of all of these produced a significant decrease in readmissions for asthma and in total hospitalizations compared to patients in usual care. The effect of the individual components of the intervention was not determined. Similarly, another hospital-based randomized trial of an inpatient education program (George et al. 1999) targeted to young, economically disadvantaged adults who were admitted with acute asthma showed that inpatient asthma education, assistance with discharge planning, postdischarge followup telephone calls, and scheduled followup clinic visits had an impact after discharge. Patients who received the

intervention had a higher followup rate, fewer subsequent ED visits, and fewer repeat hospitalizations.

In another RCT of asthma self-management education during hospital admission, 80 patients admitted with acute asthma received two 30-minute self-management education sessions and a written asthma action plan (Morice and Wrench 2001). The education group improved knowledge of asthma management compared to controls, but no significant differences between groups occurred in number of readmissions. Using a brief self-management intervention during hospital admission was found to reduce patients' daytime wheezing, nighttime awakenings, activity limitations, and hospital readmission (Osman et al. 2002). The session was 40–60 minutes of self-management education and included a written asthma action plan. All of these outcomes were improved compared to control patients but were more significant in patients for whom it was a first-time admission. The results of these trials suggest that asthma education at the time of hospitalization can have a significant effect in reducing repeat hospitalizations for asthma exacerbations.

Children

The Expert Panel recommends that asthma education programs that have been shown to be effective be delivered to children during or following discharge from the ED or the hospital (Evidence B). More research is needed to understand how to make education maximally effective at this point of care.

The Expert Panel recommends that:

- **At the time of discharge from the ED, clinicians offer brief and focused asthma education (Evidence D) and provide patients with an ED asthma discharge plan with instructions to the patients and family for how to use it (Evidence B).**
- **Before patients are discharged home, assess inhaler techniques for all prescribed medications and reinforce correct technique (Evidence B).**
- **At the time of discharge from the ED, patients be referred for followup asthma care appointment (either PCP or asthma specialist) within 1–4 weeks (Evidence B). If appropriate, consider referral to an asthma self-management education program (Evidence B).**
- **Before patients are discharged from a hospitalization for asthma exacerbations, give them asthma self-management education (Evidence B).**

A meta-analysis of eight controlled studies of educational interventions for children or adolescents following ED visits or hospital admissions found no significant benefit for health status or readmission and concluded that more research is needed (Haby et al. 2001). The authors of the meta-analysis noted trends toward clinically relevant, yet not statistically significant, decreases in ED visits, unscheduled visits, and hospitalizations. Haby and colleagues recommended more studies with larger sample sizes to assess adequately the effectiveness of educational interventions after use of emergency care. Two successful studies included in this meta-analysis showed very different approaches. An RCT of a nurse-led discharge program (consisting of a 20-minute patient education program and a written asthma action plan) significantly reduced unscheduled doctor visits, ED visits, and readmissions to hospital over 12 months (Wesseldine et al. 1999). In another RCT, a nurse-led training program

administered during admission with one outpatient followup visit to the nurse resulted in reduced hospital admissions in the following 14 months (Madge et al. 1997).

Five recent RCTs show mixed results for the effectiveness of education postdischarge from the ED. Walders and colleagues (2006) provided all participants with medical care by a specialist, including written asthma action plans, peak flow meters, and spacer devices. Participants who also received an intervention that included an asthma education session, a session on problem-solving based on an individualized asthma risk profile, and access to an asthma advice telephone service had significantly fewer ED visits at 12-month followup than the controls who received no education (Walders et al. 2006). Teach and coworkers (2006) scheduled a followup visit, within 2 weeks, to a specialized asthma clinic located in the ED, where followup care and education were provided. The intervention group received a written asthma action plan and referrals to ongoing primary care, plus education about asthma self-monitoring and management as well as environmental modification and trigger control. Compared with controls, the intervention group had significantly greater ICS use, fewer ED visits, and improved quality of life in the 6-month followup period (Teach et al. 2006). Sockrider and colleagues (2006) provided children and their families with tailored education, including a customized asthma action plan and an educational summary, before discharge from the ED for an acute episode of asthma. At 2-week followup, intervention families had significantly greater confidence than controls in their ability to manage asthma. At 9-month followup, among participants who had intermittent asthma, children whose families received education had significantly fewer ED visits than controls, but there was no difference between groups for children who had persistent asthma (Sockrider et al. 2006). Two other controlled trials of brief education, by telephone postdischarge from the ED (Khan et al. 2004) and by a combination of computer instruction and interaction with a nurse practitioner (Sundberg et al. 2005), did not improve patients' health status.

Two recent controlled trials to see if telephone reminders after discharge from the ED increased followup appointments with primary care showed positive findings at short-term but not long-term followup. In one study, appointment rates, quality of life, and asthma symptoms improved relative to controls at 6 months, but no difference was found at 12 months (Sin et al. 2004). In the second study, the number of appointments was higher and symptoms were lower at 2 weeks, but these differences had disappeared at 12 months (Smith et al. 2004).

In an RCT (Zorc et al. 2003), followup primary care appointments for children seen in the ED for acute asthma were scheduled by ED staff, but patients had no higher rate of attendance than when visits were simply requested. Furthermore, there was no change in return visits to the ED, missed school, or use of long-term control medications.

Based on these findings, the Expert Panel concludes that asthma education programs that have been shown to be effective should be delivered to children during or following discharge from the ED or the hospital. More research is needed to understand how to make education maximally effective at this point of care.

EDUCATIONAL INTERVENTIONS BY PHARMACISTS

The Expert Panel recommends that use of interventions provided by pharmacists be considered; such programs are feasible, and they merit further studies of effectiveness (Evidence B).

Controlled trials of asthma education delivered by pharmacists have shown mixed results (Barbanel et al. 2003; Basheti et al. 2005; Bynum et al. 2001; Cordina et al. 2001; McLean et al. 2003; Saini et al. 2004; Stergachis et al. 2002). Four of these RCTs recruited community pharmacies, provided training for their pharmacists, and evaluated the impact of pharmacist teaching on patient outcomes (Cordina et al. 2001; McLean et al. 2003; Saini et al. 2004; Stergachis et al. 2002). All of these studies involved repeated contacts with patients. One study showed reduced hospitalizations and improved inhaler technique (Cordina et al. 2001). A second study found reduced asthma severity, better lung function, less use of albuterol, and better perceived control of asthma (Saini et al. 2004). The third study showed reductions in daytime and nighttime symptoms, use of SABA, and doctor visits, as well as improvements in PEF and quality of life (McLean et al. 2003). The fourth study found no differences between intervention patients and controls on any measure (Stergachis et al. 2002). These studies noted difficulties in providing asthma education in a community pharmacy, but they demonstrated that community pharmacies may serve as effective venues for scheduled followup visits for specialized asthma care. A small study of patients randomized within a single pharmacy found significant reduction in symptoms for the intervention group (Barbanel et al. 2003). Another small study found that counseling by a pharmacist improved inhaler technique (Basheti et al. 2005). Finally, another study evaluated interactive telepharmacy video counseling, using compressed video, connecting adolescents in schools with pharmacists working from a remote site; this study found improvements in inhaler technique (Bynum et al. 2001).

The Expert Panel concludes that, despite the difficulties observed, use of interventions provided by pharmacists is feasible, may help improve self-management skills and asthma outcomes, and merits more clinical studies of pharmacists' providing education interventions.

EDUCATIONAL INTERVENTIONS IN SCHOOL SETTINGS

The Expert Panel recommends that implementation of school-based asthma education programs proven to be effective be considered to provide to as many children who have asthma as possible the opportunity to learn asthma self-management skills and to help provide an “asthma-friendly” learning environment for students who have asthma (Evidence B).

Several studies suggest that comprehensive school-based asthma education programs can improve health and quality of life in students who have persistent asthma. Five controlled trials of education in schools for children who have asthma have shown reduced symptoms for children receiving asthma education (Butz et al. 2005; Christiansen et al. 1997; Cicutto et al. 2005; Clark et al. 2004; MeGhan [sic] et al. 2003). Three of these studies have also shown reductions in the use of acute health care services (Butz et al. 2005; Cicutto et al. 2005; MeGhan [sic] et al. 2003). One program provided education for elementary school children, plus educational components for principals, custodians, and other school staff, resulting in reduced asthma morbidity, improved asthma management, and decreased school absences (Clark et al. 2004). A secondary analysis of this trial found that the program also had effects on students who had moderate or severe symptoms but no diagnosis; effects included reductions in daytime and nighttime symptoms and in days with restricted activity (Joseph et al. 2005). Two studies have shown that parents who did not attend the educational sessions had improved asthma management skills after completing learning assignments with children at home (Clark et al. 2004; Evans et al. 2001).

An innovative trial of peer education in the schools, in which older students were trained to deliver education to younger students, improved quality of life in participating students (Shah et al. 2001). Teacher-led asthma education interventions have been successful in improving asthma outcomes in secondary schools and in improving school policies. In a very large trial, teachers were trained to deliver asthma education to students who had and did not have asthma. This study revealed positive changes in students' knowledge of asthma, their perception that asthma could be controlled, and their tolerance of asthma in others (Henry et al. 2004). Five-year followup showed that this program was still being taught by 71 percent of the teachers who had been trained.

Three other RCTs of school-based education showed no significant effect on student health (Patterson et al. 2005; Velsor-Friedrich et al. 2005) or school staff efforts to communicate with community physicians about students' symptoms (Haltermann et al. 2005). Another RCT tested the effectiveness of an asthma educational intervention in improving asthma knowledge, self-efficacy, and quality of life in rural families (Butz et al. 2005). Children 6–12 years of age who had persistent asthma were recruited from rural elementary schools and randomized into the control (standard asthma education) group or into an interactive educational intervention consisting of three educational workshops, an asthma coloring book, and parental educational workshops. Parent/caregiver and child asthma knowledge, self-efficacy, and quality of life were assessed at baseline and at 10 months after enrollment. Children's self-efficacy, children's asthma knowledge, and parental asthma knowledge increased significantly in the intervention group, but no significant increase in parental self-efficacy or children's or parental quality of life was found at followup.

Asthma education video gaming media were shown to be useful in improving asthma self-management knowledge and asthma quality of life for high-risk, low-income, inner-city children who have asthma (Shames et al. 2004).

Taken together, these studies suggest that asthma education delivered in schools can improve health and quality of life in students who have asthma.

COMMUNITY-BASED INTERVENTIONS

Asthma Education

It is the opinion of the Expert Panel that, although studies of community-based asthma education do not demonstrate benefits in health status, they do show that asthma education programs delivered by trained community residents are feasible, can result in behavior change and improved quality of life, and deserve further research (Evidence C). (See Evidence Table 5, Asthma Self-Management Education in Community Settings.)

Community-based asthma interventions (those delivered in various community settings) can positively affect large numbers of persons who have asthma, especially in poor, inner-city communities. A controlled trial of asthma outreach and education, delivered by trained community residents in a community center, found no difference in acute care visits between intervention and comparison communities, but the study found reduced numbers of acute care visits for those who had high levels of participation in the program (Fisher et al. 2004). Surprisingly, socially isolated residents were more likely to participate in program activities than those who were socially active. An observational study of education for caregivers of children who had asthma, delivered by trained, community peer educators, found significant increases in asthma knowledge, management behavior, and quality of life; these increases were sustained

at 3, 6, and 12 months (Bryant-Stephens and Li 2004). An asthma education program that included the interventions of group and individual education sessions taught by a nurse and a physiotherapist resulted in significantly fewer primary care visits and less absenteeism from work (Gallefoss and Bakke 2001). In an observational study, hospital inpatient asthma education combined with outpatient followup asthma education in the community for children and families improved asthma knowledge (Ochsner et al. 2002). The inclusion of a child-life specialist in community-based and family-support interventions appears to be beneficial in promoting psychological adjustment of children who have chronic health conditions, such as asthma, especially if the child has low self-esteem (Chernoff et al. 2002).

HOME-BASED INTERVENTIONS

Home-Based Asthma Education for Caregivers

The Expert Panel recommends that asthma education delivered in the homes of caregivers of young children be considered and that this area needs more research (Evidence C).

A controlled trial of a home-based asthma education intervention for caregivers of young children showed that the intervention significantly reduced the amount of reported bother from asthma symptoms and increased symptom-free days and caregiver quality of life for children 1–3 years of age (Brown et al. 2002). The age of the children who had asthma appeared to moderate the intervention effect of home-based asthma education for caregivers in relation to both asthma morbidity and caregivers' quality of life. A single-group study of home-based asthma education intervention for Latino caregivers of children who have asthma (average age, 7 years) showed reductions in bedroom allergens and increases in allergen-control devices (e.g., mattress covers) at followup (Jones et al. 2001). These studies suggest that the home may be a useful point of care for education interventions.

Home-Based Allergen-Control Interventions

The Expert Panel recommends that multifaceted allergen education and control interventions delivered in the home setting and that have been shown to be effective in reducing exposures to cockroach, rodent, and dust-mite allergen and associated asthma morbidity be considered for asthma patients sensitive to those allergens (Evidence A). Further research to evaluate the cost-effectiveness and the feasibility of widespread implementation of those programs will be helpful.

Avoiding allergens is often difficult (Leickly et al. 1998). The home may be a useful point of care for educational interventions to reduce household allergens and to increase the use of allergen-control devices in the home. Eight controlled trials have evaluated allergen-control interventions that combined education for families about implementing allergen-control strategies with provision of tools and supplies needed to carry them out (Carter et al. 2001; Custovic et al. 2000; Eggleston et al. 2005; Klinnert et al. 2005; Krieger et al. 2005; McConnell et al. 2005; Morgan et al. 2004; Woodcock et al. 2003). Some of these studies added professional allergen-reduction services (Carter et al. 2001; Custovic et al. 2000; Eggleston et al. 2005; Morgan et al. 2004), and several provided broader education about asthma management as well (Klinnert et al. 2005; Krieger et al. 2005). Four of the studies delivered allergen-control education through multiple home visits (Eggleston et al. 2005; Klinnert et al. 2005; Krieger et al. 2005; Morgan et al. 2004).

In general, the aim of these trials was to test multifaceted strategies to reduce the burden of allergens in the homes of asthma patients and to improve health outcomes rather than the efficacy of specific allergen-control techniques by themselves. An innovative trial of home intervention to control allergens included both a placebo control and a “no-visit” control to assess the relative effect of the intervention versus home visits to prompt allergen-control measures by families of children who have asthma (Carter et al. 2001). The intervention and placebo control (permeable mattress covers and instructions to wash bedding in cold water) groups did not differ significantly, but both groups had reduced acute care visits when compared to the no-visit control group, suggesting that the home visit itself resulted in improved asthma control. This study did not provide information about how families in the no-visit control group reduced allergens or improved asthma control.

Another trial evaluated allergen-control measures in the homes of infants who had atopic parents and no pets; measures included using impermeable bedding covers, replacing carpet with vinyl flooring in the infant’s room, and asking participants to wash bed linens in hot water. Over the 1-year followup, the intervention group had significantly less wheeze with shortness of breath, less wheeze after vigorous activity, and less medicine prescribed by PCPs for control of wheezy attacks (Custovic et al. 2000). This study suggests that prenatal intervention in high-risk infants can reduce the risk of asthma symptoms during the first year of life.

One large trial relied primarily on repeated home visits to educate the family in allergen-control techniques and to provide them with HEPA-filter vacuum cleaners and mattress covers. The intervention was tailored to the child’s allergen-sensitivity profile, and professional pest control was applied for children allergic to cockroach (Morgan et al. 2004). Over the 2-year followup period, significant reductions occurred in cat, dust-mite, and cockroach allergens in the child’s bedroom, and these were associated with reductions in daytime and nighttime symptoms, fewer school absences in both years, and reductions in ED visits in the first followup year. This study suggests that education about relevant environmental control in the home, coupled with the provision of tools for allergen control, can enable families to reduce allergen levels and asthma morbidity effectively.

A clinical RCT of home environmental intervention with inner-city children who had mild persistent asthma demonstrated that tailored, multifaceted environmental treatment and education can reduce airborne particulate matter in inner-city homes, resulting in a modest effect on asthma morbidity, with decreased asthma symptoms, but no improvement in lung function (Eggleston et al. 2005). The intervention group received home-based education, cockroach and rodent extermination, allergen-proof mattress and pillow encasings, and HEPA-filter air cleaners. Outcomes were measured by home evaluations at 6 and 12 months, clinic evaluation at 12 months, and multiple telephone interviews.

Three RCTs, assessing the effect of home-based education on allergens and control interventions, used community health workers. One RCT showed that a home-based allergen-control and education intervention (delivered by trained community health workers to families of children who had asthma), focusing on training residents to apply cockroach-control measures themselves during a five-visit period, could successfully reduce the number of cockroaches in the home and cockroach-allergen levels in the children’s bedding (McConnell et al. 2005). No measures of health outcomes were reported. A second trial provided allergen-control education, as well as resources and support for behavior change, by trained community health workers in seven visits (Krieger et al. 2005). This study found reductions in the use of emergency health care services by children who had asthma and improvements in the quality of life of their caregivers. A third trial of allergen control and both allergen-specific

and general asthma education with children relied on 15 home visits over a period of 12 months by nurses trained in community outreach (Klennert et al. 2005). Compared to controls, this intervention significantly reduced cockroach-allergen and children's cotinine levels but had no effect on health outcomes.

In adults, a trial of dust-mite-allergen control that relied on allergen-impermeable bed covers alone, without instructions to wash linens in hot water or any other education, found no significant differences in mattress dust, morning PEF, or percent of patients who were able to control asthma without ICSs (Woodcock et al. 2003). This study, which involved no educational component, suggests that the role of education in maintaining allergen control is important.

Several studies with strong education components were successful in reducing allergen exposures in the home and/or reducing asthma morbidity, whether education was delivered by community workers or research staff. More research is needed to increase our understanding about how the combination of home-based education interventions and the provision of tools for allergen control in high-risk asthma populations can reduce the burden of allergen exposure and affect asthma morbidity. Studies are also needed to evaluate the cost-effectiveness and feasibility of widespread implementation of all allergen-control interventions delivered in patients' homes.

Summary statement on asthma self-management education at points of care outside the health care system:

According to the review of RCTs, asthma education can be delivered at multiple points of care other than clinics, EDs, and hospitals. With the support of clinicians, effective educational interventions should be provided at points of care outside the traditional health care setting, including schools (Butz et al. 2005; Christiansen et al. 1997; Cicutto et al. 2005; Clark et al. 2004; Meghan [sic] et al. 2003), pharmacies (Cordina et al. 2001; McLean et al. 2003; Saini et al. 2004), and homes. For example, pharmacy-based education directed toward understanding medications and teaching inhaler skills as well as home-based interventions to increase patient and family capacity to control allergen and irritant exposure (Custovic et al. 2000; Eggleston et al. 2005; Klennert et al. 2005; Krieger et al. 2005; McConnell et al. 2005; Morgan et al. 2004) are strategies that will enhance overall asthma self-management support.

OTHER OPPORTUNITIES FOR ASTHMA EDUCATION

Education for Children Using Computer-Based Technology

The Expert Panel recommends that computer-based programs that are incorporated into asthma care be considered for adolescents and children (Evidence B).

Four controlled trials have tested the ability of interactive computer asthma-education programs to improve children's asthma self-management behavior, health outcomes, and use of emergency health services. Two studies of computer-based asthma-education programs that children completed over a series of clinic visits reported positive results including: reduced symptoms and hospitalizations, and increased clinic followup visits (Bartholomew et al. 2000); reduced symptoms and ED visits, and less use of ICSs (Krishna et al. 2003). In two other trials of computer-based education, no improvements were found in health status or use of emergency health services. One study involved three opportunities to complete the program over three clinic visits (Homer et al. 2000); the other study involved a single 20-minute opportunity to complete the program at home with guidance from a nurse (Huss et al. 2003).

Two other trials tested computer-based programs to facilitate recording symptoms, communicating with health care providers, and making decisions about treatment. A trial of a device used at home to monitor symptoms and medication use, obtain immediate programmed feedback, and communicate results to health care providers over a telephone link found reductions in days with activity limitation, reports of peak flow in yellow or red zones, and urgent telephone calls to the doctor (Guendelman et al. 2002). A trial that tested an interactive, Internet-based system, allowing specialists to monitor patient diaries of symptoms and peak flow and to adjust therapy quickly, rapidly improved patients' control of symptoms and quality of life (Rasmussen et al. 2005).

An observational study found that asking children and adolescents to videotape their asthma-management practices at home provided detailed evidence of problems with adherence and inhaler technique (Rich et al. 2000). Reviewing these videotape narratives with the patient may help clinicians improve teaching and care of patients.

Taken together, these studies suggest that new technologies, including computer and Internet-based education and communication with physicians, can improve patients' control of asthma. More research is needed in these areas.

Education on Tobacco Avoidance for Women Who Are Pregnant and Members of Households With Infants and Young Children

The Expert Panel recommends that all patients who have asthma and women who are pregnant be advised not to smoke and not to be exposed to ETS (Evidence C). Query patients about their smoking status, and consider specifically referring to smoking cessation programs adults who smoke and have young children who have asthma in the household (Evidence B).

Several studies strongly suggest that maternal smoking during pregnancy results in harmful in utero exposure of the fetus and increases the risk of the child's developing recurrent wheezing and asthma in the first 5 years of life (Agabiti et al. 1999; Gergen et al. 1998; Gilliland et al. 2001). Children exposed in utero to maternal smoking demonstrate persistent deficits in lung function measured by spirometry (Kelso et al. 1995). Children not exposed in utero but exposed postnatally to tobacco smoke in the home also have an increased risk of wheezing and asthma by age 5 (Gergen et al. 1998). Heavy postnatal tobacco smoke markedly increases the risk for persistent asthma in the child (Infante-Rivard et al. 1999). In addition, children 4–16 years of age who were exposed to pre- and postnatal tobacco smoke and had high cotinine levels were found to have increased wheezing, increased school absences, and decreased lung function (Mannino et al. 2001).

It is now well established that exposure to ETS increases the severity of asthma, increases the risk of asthma-related ED visits and hospitalizations, and decreases the quality of life in both children and adults (Eisner 2002; Mannino et al. 2002; Morkjaroenpong et al. 2002). In adult, nonsmoking persons who have asthma, recent secondhand smoke exposure (as directly measured by 7-day nicotine badge) and long-term 3-month exposure (as measured by levels of both nicotine and cotinine in hair) are associated with increased asthma severity and poorer asthma outcomes (Eisner et al. 2005). In terms of public health, these results support efforts to prohibit smoking in public places.

An important RCT (Wilson et al. 2001) used three nurse-led education sessions with parents who were smokers; the sessions incorporated behavior change strategies, asthma education, and repeated feedback of their children's urinary cotinine levels. The intervention significantly reduced medical visits for acute asthma in these tobacco-exposed, low-income, minority children.

Because of the marked impact of tobacco as an irritant for most people who have asthma plus the negative health consequences of smoking to the smoker, the smoking status of all patients should be obtained, and appropriate advice and support should be offered to all patients who smoke.

Case Management for High-Risk Patients

The Expert Panel recommends that case or care management by trained health professionals be considered for patients who have poorly controlled asthma and have recurrent visits to the ED or hospital (Evidence B).

Case or care management is the strategy of using expert guidelines to focus management of patients who have asthma and have high levels of health care service use on specific, stepwise goals to reduce morbidity and costs, as well as the risk of mortality from asthma. Three RCTs (Greineder et al. 1999; Hughes et al. 1991; Kelly et al. 2000) found that case management reduced ED visits, hospitalizations, and health care costs among children who had asthma and were high users of health care resources. In all three trials, the intervention included intensive education of patients combined with case management by nurses. One study (Greineder et al. 1999) found a 39 percent reduction in ED use in the group that received asthma education alone, but the extent to which this was attributable to the education rather than to developmental changes cannot be determined. However, case management with education resulted in a 73 percent decrease in ED visits—a reduction of 34 percentage points compared with education alone ($p = 0.0002$). Hospitalizations were reduced by 43 percent in the control group and by 84 percent in the case-management group. Total use of services outside the study group health plans was reduced 28 percent in control and 82 percent in case-management groups. All between-group differences were statistically significant. The positive effect of asthma education was significantly enhanced by followup case management, with continued contact with the nurse case manager. Care-management processes are tools to improve the efficiency and quality of primary care delivery. These tools are often used by organizations that provide care for chronic illnesses, such as asthma and diabetes, to low-income populations.

Another study (Delaronde 2002) explored using case management to increase use of ICSs among 249 persons who had asthma, were in a managed care program, were identified as receiving three or more SABA prescriptions for 3 consecutive months, but had no prescription for anti-inflammatory medications. The results of this study and another observational study with more intensive followup (Delaronde et al. 2005) showed that case management may improve medication use by patients who do not use asthma medications as prescribed. Patients who received intensive case-management intervention were four times more likely to be prescribed anti-inflammatory medications.

Taken together, the findings of these studies suggest that case (or care) management can be effective in improving asthma control in selected populations of individuals who have poorly controlled asthma.

COST-EFFECTIVENESS

The Expert Panel recommends that asthma self-management education that is provided by trained health professionals be considered for policies and reimbursements as an integral part of effective asthma care; the education improves patient outcomes (Evidence A) and can be cost-effective (Evidence B). (See Evidence Table 6, Cost-Effectiveness of Asthma Self-Management Education.)

Cost-effectiveness analyses provide evidence of the financial impact of interventions as well as their clinical benefits. The analyses relate costs to a measure of clinical effectiveness of the intervention. The cost-effectiveness ratio is the ratio of the difference in costs between two alternatives to the difference in effectiveness between the same two alternatives. When an intervention that has a certain cost improves a significant clinical outcome and total costs are decreased, the intervention is considered cost-effective. For example, if self-management education improves overall control of asthma, with fewer days of symptoms, fewer ED visits, and fewer hospitalizations, then the intervention may result in lower overall direct medical costs. If these educated patients also have fewer missed work or school days, then indirect costs are reduced as well.

The cost-effectiveness and/or cost savings of asthma self-management education has been shown in six RCTs (Gallefoss and Bakke 2001; Kamps et al. 2004; Kauppinen et al. 1999; Schermer et al. 2002; Sullivan et al. 2002, 2005) and one observational study (Tinkelman and Wilson 2004). Sullivan and colleagues (2002) conducted a prospective cost analysis of an inner-city asthma-management program being studied in an RCT of 1,033 inner-city children who had asthma. The primary efficacy end point was the mean number of days with asthma symptoms self-reported over a 2-week period. Masters-level social workers worked with adult family members to improve asthma-management skills. Children attended two child-only group sessions for skill development. Compared with usual care, the intervention improved outcomes at average cost of \$9.20 per symptom-free day. Cost savings increased as severity of a child's asthma increased. Cost-effectiveness was greater in subgroups of children who had more severe asthma because, for the modest increase in cost of the intervention, substantial reductions occurred in the total cost of medical care. Later, Sullivan and colleagues (2005) evaluated the cost-effectiveness of interventions designed to improve the quality of care delivered to children who had asthma and their outcomes. In this three-arm, cluster RCT, peer-led physician education was compared to combined peer-led education with a multilevel, nurse-led educational intervention to improve asthma care and compared to usual care. The primary clinical outcome, symptom-free days, was highest (13.3 days) for the combined intervention compared to peer-led education alone (6.5 days) and compared to usual care, but this outcome was achieved at an increased cost of asthma care (cost-effectiveness ratio of \$18/symptom-free day for peer-led education and \$68/symptom-free day for the combined intervention). The higher costs were attributable to the cost of implementing and maintaining the interventions.

Two other RCTs demonstrate the cost-effectiveness of self-management education (Gallefoss and Bakke 2001; Schermer et al. 2002). Both studies showed that guided self-management education improved quality of life, lung function, and compliance with ICS medication while reducing rates of physician consultation and absenteeism from work due to asthma. A key part of the intervention was teaching how to change medication during symptom episodes of asthma. Both studies showed a reduction in total direct and indirect costs while improving asthma outcomes, thus making the cost of the self-management interventions cost-effective.

In an earlier study, Kauppinen and coworkers (1999) conducted an RCT in newly diagnosed adults who had asthma, comparing the long-term cost-effectiveness of intensive patient education combined with supervision of self-management to a control group who received conventional brief education at the initial visit. After 3 years, a significant improvement in lung function and a significant reduction in sick days occurred in the self-management group. Quality-of-life scores did not differ between groups, and the difference in costs was not statistically significant, although costs were consistently lower in the self-management group.

Kamps and colleagues (2004) conducted an RCT of outpatient asthma management of children, who were 2–18 years of age and had asthma, by trained nurses compared to pediatricians. After all patients were seen for the first asthma-education visit with a nurse educator, the patients were randomly assigned to either a pediatrician or an experienced asthma nurse educator. Costs of followup care were less for the nurse than for the pediatrician due to lower salary costs. In this population of patients who had mild asthma, nurse-led outpatient management of childhood asthma was provided at a lower cost, with no difference in health care utilization, compared to medical care by pediatricians. Similar results were shown by Lindberg and coworkers (2002) in a comparative cohort study of adult patients cared for by trained asthma nurses versus physicians. The average costs of care were significantly less for the group of patients managed by nurses.

In an observational study, Tinkelman and Wilson (2004) reported a disease-management intervention that was effective in achieving cost savings in asthma care. Patients served as their own controls and showed a significant improvement, between baseline and postintervention, in costs of care.

Taken together, the analyses of costs in both randomized and observation trials demonstrate the cost-effectiveness of education in those asthma self-management programs that improve patients' skills and decrease health care utilization. (See Evidence Table 6, Cost-Effectiveness of Asthma Self-Management Education.)

Tools for Asthma Self-Management

ROLE OF WRITTEN ASTHMA ACTION PLANS FOR PATIENTS WHO HAVE ASTHMA

The Expert Panel recommends that clinicians provide to all patients who have asthma a written asthma action plan that includes instructions for (1) daily management and (2) recognizing and handling worsening asthma, including adjustment of dose of medications. Written action plans are particularly recommended for patients who have moderate or severe persistent asthma, a history of severe exacerbations, or poorly controlled asthma (Evidence B). Written asthma action plans may be based on PEF measurements or symptoms or both, depending on the preference of the patient and clinician (Evidence B). A peak-flow-based plan may be particularly useful for patients who have difficulty perceiving signs of worsening asthma (Evidence D).

The Expert Panel prefers to use one term—"written asthma action plan"—to encompass instructions both for daily actions to keep asthma controlled and for actions to adjust treatment when symptoms or exacerbations occur. Using one term addresses the confusion over previous guidelines' use of several different terms for asthma management plans and emphasizes the importance of giving patients instructions for managing both the acute and long-term aspects of asthma. Therefore, this report uses one term "written asthma action plan," although in some studies investigators used a variation of this term.

Written asthma action plans provide a way to involve the patient directly in self-management by writing down the treatment plan the clinician and patient agree on together and by giving clear instructions that the patient can use at home. The asthma action plan should be reviewed and refined at the patient's followup visits. Clinicians should choose an action plan that suits their practice, patients, and style. Examples of asthma action plans are provided in figures 3–10 a, b, and c to demonstrate the range of possibilities; they can be modified as appropriate.

Written asthma action plans include two important elements:

- Daily management
 - What medicine to take daily, including the specific names of the medications
 - What actions to take to control environmental factors that worsen the patient's asthma
- How to recognize and handle worsening asthma
 - What signs, symptoms, and PEF measurements (if peak flow monitoring is used) indicate worsening asthma
 - What medications to take in response to these signs
 - What symptoms and PEF measurements indicate the need for urgent medical attention
 - Emergency telephone numbers for the physician, ED, and person or service to transport the patient rapidly for medical care

The effectiveness of written asthma action plans has been addressed in several recent systematic reviews and in five individual studies. A recent systematic review of 36 RCTs showed that self-management education that included self-monitoring by either PEF or symptoms, coupled with regular medical review and a written asthma action plan, reduced hospitalizations, urgent care visits, ED visits, work absences, and nocturnal asthma in adults (Gibson et al. 2003). Although subgroup analyses were not able to isolate the specific contribution of written plans to these outcomes, the authors conclude that education programs that enable people to adjust their medication using a written asthma action plan appear to be more effective than other forms of asthma self-management.

In a later systematic review (Toelle and Ram 2004), three RCTs tested the effect of written plans versus no written plans and found no consistent evidence that written plans produced better patient outcomes than outcomes with no written plan. The trials were too small and the results too inconsistent to reach a firm conclusion about the contribution of written asthma action plans to asthma education.

Five individual studies (including four RCTs, and one with an additional, extended followup) and one case-control study have examined the contributions of written asthma action plans to the control of asthma (Abramson et al. 2001; Baldwin et al. 1997; Cowie et al. 1997; Jones et al. 1995; Klein et al. 2001; van der Palen et al. 2001). Two RCTs showed no effect for written asthma action plans compared to no written plans for measures of asthma morbidity or health care utilization (Baldwin et al. 1997; Jones et al. 1995). The individual benefit of including an asthma action plan for self-management of exacerbations was shown in a 2-year RCT

FIGURE 3-10a. SAMPLE ASTHMA ACTION PLAN

My Asthma Action Plan

Patient Name: _____

Medical Record #: _____

Physician's Name: _____ DOB: _____


Physician's Phone #: _____ Completed by: _____ Date: _____

Long-Term-Control Medicines	How Much To Take	How Often	Other Instructions
		_____ times per day EVERY DAY!	
		_____ times per day EVERY DAY!	
		_____ times per day EVERY DAY!	
		_____ times per day EVERY DAY!	
Quick-Relief Medicines	How Much To Take	How Often	Other Instructions
		Take ONLY as needed	NOTE: If this medicine is needed frequently, call physician to consider increasing long-term-control medications.

Special instructions when I feel ● *good*, ● *not good*, and ● *awful*.

GREEN ZONE

I feel *good*.
(My peak flow is in the GREEN zone.)




YELLOW ZONE

I do *not* feel *good*.
(My peak flow is in the YELLOW zone.)

My symptoms may include one or more of the following:

- Wheeze
- Tight chest
- Cough
- Shortness of breath
- Waking up at night with asthma symptoms
- Decreased ability to do usual activities




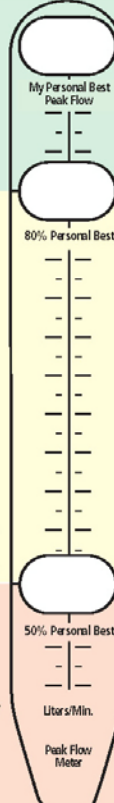
RED ZONE

I feel *awful*.
(My peak flow is in the RED zone.)

Warning signs may include one or more of the following:

- It's getting harder and harder to breathe
- Unable to sleep or do usual activities because of trouble breathing





PREVENT asthma symptoms everyday:

- Take my long-term-control medicines (above) every day.
- Before exercise, take _____ puffs of _____
- Avoid things that make my asthma worse like: _____

CAUTION. I should continue taking my long-term-control asthma medicines every day AND:

- Take _____

If I still do not feel good, or my peak flow is not back in the **Green Zone** within 1 hour, then I should:

- Increase _____
- Add _____
- Call _____

MEDICAL ALERT! Get help!

- Take _____ until I get help immediately.
- Take _____
- Call _____

Danger! Get help immediately! Call 9-1-1 if you have trouble walking or talking due to shortness of breath or lips or fingernails are gray or blue.

Source: Adapted and reprinted with permission from the Regional Asthma Management and Prevention (RAMP) Initiative, a program of the Public Health Institute. <http://www.calasthma.org/uploads/resources/actionplanpdf.pdf>; San Francisco Bay Area Regional Asthma Management Plan, <http://www.rampasthma.org>

FIGURE 3–10b. SAMPLE ASTHMA ACTION PLAN

Child Asthma Action Plan

0–5 years of age

Patient Name: _____

Medical Record #: _____


Health Care Provider's Name: _____ DOB: _____

Health Care Provider's Phone #: _____ Completed by: _____ Date: _____

Long-Term-Control Medicines (Use Every Day To Stay Healthy)	How Much To Take	How Often	Other Instructions (such as spacers/masks, nebulizers)
		_____ times per day EVERY DAY!	
		_____ times per day EVERY DAY!	
		_____ times per day EVERY DAY!	
		_____ times per day EVERY DAY!	
Quick-Relief Medicines	How Much To Take	How Often	Other Instructions
		Give ONLY as needed	NOTE: If this medicine is needed often (_____ times per week), call physician.

GREEN ZONE

*Child is **well** and has no asthma symptoms, even during active play.*



PREVENT asthma symptoms every day:

- Give the above long-term-control medicines every day.
- Avoid things that make the child's asthma worse:
 - Avoid tobacco smoke; ask people to smoke outside.
 - _____
 - _____

YELLOW ZONE

*Child is **not well** and has asthma symptoms that may include:*

- Coughing
- Wheezing
- Runny nose or other cold symptoms
- Breathing harder or faster
- Awakening due to coughing or difficulty breathing
- Playing less than usual
- _____
- _____

Other symptoms that could indicate that your child is having trouble breathing may include: difficulty feeding (grunting sounds, poor sucking), changes in sleep patterns, cranky and tired, decreased appetite.

CAUTION. Take action by continuing to give regular asthma medicines **every day** AND:

- Give _____
(include dose and frequency)

If the child is not in the **Green Zone** and still has symptoms after 1 hour, then:

- Give more _____
(include dose and frequency)
- _____
(include dose and frequency)
- Call _____
(include dose and frequency)

RED ZONE

*Child feels **awful!** Warning signs may include:*

- Child's wheeze, cough, or difficulty breathing continues or worsens, even after giving yellow zone medicines.
- Child's breathing is so hard that he/she is having trouble walking/talking/eating/playing.
- Child is drowsy or less alert than normal.

MEDICAL ALERT! Get help!

- Take the child to the hospital or call 9–1–1 immediately!
- Give more _____ until you get help. (include dose and frequency)
- Give _____ (include dose and frequency)

Call 9–1–1 if:

- The child's skin is sucked in around neck and ribs, or
- Lips and/or fingernails are grey or blue, or
- Child doesn't respond to you.

Danger! Get help immediately!

Adapted and reprinted with permission from the Regional Asthma Management and Prevention (RAMP) Initiative, a program of the Public Health Institute.

Source: <http://www.calasthma.org/uploads/resources/actionplanpdf.pdf>; San Francisco Bay Area Regional Asthma Management Plan, <http://www.rampasthma.org>

FIGURE 3–10c. SAMPLE ASTHMA ACTION PLAN

Asthma Action Plan

For: Doctor's Phone Number _____ Doctor: _____ Hospital/Emergency Department Phone Number _____ Date: _____

GREEN ZONE

Doing Well

- No cough, wheeze, chest tightness, or shortness of breath during the day or night
- Can do usual activities

And, if a peak flow meter is used,
Peak flow: more than _____ (50 percent or more of my best peak flow)
 My best peak flow is: _____

**Take these long-term-control medicines each day (include an anti-inflammatory).
 Medicine _____ How much to take _____ When to take it _____**

Identify and avoid and control the things that make your asthma worse, like (list here):

Before exercise, if prescribed, take: 2 or 4 puffs _____ 5 to 60 minutes before exercise

YELLOW ZONE

Asthma Is Getting Worse

- Cough, wheeze, chest tightness, or shortness of breath, or
- Walking at night due to asthma, or
- Can do some, but not all, usual activities

-Or-
Peak flow: _____ to _____ (50 to 79 percent of my best peak flow)

First **Add: quick-relief medicine—and keep taking your GREEN ZONE medicine.**
 _____ (short-acting beta₂-agonist) 2 or 4 puffs, every 20 minutes for up to 1 hour
 Nebulizer, once

Second **If applicable, remove yourself from the thing that made your asthma worse.
 If your symptoms (and peak flow, if used) return to GREEN ZONE after 1 hour of above treatment:**
 Continue monitoring to be sure you stay in the green zone.

-Or-
Peak flow: _____ (50 to 79 percent of my best peak flow)
Take: _____ (short-acting beta₂-agonist) 2 or 4 puffs or Nebulizer
Add: _____ mg per day For _____ (3–10) days
 (oral corticosteroid)
Call the doctor, _____, before/ within _____ hours after taking the oral corticosteroid.
 (phone)

RED ZONE

Medical Alert!

- Very short of breath, or
- Quick-relief medicines have not helped, or
- Cannot do usual activities, or
- Symptoms are same or get worse after 24 hours in Yellow Zone

-Or-
Peak flow: less than _____ (50 percent of my best peak flow)

Take this medicine:
 _____ (short-acting beta₂-agonist) 4 or 6 puffs or Nebulizer
 _____ mg
 (oral corticosteroid)

Then call your doctor NOW. Go to the hospital or call an ambulance if:
 ■ You are still in the red zone after 15 minutes AND
 ■ You have not reached your doctor.

DANGER SIGNS ■ **Trouble walking and talking due to shortness of breath** **Take 4 or 6 puffs of your quick-relief medicine AND**
 ■ **Lips or fingernails are blue** **Go to the hospital or call for an ambulance** _____ **NOW!**
 (phone)

Source: National Heart, Lung, and Blood Institute, National Institutes of Health, U.S. Department of Health and Human Services. NIH Publication No 07-5251, October 2006.

(van der Palen et al. 2001). The self-management action plan significantly improved self-perceived asthma control, confidence (self-efficacy) for self-management, and self-treatment and self-management behavior during a hypothetical asthma exacerbation. These subjective outcomes were confirmed after 2 years of followup, but no significant effect on asthma clinical status was detected (Klein et al. 2001). Another RCT (Cowie et al. 1997) provided education for all patients during ED visits for asthma exacerbations and randomly assigned patients to three study arms: no written plan, a symptom-based written plan, and a peak flow-based written plan. Over the 6-month followup period, all groups improved their asthma control, but patients who received a peak flow-based written plan had significantly ($p = 0.002$) fewer urgent care visits (5 for 46 patients) compared with patients who received a symptom-based plan (45 visits for 48 patients) or no written plan (55 visits for 48 patients). A case-control study by Abramson and colleagues (2001) compared patients who died from exacerbation of asthma with controls who had severe asthma exacerbations successfully treated in the ED. After adjustment for demographic, psychosocial, and disease severity factors, having a written asthma action plan at the time of the exacerbation was significantly associated with a 70 percent reduction in the risk of death (RR = 0.29 (0.09, 0.93)).

Although the results of these studies are mixed, they suggest that the use of written plans may help patients improve control of their asthma, particularly in preventing or managing asthma exacerbations. A scientific review (Powell and Gibson 2003) examined several options for the use of written plans in asthma management. The review found no difference in outcomes when patients self-adjusted medication by using a written asthma action plan compared to when clinicians adjusted treatment. These two methods for achieving asthma control were found to be equivalent. This finding suggests that it is safe and effective for patients to use written asthma action plans for self-management of their asthma.

Adams and colleagues (2001) showed that a comprehensive program, with monthly telephone contact to discuss the asthma action plans directed by either symptoms or peak flow, was equally effective in improving outcomes. The key factor in this study was the monthly contact to provide reinforcement for the educational endeavor. Only patients who had higher levels of denial of the disease and lower self-confidence had increased numbers of ED visits for asthma flares.

ROLE OF PEAK FLOW MONITORING

The Expert Panel recommends that:

- **Written asthma action plans can be based on either symptoms or peak flow measurements (Evidence B).**
- **Long-term daily peak flow monitoring be considered for patients who have moderate or severe persistent asthma (Evidence B), poor perception of airflow obstruction or worsening asthma, unexplained response to environmental or occupational exposures, and others at the discretion of the clinician and the patient (EPR—2 1997).**

Several studies reviewed in the National Asthma Education and Prevention Program (NAEPP) “Expert Panel Report—Update 2002: Guidelines for the Diagnosis and Management of Asthma” show that peak flow and symptom-based action plans are equally effective in adults (EPR—Update 2002). The choice should be left to the discretion of the patient and the health care clinician. When peak-flow-guided action plans are chosen, the patient’s personal best peak flow must be known. Reddel and colleagues (2004) reported that personal best PEF is a

useful concept for written asthma action plans and can be determined by using the highest PEF over the previous 2 weeks. Additionally, the patient must be educated, understand how to use the action plan, and be willing to incorporate peak flow monitoring into asthma care. Use of peak flow monitoring should not replace symptom recognition but should facilitate additional discussion with the health care provider.

Peak flow monitoring for self-management of asthma may be less effective for children. In a small RCT of peak flow monitoring and diary recording in children, Kamps and coworkers (2001) found low levels of adherence over a 4-week period of monitoring peak flow twice daily. Children and their parents were not told the electronic monitor was recording date and time of measurement. Actual compliance recorded electronically was significantly lower than reported compliance in both study groups, and 50 percent of the values were either recorded incorrectly or invented. Eid and colleagues (2000) showed that PEF monitoring in children may be inaccurate compared to FEV₁, especially as the severity of airway obstruction increases. The addition of peak flow monitoring to symptom-based guided self-management was not shown to contribute to self-management decisionmaking in children 7–14 years of age in another RCT (Wensley and Silverman 2004). During acute episodes of asthma, children responded to increased symptoms by taking more ICS when PEF was greater than 70 percent of personal best. In contrast to the finding of Eid and colleagues (2000), these investigators found no evidence that FEV₁ was more sensitive than PEF in detecting airflow obstruction. In the findings of an RCT comparing symptom monitoring to PEF monitoring only when symptoms occurred, to daily and symptom-time PEF monitoring, children and their parents perceived benefit from symptom monitoring whether or not it was accompanied by peak flow measurement (McMullen et al. 2002). These investigators found no evidence of benefit from more intensive daily monitoring.

Periodic daily peak flow monitoring may be useful to evaluate responses to changes in treatment, identify the temporal relationship between environmental or occupational exposures and bronchospasm, and provide guidance for patients who have poor perception of airflow obstruction.

See “Component 1: Assessment and Monitoring” for additional discussion. See “How To Use Your Peak Flow Meter” (figure 3–11) for a sample handout for patients.

GOALS OF ASTHMA SELF-MANAGEMENT EDUCATION AND KEY EDUCATIONAL MESSAGES

Patient education is an essential component of successful asthma management. Current management approaches require patients and families to effectively carry out complex pharmacologic regimens, institute environmental control strategies, detect and self-treat most asthma exacerbations, and communicate appropriately with health care providers. Patient education is the mechanism through which patients learn to accomplish those tasks successfully. It is also a powerful tool for helping patients gain the motivation, skill, and confidence to control their asthma (Butz et al. 2005; Gibson et al. 2000; Guevara et al. 2003; Levy et al. 2000; Perneger et al. 2002). Research shows that asthma education can be cost-effective and can reduce morbidity for both adults and children, especially among high-risk patients (Gallefoss and Bakke 2001; Gibson et al. 2000, 2003; Guevara et al. 2003; Schermer et al. 2002; Sullivan et al. 2002).

This section covers strategies for enhancing the delivery of patient education and improving the likelihood that patients will follow clinical recommendations.

FIGURE 3–11. 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 five 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. But if you cough or make a mistake, don't write down the number. Do it over again.
- Repeat steps 1 through 5 two more times, and write down the best of the three 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-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 needs to be based on your own personal best peak flow number.

To find out 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 in late afternoon or early evening.
- 15–20 minutes after you take your inhaled short-acting beta₂-agonist for quick relief.
- As instructed by your doctor.

FIGURE 3–11. HOW TO USE YOUR PEAK FLOW METER (CONTINUED)

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. For example:

Green Zone (more than ___ L/min [80 percent 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 less than 80 percent of your personal best number]) signals caution. If you remain in the yellow zone after several measures of peak flow, take an inhaled short-acting beta₂-agonist. If you continue to register peak flow readings in the yellow zone, your asthma may not be under good control. Ask your doctor if you need to change or increase your daily medicines.

Red Zone (below ___ L/min [less than 50 percent of your personal best number]) signals a medical alert. You must take an inhaled short-acting beta₂-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.

Record your personal best peak flow number and peak flow zones in your asthma diary.

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

- PEF goes between ___ L/min and ___ L/min (50 to less than 80 percent of personal best, yellow zone).

ACTION: Take an inhaled short-acting beta₂-agonist (quick-relief medicine) as prescribed by your doctor.

- PEF increases 20 percent or more when measured before and after taking an inhaled short-acting beta₂-agonist (quick-relief medicine).

ACTION: Talk to your doctor about adding more medicine to control your asthma better (for example, an anti-inflammatory medication).

Source: Adapted from *Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma*. National Asthma Education and Prevention Program, National Heart, Lung, and Blood Institute, 1997.

Establish and Maintain a Partnership

The Expert Panel recommends that a partnership between patient and clinician be established to promote effective asthma management (Evidence A).

Building a partnership requires that clinicians promote open communication and ensure that patients have a basic and accurate foundation of knowledge about asthma, understand the treatment approach, and have the self-management skills necessary to monitor the disease objectively and take medication effectively (Clark et al. 1995, 1998, 2000; Evans et al. 1997; Love et al. 2000; Marabini et al. 2002; Smith et al. 2005; Wilson et al. 2005, 2006).

The Expert Panel recommends that when nurses, pharmacists, respiratory therapists, and other health care professionals are available to provide and support patient self-management education, a team approach through multiple points of care should be used (NHLBI 1995b,c). The principal clinician, care manager, or any other health professional trained in asthma management and self-management education can introduce the key educational messages (See figure 3–12.) and negotiate agreements with patients about the goals of treatment, medications to use, and the actions the patient will take to promote asthma control (Clark et al. 1995, 1998, 2000; Marabini et al. 2002; Wilson et al. 2005, 2006). All health care professionals who encounter patients who have asthma are members of the health care team and should reinforce and expand these messages during clinic visits, ED visits, pharmacy visits, telephone calls, and in community centers and schools. National certification for asthma educators is available in the United States. Although no published data are available comparing certified to noncertified educators, certification requires a minimum number of hours of experience and passing a standardized test.

It is the opinion of the Expert Panel that the health professional team members should consider documenting in the patient's record the key educational points (See figure 3–12.), patient concerns, and actions the patient agrees to take (Evidence C). This record will enable all members of the team to be consistent and to reinforce the educational points and the progress being made. Communication strategies that unite the network of health care professionals should be developed and strengthened. See further discussion in the section on "Communication Techniques."

FIGURE 3–12. KEY EDUCATIONAL MESSAGES: TEACH AND REINFORCE AT EVERY OPPORTUNITY

Basic Facts About Asthma

- The contrast between airways of a person who has and a person who does not have asthma; the role of inflammation
- What happens to the airways in an asthma attack

Roles of Medications: Understanding the Difference Between:

- Long-term-control medications: prevent symptoms, often by reducing inflammation. Must be taken daily. Do not expect them to give quick relief.
- Quick-relief medications: short-acting beta₂-agonists relax muscles around the airway and provide prompt relief of symptoms. Do not expect them to provide long-term asthma control. Using quick-relief medication on a daily basis indicates the need for starting or increasing long-term control medications.

Patient Skills

- Taking medications correctly
 - Inhaler technique (demonstrate to patient and have the patient return the demonstration)
 - Use of devices, such as prescribed valved holding chamber (VHC), spacer, nebulizer
- Identifying and avoiding environmental exposures that worsen the patient's asthma; e.g., allergens, irritants, tobacco smoke
- Self-monitoring to:
 - Assess level of asthma control
 - Monitor symptoms and, if prescribed, peak flow
 - Recognize early signs and symptoms of worsening asthma
- Using written asthma action plan to know when and how to:
 - Take daily actions to control asthma
 - Adjust medication in response to signs of worsening asthma
 - Seek medical care as appropriate

TEACH ASTHMA SELF-MANAGEMENT

The Expert Panel recommends that:

- **Clinicians teach patients and families the basic facts about asthma (especially the role of inflammation), medication skills, and self-monitoring techniques (Evidence A).**
- **Provide all patients with a written asthma action plan that includes daily management and how to recognize and handle worsening asthma. Written action plans are particularly recommended for patients who have moderate or severe persistent asthma, a history of severe exacerbations, or poorly controlled asthma (Evidence B).**
- **Clinicians teach patients environmental control measures (See “Component 3: Control of Environmental Factors and Comorbid Conditions That Affect Asthma” for evidence ranking on different control measures.).**

Self-management education should include the following key points, adapted to meet the individual patient’s needs:

- Figure 3–13 illustrates how education can be delivered across initial patient visits and followup visits.
- Teach basic facts about asthma so that the patient and family understand the rationale for needed actions. Give a brief verbal description of what asthma is, emphasizing the role of inflammation, and the intended role of each medication. Do not overwhelm the patient with too much information all at once, but repeat the important messages at each visit. Ask the patient to bring all medications to each appointment for review.
- Teach the patient necessary medication skills, such as correct use of the inhaler (See figure 3–14.) and VHC or spacer and knowing when and how to take quick-relief medications.
- Teach self-monitoring skills: symptom monitoring; peak flow monitoring, as appropriate; and recognizing early signs of deterioration.
- Identify current level of asthma control, goals for improvement, and teach how to self-manage worsening asthma by adjusting medications to regain asthma control.
- Teach relevant environmental control/avoidance strategies (See figure 3–15, “How To Control Things That Make Your Asthma Worse.”). Teach how environmental allergens and irritants can make the patient’s asthma worse at home, school, and work as well as how to recognize both immediate and delayed reactions. Teach patients strategies for removing allergens and irritants to which they are sensitive from their living spaces. If possible, refer them to evaluated, effective, home-based education programs for allergen and irritant control.
- Advise all patients not to smoke tobacco and to avoid secondhand tobacco smoke. Emphasize the importance of not smoking for women who are pregnant and for parents of small children.

FIGURE 3–13. DELIVERY OF ASTHMA EDUCATION BY CLINICIANS DURING PATIENT CARE VISITS

Assessment Questions	Information	Skills
Recommendations for Initial Visit		
<p>Focus on:</p> <ul style="list-style-type: none"> ■ Expectations of visit ■ Asthma control ■ Patients' goals of treatment ■ Medications ■ Quality of life <p>“What worries you most about your asthma?”</p> <p>“What do you want to accomplish at this visit?”</p> <p>“What do you want to be able to do that you can't do now because of your asthma?”</p> <p>“What do you expect from treatment?”</p> <p>“What medicines have you tried?”</p> <p>“What other questions do you have for me today?”</p> <p>“Are there things in your environment that make your asthma worse?”</p>	<p>Teach in simple language:</p> <ul style="list-style-type: none"> ■ What is asthma? Asthma is a chronic lung disease. The airways are very sensitive. They become inflamed and narrow; breathing becomes difficult. ■ The definition of asthma control: few daytime symptoms, no nighttime awakenings due to asthma, able to engage in normal activities, normal lung function. ■ Asthma treatments: two types of medicines are needed: <ul style="list-style-type: none"> — Long-term control: medications that prevent symptoms, often by reducing inflammation. — Quick relief: short-acting bronchodilator relaxes muscles around airways. ■ Bring all medications to every appointment. ■ When to seek medical advice. Provide appropriate telephone number. 	<p>Teach or review and demonstrate:</p> <ul style="list-style-type: none"> ■ Inhaler (see figure 3–14) and spacer or valved holding chamber (VHC) use. Check performance. ■ Self-monitoring skills that are tied to a written action plan: <ul style="list-style-type: none"> — Recognize intensity and frequency of asthma symptoms. — Review the signs of deterioration and the need to reevaluate therapy: <ul style="list-style-type: none"> ◆ Waking at night or early morning with asthma ◆ Increased medication use ◆ Decreased activity tolerance ■ Use of a written asthma action plan (See figure 3–10.) that includes instructions for daily management and for recognizing and handling worsening asthma.
Recommendations for First Followup Visit (2 to 4 weeks or sooner as needed)		
<p>Focus on:</p> <ul style="list-style-type: none"> ■ Expectations of visit ■ Asthma control ■ Patients' goals of treatment ■ Medications ■ Patient treatment preferences ■ Quality of life <p>Ask relevant questions from previous visit and also ask:</p> <p>“What medications are you taking?”</p> <p>“How and when are you taking them?”</p> <p>“What problems have you had using your medications?”</p> <p>“Please show me how you use your inhaled medications.”</p>	<p>Teach in simple language:</p> <ul style="list-style-type: none"> ■ Use of two types of medications. ■ Remind patient to bring all medications and the peak flow meter, if using, to every appointment for review. ■ Self-assessment of asthma control using symptoms and/or peak flow as a guide. 	<p>Teach or review and demonstrate:</p> <ul style="list-style-type: none"> ■ Use of written asthma action plan. Review and adjust as needed. ■ Peak flow monitoring if indicated (See figure 3–11.). ■ Correct inhaler and spacer or VHC technique.

FIGURE 3–13. DELIVERY OF ASTHMA EDUCATION BY CLINICIANS DURING PATIENT CARE VISITS (CONTINUED)

Assessment Questions	Information	Skills
Recommendations for Second Followup Visit		
Focus on:	Teach in simple language:	Teach or review and demonstrate:
<ul style="list-style-type: none"> ■ Expectations of visit ■ Asthma control ■ Patients' goals of treatment ■ Medications ■ Quality of life <p>Ask relevant questions from previous visits and also ask:</p> <p>“Have you noticed anything in your home, work, or school that makes your asthma worse?”</p> <p>“Describe for me how you know when to call your doctor or go to the hospital for asthma care.”</p> <p>“What questions do you have about the asthma action plan?” “Can we make it easier?”</p> <p>“Are your medications causing you any problems?”</p> <p>“Have you noticed anything in your environment that makes your asthma worse?”</p> <p>“Have you missed any of your medications?”</p>	<ul style="list-style-type: none"> ■ Self-assessment of asthma control, using symptoms and/or peak flow as a guide. ■ Relevant environmental control/avoidance strategies (See figure 3–15.): <ul style="list-style-type: none"> — How to identify home, work, or school exposures that can cause or worsen asthma — How to control house-dust mites, animal exposures if applicable — How to avoid cigarette smoke (active and passive) ■ Review all medications. 	<ul style="list-style-type: none"> ■ Inhaler/spacer or VHC technique. ■ Peak flow monitoring technique. ■ Use of written asthma action plan. Review and adjust as needed. ■ Confirm that patient knows what to do if asthma gets worse.
Recommendations for All Subsequent Visits		
Focus on:	Teach in simple language:	Teach or review and demonstrate:
<ul style="list-style-type: none"> ■ Expectations of visit ■ Asthma control ■ Patients' goals of treatment ■ Medications ■ Quality of life <p>Ask relevant questions from previous visits and also ask:</p> <p>“How have you tried to control things that make your asthma worse?”</p> <p>“Please show me how you use your inhaled medication.”</p>	<ul style="list-style-type: none"> ■ Review and reinforce all: <ul style="list-style-type: none"> — Educational messages — Environmental control strategies at home, work, or school — Medications — Self-assessment of asthma control, using symptoms and/or peak flow as a guide 	<ul style="list-style-type: none"> ■ Inhaler/spacer or VHC technique. ■ Peak flow monitoring technique, if appropriate. ■ Use of written asthma action plan. Review and adjust as needed. ■ Confirm that patient knows what to do if asthma gets worse.

Sources: Adapted from Guevara et al. 2003; Janson et al. 2003; Powell and Gibson 2003; Wilson et al. 1993.

FIGURE 3–14. HOW TO USE YOUR METERED-DOSE INHALER**HOW TO USE YOUR METERED-DOSE INHALER**

Using an inhaler seems simple, but most patients do not use it the right way. When you use your inhaler the wrong way, less medicine gets to your lungs.

For the next few days, read these steps aloud as you do them or ask someone to read them to you. Ask your doctor or nurse to check how well you are using your inhaler.

Use your inhaler in one of the three ways pictured below. A or B are best, but C can be used if you have trouble with A and B. Your doctor may give you other types of inhalers.

Steps for Using Your Inhaler

Getting ready

1. Take off the cap and shake the inhaler.
2. Breathe out all the way.
3. Hold your inhaler the way your doctor said (A, B, or C below).

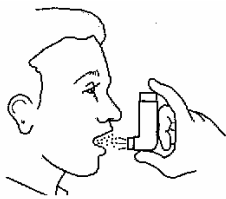
Breathe in slowly

4. As you start breathing in slowly through your mouth, press down on the inhaler one time. (If you use a holding chamber, first press down on the inhaler. Within 5 seconds, begin to breathe in slowly.)

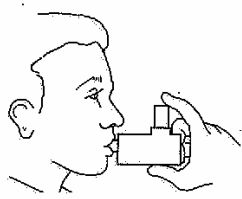
Hold your breath

5. Keep breathing in slowly, as deeply as you can.
6. Hold your breath as you count to 10 slowly, if you can.
7. For inhaled quick-relief medicine (beta₂-agonists), wait about 15–30 seconds between puffs. There is no need to wait between puffs for other medicines.

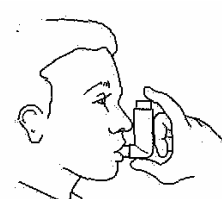
A. Hold inhaler 1 to 2 inches in front of your mouth (about the width of two fingers).



B. Use a spacer/holding chamber. These come in many shapes and can be useful to any patient.



C. Put the inhaler in your mouth. Do not use for steroids.



Clean your inhaler as needed, and know when to replace your inhaler. For instructions, read the package insert or talk to your doctor, other health care provider, or pharmacist.

FIGURE 3–15. HOW TO CONTROL THINGS THAT MAKE YOUR ASTHMA WORSE

You can help prevent asthma episodes by staying away from things that make your asthma worse. This guide suggests many ways to help you do this.

You need to find out what makes your asthma worse. Some things that make asthma worse for some people are not a problem for others. You do not need to do all of the things listed in this guide.

Look at the things listed in dark print below. Put a check next to the ones that you know make your asthma worse, particularly if you are allergic to the things. Then, decide with your doctor what steps you will take. Start with the things in your *bedroom* that bother your asthma. Try something simple first.

Tobacco Smoke

- If you smoke, ask your doctor for ways to help you quit. Ask family members to quit smoking, too.
- Do not allow smoking in your home, car, or around you.
- Be sure no one smokes at a child's daycare center or school.

Dust Mites

Many people who have asthma are allergic to dust mites. Dust mites are like tiny "bugs" you cannot see that live in cloth or carpet.

Things that will help the most:

- Encase your mattress in a special dust mite-proof cover.*
- Encase your pillow in a special dust mite-proof cover* or wash the pillow each week in hot water. Water must be hotter than 130 °F to kill the mites. Cooler water used with detergent and bleach can also be effective.
- Wash the sheets and blankets on your bed each week in hot water.

Other things that can help:

- Reduce indoor humidity to or below 60 percent; ideally 30–50 percent. Dehumidifiers or central air conditioners can do this.
- Try not to sleep or lie on cloth-covered cushions or furniture.
- Remove carpets from your bedroom and those laid on concrete, if you can.
- Keep stuffed toys out of the bed, or wash the toys weekly in hot water or in cooler water with detergent and bleach. Placing toys weekly in a dryer or freezer may help. Prolonged exposure to dry heat or freezing can kill mites but does not remove allergen.

***To find out where to get products mentioned in this guide, call:**

Asthma and Allergy Foundation of America
(800–727–8462)

American Academy of Allergy, Asthma, and Immunology
(800–822–2762)

Allergy and Asthma Network/Mothers of
Asthmatics, Inc. (800–878–4403)

National Jewish Medical and Research Center
(Lung Line) (800–222–5864)

American College of Allergy, Asthma, and Immunology
(800–842–7777)

FIGURE 3–15. HOW TO CONTROL THINGS THAT MAKE YOUR ASTHMA WORSE (CONTINUED)

Animal Dander

Some people are allergic to the flakes of skin or dried saliva from animals.

The best thing to do:

- Keep animals with fur or hair out of your home.

If you can't keep the pet outdoors, then:

- Keep the pet out of your bedroom, and keep the bedroom door closed.
- Remove carpets and furniture covered with cloth from your home. If that is not possible, keep the pet out of the rooms where these are.

Cockroach

Many people with asthma are allergic to the dried droppings and remains of cockroaches.

- Keep all food out of your bedroom.
- Keep food and garbage in closed containers (never leave food out).
- Use poison baits, powders, gels, or paste (for example, boric acid). You can also use traps.
- If a spray is used to kill roaches, stay out of the room until the odor goes away.

Vacuum Cleaning

- Try to get someone else to vacuum for you once or twice a week, if you can. Stay out of rooms while they are being vacuumed and for a short while afterward.
- If you vacuum, use a dust mask (from a hardware store), a central cleaner with the collecting bag outside the home, or a vacuum cleaner with a HEPA filter or a double-layered bag.*

Indoor Mold

- Fix leaking faucets, pipes, or other sources of water.
- Clean moldy surfaces.
- Dehumidify basements if possible.

Pollen and Outdoor Mold

During your allergy season (when pollen or mold spore counts are high):

- Try to keep your windows closed.
- If possible, stay indoors with windows closed during the midday and afternoon, if you can. Pollen and some mold spore counts are highest at that time.
- Ask your doctor whether you need to take or increase anti-inflammatory medicine before your allergy season starts.

Smoke, Strong Odors, and Sprays

- If possible, do not use a wood-burning stove, kerosene heater, fireplace, unvented gas stove, or heater.
- Try to stay away from strong odors and sprays, such as perfume, talcum powder, hair spray, paints, new carpet, or particle board.

Exercise or Sports

- You should be able to be active without symptoms. See your doctor if you have asthma symptoms when you are active—such as when you exercise, do sports, play, or work hard.
- Ask your doctor about taking medicine before you exercise to prevent symptoms.
- Warm up for a period before you exercise.
- Check the air quality index and try not to work or play hard outside when the air pollution or pollen levels (if you are allergic to the pollen) are high.

Other Things That Can Make Asthma Worse

- Sulfites in foods: Do not drink beer or wine or eat shrimp, dried fruit, or processed potatoes if they cause asthma symptoms.
- Cold air: Cover your nose and mouth with a scarf on cold or windy days.
- Other medicines: Tell your doctor about all the medicines you may take. Include cold medicines, aspirin, and even eye drops.

JOINTLY DEVELOP TREATMENT GOALS

The Expert Panel recommends that clinicians determine the patient's personal treatment goals and preferences for treatment; review the general goals of asthma treatment; and agree on the goals of treatments (Evidence B).

Fundamental to building a partnership is that clinicians and patients jointly develop and agree on both short- and long-term treatment goals. Such agreements can encourage active participation, enhance the partnership, and improve asthma management (Clark et al. 1995, 2000; Marabini et al. 2002; Wilson et al. 2005, 2006).

- **Determine the patient's personal treatment goals and preferences for treatment.** Ask how asthma interferes with the patient's life (e.g., inability to sleep through the night, play a sport), and incorporate the responses into personal treatment goals. Involve the patient in decisionmaking about treatment.
- **Share the general goals of asthma treatment with the patient and family.** Tell patients, "Our measures of control are to have you:
 - Be free from troublesome symptoms day and night, including sleeping through the night."
 - Have the best possible lung function."
 - Be able to participate fully in any activities of your choice."
 - Not miss work or school because of asthma symptoms."
 - Need fewer or no urgent care visits or hospitalizations for asthma."
 - Use medications to control asthma with as few side effects as possible."
 - Be satisfied with your asthma care."
- **Agree on the goals of treatment.** The clinicians, the patient, and, when appropriate, the patient's family should agree on the goals of asthma management, which include both the patient's personal goals and the general goals (see list above) suggested by the clinicians. Negotiate the treatment plans to accomplish joint goals of treatment.
- **Provide a written asthma action plan that reflects the agreed upon goals for treatment.** See earlier discussion, "The Role of Written Asthma Action Plans for Patients Who Have Asthma."

ASSESS AND ENCOURAGE ADHERENCE TO RECOMMENDED THERAPY

The Expert Panel recommends that clinicians assess and encourage adherence during all asthma visits (Evidence C).

An important part of patient education is encouraging adherence. In a meta-analysis of methods to improve adherence to medical regimens, Roter and colleagues (1998) used multiple measures of compliance (health outcomes; direct indicators, such as urine and blood tracers; indirect indicators, such as pill and refill counts; subjective patient reports; and utilization, such as appointment keeping) to identify successful adherence strategies. The authors found that no single strategy or programmatic focus showed any clear advantage but that comprehensive interventions combining multiple strategies with cognitive, behavioral, and affective components were more likely to be effective than those using a single focus. Magar and coworkers (2005) showed that a multifocused strategy that tailored asthma education goals and messages to the individual patient improved outcomes. Other studies in small numbers of adults have shown that self-management education programs in asthma led to improved adherence over periods of

7 weeks to 6 months (Janson et al. 2003; Schaffer and Tian 2004). Onyirimba and colleagues (2003) found that direct clinician-to-patient discussion and feedback of adherence rates improved use of ICSs over a 10-week period.

Evidence concerning the optimal frequency for assessing and encouraging adherence among asthma patients is lacking, and no evidence from adherence studies identifies any single successful method. Evidence from studies in multiple diseases and in asthma, however, indicates that repetition is important, perhaps especially so in a variable, chronic disease such as asthma, and that consideration of the following strategies would be helpful for assessing and improving adherence within the context of clinical visits.

- Use effective techniques to promote open communication. Studies of physicians' communication styles suggest that being willing to address all questions, active listening, and using good communication techniques can improve patient adherence and/or satisfaction with care (Brown et al. 2004; Clark et al. 1998, 2000; Smith et al. 2005).
- Start each visit by asking about the patient's or parent's concerns and goals for the visit. Studies of adults and children have shown the most common concerns of patients and families include: fear and misunderstanding of effects of medications, including concerns of becoming "dependent" on asthma medications (Bender and Bender 2005; Janson and Becker 1998; Leickly et al. 1998; Muntner et al. 2001; Yawn 2003), and uncertainty of when to seek help (Bender and Bender 2005; Janson and Becker 1998). Open-ended questions, such as "What worries you most about your asthma?" may encourage patients and families to voice issues, personal beliefs, or concerns they may be apprehensive about discussing or may think are not of interest to the clinician. Most nonadherence originates in personal beliefs or concerns about asthma that have not been discussed with the clinician (Bender and Bender 2005; Janson and Becker 1998; Janz et al. 1984; Korsch et al. 1968; Yawn 2003). Until such fears and worries are identified and addressed, patients will not be able to adhere to the clinician's recommendations (Adams et al. 2003; Colland et al. 2004; Cowie et al. 2004; Gibson et al. 2002, 2005; Janson and Becker 1998; Korsch et al. 1968; Levy et al. 2000; Lindberg et al. 1999).
- Ask specifically about any concerns patients or parents have about medicines (e.g., safety, impact, convenience, and cost) (Bender and Bender 2005; Janson and Becker 1998; Leickly et al. 1998; Muntner et al. 2001; Yawn 2003).
- Assess the patient's and family's perceptions of the severity level of the disease and how well it is controlled. Beliefs that the asthma is not really severe have been shown to affect adherence adversely (Bender and Bender 2005; Muntner et al. 2001). Ask questions such as "How much danger do you believe you are in from your asthma?" Identifying patients who are overwhelmed by fear of death offers the opportunity to put their fears in perspective with the results of objective assessments and expert opinion. A written asthma action plan that directs the patient how to respond to worsening asthma (figure 3–10a, b, and c) may also be helpful in reducing anxiety and directing appropriate use of health care resources (Bender and Bender 2005; Janson-Bjerklie et al. 1992; Janz et al. 1984; Muntner et al. 2001).
- Assess the patient's and family's level of social support, and encourage family involvement. Ask "Who among your family or friends can you turn to for help if your asthma worsens?" Counsel patients to identify an asthma "partner" among their family or friends who is willing to be educated and provide support. Include at least one of these individuals in followup appointments with the patient so that he or she can hear what is expected of the patient in following the self-management and action plans (Graham et al. 1990).

- Assess levels of stress, family disruption, anxiety, and depression associated with asthma and asthma management. Although stress, anxiety, and depression do not cause asthma, they can make management more difficult (Busse et al. 1995) and can complicate an individual's attempts at self-management. Use tools to formally assess these conditions (USPSTF 2004) and, when appropriate, refer the patient to a psychologist, social worker, psychiatrist, or other licensed professional when stress seems to interfere unduly with daily asthma management. Referral to a local support group also may be useful.
- Assess ability to adhere to the written asthma action plan. Adherence to the action plan is enhanced when the plan is simplified, the number of medications and frequency of daily doses are minimized, the medication doses and frequency fit into the patient's and family's daily routine (Bender et al. 1998; Bender and Bender 2005; Clark et al. 1995; Eisen et al. 1990; Evans 1993; Haynes et al. 2005; Janson and Becker 1998; Meichenbaum and Turk 1987), and the plan considers the patient's ability to afford the medications (Bender and Bender 2005; Hindi-Alexander et al. 1987).

TAILOR EDUCATION TO THE NEEDS OF THE INDIVIDUAL PATIENT

The Expert Panel recommends that:

- **Asthma education interventions be tailored as much as possible to an individual's underlying knowledge and beliefs about the disease (Evidence C).**
- **Health care professionals who develop asthma education programs consider the needs of patients who have limited literacy (Evidence C).**
- **Clinicians consider assessing cultural or ethnic beliefs or practices that may influence self-management activities, and modify educational approaches as needed (Evidence C).**

Knowledge and Beliefs

People who have asthma have different levels of knowledge about the disease and diverse underlying asthma-related beliefs. African Americans and other minorities who have asthma often accept suboptimal levels of asthma control because they are not aware of the effect that proper asthma management can have on their quality of life. Incorrect underlying beliefs about asthma may constitute a major obstacle to adherence to daily anti-inflammatory therapy and other self-management behavior, and such beliefs thereby may contribute to poor asthma outcomes. Studies have highlighted the lack of appreciation, on the part of people who have asthma and/or their caregivers, of the importance of the use of ICSs on days when the asthma is asymptomatic. This behavior appears to be based on the belief that asthma is absent if overt asthma symptoms are absent, and therefore asthma medications are only necessary when an acute episode occurs (Halm et al. 2006; Riekert et al. 2003). Doubts about the usefulness of anti-inflammatory asthma medications and concerns about the long-term side effects of these medications also contribute to this pattern of behavior (George et al. 2003; Leickly et al. 1998; Mansour et al. 2000; Van Sickle and Wright 2001). Moreover, African Americans are significantly more likely than Caucasians to report distrust of the health care system (George et al. 2003; Halbert et al. 2006).

A recent study demonstrated how underlying beliefs about asthma may serve as an obstacle to adherence with daily anti-inflammatory therapy and other self-management behaviors in high-risk patients who have moderate or severe persistent asthma (Halm et al. 2006). This prospective, longitudinal, observational cohort study assessed disease beliefs and

self-management behaviors. In this group of low-income, high-risk, predominantly Latino and African American people, more than half of the persons who had asthma believed they have asthma only when they have symptoms. This “no symptoms, no asthma” belief was associated with one-third lower odds of adherence to ICS use when the asthma was asymptomatic. One study suggested that, if enough time is taken to explain the function and use of ICSs, adherence to therapy might be improved in African American patients who have asthma (Apter et al. 2003).

Another study demonstrated that education focusing on changing behavior, rather than providing information alone, improved quality of life. Perceived control of asthma and asthma-specific quality of life significantly improved after patients who have asthma completed a behavior modification-based asthma education program for adults. The authors concluded that assessment of perceived control of asthma may enable educators to target and tailor educational interventions for individuals who perceive a lack of control over their asthma and to monitor the effectiveness of asthma education (Olajos-Clow et al. 2005). Qualitative research is one important methodology for understanding the health beliefs and attitudes of patients and for formulating hypotheses for improving ICS adherence that can be tested in the future by using quantitative research methods (George et al. 2003).

Health Literacy

Nationally, almost one-quarter of the adult population cannot read and understand basic written material (Kirsh et al. 1993). Traditional patient education relies largely on printed materials that are often written at too high a level for patients who have a low level of literacy to read and adequately comprehend. Inadequate literacy is a barrier to asthma knowledge and self-care (Williams et al. 1998). Asthma education programs may not adequately reach those patients who suffer the greatest morbidity and mortality from asthma. Some asthma education strategies may not reach a large number of patients who have asthma and poor reading skills. Therefore, it is important that health education literature meet the readability standards (of 5th-grade level or lower) recommended by health education experts (Doak et al. 1996). Knowledge of asthma may affect health behaviors and disease outcomes. Patients need to understand proper health behaviors and acquire self-management skills. Correcting knowledge and behavior deficits through asthma instructional programs has been shown to be cost-effective (Neri et al. 1996) and to reduce physician visits and hospitalizations (Kelso et al. 1996; Patel et al. 2004).

Self-management skills and asthma knowledge are poorer among patients who have limited reading ability. In a cross-sectional survey, using multivariate analysis, a patient’s reading level was the strongest predictor of asthma knowledge score and the strongest predictor of skills in use of MDI (Williams et al. 1998). A prospective cohort study examined the relationship between inadequate health literacy and the capacity to learn and retain instructions about discharge medications and appropriate MDI technique. Before instruction, inadequate health literacy was associated with lower asthma medication knowledge and worse MDI technique; after instruction, it was demonstrated that inadequate health literacy was not associated with difficulty in learning or retaining instructions. This study demonstrated that tailored education can successfully overcome barriers related to inadequate health literacy and improve asthma self-management skills (Paasche-Orlow et al. 2005).

Overcoming the barrier of inadequate literacy may be facilitated by structuring asthma education programs for low literacy levels and by developing systematic approaches to tailor asthma education to patients. Additional studies are needed to determine whether tailored asthma education provided to vulnerable populations will result in long-term gains in asthma self-management.

Cultural/Ethnic Considerations

Cultural variables may affect patient understanding of and adherence to medical regimens (Kleinman et al. 1978; Pachter and Weller 1993). Moudgil and colleagues (2000) have suggested that using a culturally sensitive patient education approach directed toward altering attitudes and beliefs, as well as toward physical management of the disease is a more successful approach to improving asthma health outcomes. Improved understanding is needed concerning how ethnocultural practices, independent of socioeconomic variables, may influence asthma care and the use of health care services. Open-ended questions such as “In your community, what does having asthma mean?” can elicit informative responses. The culturally sensitive clinician should attempt to find ways to incorporate harmless or potentially beneficial remedies with the pharmacologic plan.

For example, a prevalent ethnocultural belief among the Latino population is that illnesses are either “hot” or “cold” (Pachter et al. 2002; Risser and Mazur 1995). Asthma is viewed as a “cold” illness amenable to “hot” treatment. Suggesting that asthma medications be taken with hot tea or hot water incorporates this belief into the therapeutic regimen and helps build the therapeutic partnership. In a study of Dominican Americans, most of the mothers of persons who had asthma used folk remedies called “zumos” instead of prescription medicines. These folk remedies were derived from their folk beliefs about health and illness. In this study, most of the mothers said that prescribed medications are overused in this country and that physicians hide therapeutic information from them (Bearison et al. 2002). It is important to be aware of potential barriers posed by ethnocultural beliefs within racial/ethnic minority communities about the practice of traditional Western medicine. When harmful home remedies are being used, clinicians should discourage their use by suggesting a culturally acceptable alternative as a replacement or recommending a safer route of administration (Pachter et al. 1995). These and other strategies may be useful in working with ethnic minorities (NHLBI 1995a).

Every effort should be made to discuss asthma care, especially the asthma action plan, in the patient’s native language so that educational messages are fully understood. It is the opinion of the Expert Panel that, for some ethnic groups, the word “action” may require additional explanation to patients and their families when used in the context of a medical treatment plan. Research suggests that lack of language concordance between the clinician and the patient affects adherence and appropriate use of health care services (Manson 1988). Language is a significant barrier for Latinos seeking health care for asthma. In a study assessing risk factors for inadequate asthma therapy in children, the risk of receiving inadequate asthma therapy when Spanish was the preferred language was 1.4 times greater than if English was the preferred language (Halterman et al. 2000). In a study of Latinos attending an inner-city pediatric clinic, immigrant parents cited language as the greatest barrier to health care access for their children (Flores et al. 1998). Language barriers also may complicate the assessment of cultural differences. Often, medical interpreters are not used; when used, they sometimes lack formal training in this skill (Baker et al. 1996). If interpreters are used, they should be equally competent in both English and the patient’s language as well as knowledgeable about medical terms (Woloshin et al. 1995).

MAINTAIN THE PARTNERSHIP

As part of ongoing care, the clinician should continue to build the partnership by being a sympathetic coach and by helping the patient follow the written asthma action plan and take other needed actions. Educational efforts should be continuous, because it may take up to 6 months for the effect of education to be evident (Gallefoss and Bakke 2001; Gibson et al. 2003; Toelle et al. 1993). Furthermore, it is necessary to review periodically the information and skills

covered previously, because patients' self-management behavior is likely to decline over time (Cote et al. 2001; Ries et al. 1995).

The Expert Panel recommends that clinicians demonstrate, review, evaluate, and correct inhaler technique and, if appropriate, the use of a VHC or spacer at each visit, because these skills can deteriorate rapidly (Evidence C). Written instructions are helpful (See figure 3–14.) but insufficient (Nimmo et al. 1993; Wilson et al. 1993). Research suggests that patients who use inhalers tend to make specific mistakes that need to be corrected (Hanania et al. 1994; Hesselink et al. 2004; Kesten et al. 1993; Larsen et al. 1994; Scarfone et al. 2002). Patients especially need to be reminded to inhale slowly, to activate the inhaler only *once* for each breath (Rau et al. 1996), and to use DPI devices correctly (Melani et al. 2004). Inhaler technique may be improved with educational interventions (Agertoft and Pedersen 1998; Hesselink et al. 2004).

The Expert Panel recommends that clinicians continue to promote open communication with the patient and family by addressing, as much as possible, the following elements in each followup visit (Evidence B unless otherwise noted) (See also figure 3–13.):

- **Continue asking patients early *in each visit* what concerns they have about their asthma and what they especially want addressed during the visit.**
- **Review the short-term goals agreed on in the initial visit.** Assess how well the goals are being achieved (e.g., was the patient's wish to engage in physical activity achieved?). Revise the goals as needed. Achievement of short-term goals should be discussed as indicators that the patient is moving toward long-term goals. Give positive verbal reinforcement for achievement of a goal, and recognize the patient's success in moving closer to full control of the disease (Clark et al. 1998, 2000; Evans et al. 1997).
- **Review the written asthma action plan and the steps the patient is to take. Adjust the plan as needed.** For example, give recommendations on how to use medicines if the dose or type is not working, and confirm that the patient knows what to do if his or her asthma gets worse. Identify other problems the patient has in following the agreed-on steps (e.g., disguising the bad taste of medicine). Treat these as areas that need more work, not as adherence failures (Clark et al. 1995, 1998, 2000).
- **Either encourage parents to take a copy of the child's written asthma action plan to the child's school or childcare setting, or obtain parental permission and send a copy to the school nurse or designee (Evidence C) (See figures 3–16a, b.).**
- **Continue teaching and reinforcing key educational messages (See figure 3–12.).** Provide information and teach skills over several visits so as not to overwhelm the patient with too much information at one time. Repeat important points often.
- **Give patients simple, brief, written materials that reinforce the actions recommended and skills taught (Gibson et al. 2000).** See "Asthma Education Resources" for a list of organizations that distribute patient education materials. Many of these organizations also have some Spanish-language materials.

FIGURE 3-16a. SCHOOL ASTHMA ACTION PLAN



Asthma and Allergy Foundation of America

STUDENT ASTHMA ACTION CARD



National Asthma Education and Prevention Program



Name: _____ Grade: _____ Age: _____

Homeroom Teacher: _____ Room: _____

Parent/Guardian Name: _____ Ph: (h): _____

Address: _____ Ph: (w): _____

Parent/Guardian Name: _____ Ph: (h): _____

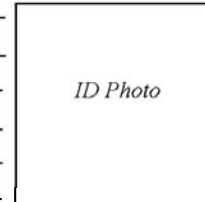
Address: _____ Ph: (w): _____

Emergency Phone Contact #1 _____ Name _____ Relationship _____ Phone _____

Emergency Phone Contact #2 _____ Name _____ Relationship _____ Phone _____

Physician Treating Student for Asthma: _____ Ph: _____

Other Physician: _____ Ph: _____



EMERGENCY PLAN

Emergency action is necessary when the student has symptoms such as _____, _____, _____, _____ or has a peak flow reading of _____.

Steps to take during an asthma episode:

1. Check peak flow.
2. Give medications as listed below. Student should respond to treatment in 15-20 minutes.
3. Contact parent/guardian if _____
4. Re-check peak flow.
5. Seek emergency medical care if the student has any of the following:
 - ✓ Coughs constantly
 - ✓ No improvement 15-20 minutes after initial treatment with medication and a relative cannot be reached.
 - ✓ Peak flow of _____
 - ✓ Hard time breathing with:
 - Chest and neck pulled in with breathing
 - Stooped body posture
 - Struggling or gasping
 - ✓ Trouble walking or talking
 - ✓ Stops playing and can't start activity again
 - ✓ Lips or fingernails are grey or blue

IF THIS HAPPENS, GET EMERGENCY HELP NOW!

Emergency Asthma Medications

Name	Amount	When to Use
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____

See reverse for more instructions

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FIGURE 3-16a. SCHOOL ASTHMA ACTION PLAN (CONTINUED)

DAILY ASTHMA MANAGEMENT PLAN

• Identify the things which start an asthma episode (Check each that applies to the student.)

- Exercise
- Respiratory infections
- Change in temperature
- Animals
- Food _____
- Strong odors or fumes
- Chalk dust / dust
- Carpets in the room
- Pollens
- Molds
- Other _____

Comments _____

• Control of School Environment

(List any environmental control measures, pre-medications, and/or dietary restrictions that the student needs to prevent an asthma episode.) _____

• Peak Flow Monitoring

Personal Best Peak Flow number: _____

Monitoring Times: _____

• Daily Medication Plan

	Name	Amount	When to Use
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____

COMMENTS / SPECIAL INSTRUCTIONS

FOR INHALED MEDICATIONS

- I have instructed _____ in the proper way to use his/her medications. It is my professional opinion that _____ should be allowed to carry and use that medication by him/herself.
- It is my professional opinion that _____ should not carry his/her inhaled medication by him/herself.

_____ Physician Signature	_____ Date
_____ Parent/Guardian Signature	_____ Date

AAFA • 1233 20th Street, N.W., Suite 402, Washington, DC 20036 • www.aafa.org • 1-800-7-ASTHMA

02/00

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FIGURE 3–16b. SCHOOL ASTHMA ACTION PLAN

School Information	Asthma Action Plan for Schools and Families	Health Care Provider Information
Last Name: _____	First Name: _____	
Date of Birth (mm/dd/yyyy): _____	Medical Record #: _____	
School Name: _____	School Contact Phone #: _____	
Parent/Guardian Name: _____	Parent/Guardian Phone #: _____	
Emergency Contact: _____	Emergency Phone #: _____	
Health Care Provider Name: _____	Health Care Provider Phone #: _____	
<i>To be completed by health care provider:</i> Asthma Severity: <input type="checkbox"/> Intermittent <input type="checkbox"/> Mild Persistent <input type="checkbox"/> Moderate Persistent <input type="checkbox"/> Severe Persistent Attention Parent/Guardian/School Personnel: ANY student with asthma (of any severity) can have a severe asthma attack. Asthma symptoms are triggered by: <input type="checkbox"/> Exercise <input type="checkbox"/> Dust <input type="checkbox"/> Animal dander <input type="checkbox"/> Strong odors or fumes <input type="checkbox"/> Mold <input type="checkbox"/> _____		
Green Zone Personal Best Peak Flow (PF) _____ Date: _____ Peak flow is between _____ (80% of personal best) and _____ (100% of personal best)		
1. Take LONG-TERM-CONTROL medication(s) (at home) EVERY DAY: Take _____ inhaler _____ puffs _____ times/day. <small style="margin-left: 20px;">Name of medicine How much How often</small> Take _____ inhaler _____ puffs _____ times/day. <small style="margin-left: 20px;">Name of medicine How much How often</small> If asthma is triggered by exercise (at school or home), take <input type="checkbox"/> Albuterol or _____ inhaler _____ puffs at least _____ minutes before exercise. Restrictions or activity limitations: _____		
Yellow Zone—Caution! DO NOT LEAVE STUDENT ALONE! Peak flow is between _____ (50% of personal best) and _____ (80% of personal best).		
1. Begin QUICK RELIEF medication (at school or home) right NOW: Take <input type="checkbox"/> Albuterol or _____ inhaler _____ puffs OR _____ solution _____ ml by nebulizer. <small style="margin-left: 20px;">Name of medicine How much Name of medicine How much</small> <ul style="list-style-type: none"> • If symptoms are better or if the peak flow is improved within <input type="checkbox"/> 15 minutes/_____ minutes, THEN repeat QUICK-RELIEF MEDICATION (as listed above in 1) every _____ hours for _____ days. • If symptoms are NOT better or if the peak flow is NOT improved, go to Red Zone. Attention School: Call Parent/Guardian when quick-relief medication has been administered by student and/or staff. 2. Attention Parent/Guardian (Home Instructions): <input type="checkbox"/> Call your child's Health Care Provider <input type="checkbox"/> Continue to take LONG-TERM-CONTROL medication (at home) every day as written above in <i>Green Zone</i> instructions. <input type="checkbox"/> <u>Increase</u> LONG-TERM-CONTROL medication: Take _____ inhaler _____ puffs _____ times/day for _____ days. <small style="margin-left: 20px;">Name of medicine How much How often Number</small>		
Red Zone—Medical Alert! Get Help! DO NOT LEAVE STUDENT ALONE! Peak flow is below _____ (50% of personal best)		
1. Take QUICK-RELIEF medication (at school or home) right NOW: Take <input type="checkbox"/> Albuterol or _____ inhaler _____ puffs OR _____ solution _____ ml by nebulizer and REPEAT EVERY 20 MINUTES UNTIL PARAMEDICS ARRIVE! <small style="margin-left: 20px;">Name of medicine How much Name of medicine How much</small> <ul style="list-style-type: none"> • Call 9–1–1 immediately and call Parent/Guardian 2. Attention Parent/Guardian (Home Instructions): <input type="checkbox"/> Call your child's Health Care Provider. <input type="checkbox"/> Continue CONTROLLER medication (at home): Take _____ inhaler _____ puffs _____ times/day for _____ days. <small style="margin-left: 20px;">Name of medicine How much How often Number</small> <input type="checkbox"/> And ADD _____ mg orally once daily for _____ days. <small style="margin-left: 20px;">Name of medicine How much Number</small>		
Authorization and Disclaimer from Parent/Guardian: I request that the school assist my child with the above asthma medications and the Asthma Action Plan in accordance with state laws and regulations. Yes <input type="checkbox"/> No <input type="checkbox"/> My child may carry and self-administer asthma medications and I agree to release the school district and school personnel from all claims of liability if my child suffers any adverse reactions from self-administration of asthma medications: Yes <input type="checkbox"/> No <input type="checkbox"/>		
_____ <small>Parent/Guardian Signature</small>		_____ <small>Date</small>
Health Care Provider: My signature provides authorization for the above written orders. I understand that all procedures will be implemented in accordance with state laws and regulations. Student may carry and self-administer asthma medications: Yes <input type="checkbox"/> No <input type="checkbox"/> (This authorization is for a maximum of 1 year from signature date.)		
_____ <small>Health Care Provider Signature</small>		_____ <small>Date</small>

Source: California Asthma Public Health Initiative, California Department of Public Health. <http://www.cdph.ca.gov/healthinfo/discond/pages/asthma.aspx>.

ASTHMA EDUCATION RESOURCES

ALLERGY AND ASTHMA NETWORK MOTHERS OF ASTHMATICS	1-800-878-4403 1-703-641-9595
2751 Prosperity Avenue, Suite 150 Fairfax, VA 22030 www.breatherville.org	
AMERICAN ACADEMY OF ALLERGY, ASTHMA, AND IMMUNOLOGY	1-414-272-6071
555 East Wells Street Suite 1100 Milwaukee, WI 53202-3823 www.aaaai.org	
AMERICAN ASSOCIATION FOR RESPIRATORY CARE	1-972-243-2272
9125 North MacArthur Boulevard, Suite 100 Irving, TX 75063 www.aarc.org	
AMERICAN COLLEGE OF ALLERGY, ASTHMA, AND IMMUNOLOGY	1-800-842-7777 1-847-427-1200
85 West Algonquin Road, Suite 550 Arlington Heights, IL 60005 www.acaai.org	
AMERICAN LUNG ASSOCIATION	1-800-586-4872
61 Broadway New York, NY 10006 www.lungusa.org	
ASSOCIATION OF ASTHMA EDUCATORS	1-888-988-7747
1215 Anthony Avenue Columbia, SC 29201 www.asthmaeducators.org	
ASTHMA AND ALLERGY FOUNDATION OF AMERICA	1-800-727-8462
1233 20th Street, NW., Suite 402 Washington, DC 20036 www.aafa.org	
CENTERS FOR DISEASE CONTROL AND PREVENTION	1-800-311-3435
1600 Clifton Road Atlanta, GA 30333 http://www.cdc.gov	
FOOD ALLERGY & ANAPHYLAXIS NETWORK	1-800-929-4040
11781 Lee Jackson Highway, Suite 160 Fairfax, VA 22033 www.foodallergy.org	
NATIONAL HEART, LUNG, AND BLOOD INSTITUTE HEALTH INFORMATION CENTER	1-301-592-8573
P.O. BOX 30105 Bethesda, MD 20824-0105 www.nhlbi.nih.gov	
NATIONAL JEWISH MEDICAL AND RESEARCH CENTER	1-800-222-LUNG
1400 Jackson Street Denver, CO 80206 www.njc.org	
U.S. ENVIRONMENTAL PROTECTION AGENCY	1-800-490-9198
P.O. BOX 42419 Cincinnati, OH 45242-0419 www.airnow.gov	

Provider Education

METHODS OF IMPROVING CLINICIAN BEHAVIORS

Implementing Guidelines—Recommended Practices

The Expert Panel recommends the use of multifaceted, clinician education programs that reinforce guidelines-based asthma care and are based on interactive learning strategies (Evidence B). (See Evidence Table 7, Methods for Improving Clinician Behaviors.)

In an attempt to improve and standardize the quality of care given to people with asthma, several studies have focused on methods of implementing guideline-based practice. This process of implementation is designed to change the behavior of clinicians. Eight RCTs and one trial's secondary analysis (Baker et al. 2003; Brown et al. 2004; Cabana et al. 2006; Clark et al. 2000; Finkelstein et al. 2005; Kattan et al. 2006; Lagerlov et al. 2000; White et al. 2004) show the variable effects of interventions designed to change clinicians' use of recommended asthma guidelines. Lagerlov and colleagues (2000) provided 199 general practitioners with two evening meetings, 1 week apart, lasting almost 3 hours each. At the first meeting, participants discussed how they diagnosed asthma and the treatment they prescribed. At the second meeting, guidelines were presented, and the group agreed on quality criteria for prescribing based on the guidelines. The educational sessions resulted in a small (6 percent) but statistically significant increase in the mean proportion of acceptably treated patients compared to controls. In peer groups of doctors, combining feedback about prescribing behavior along with guideline recommendations improved the quality of care of their patients who had asthma.

Clark and coworkers (2000) evaluated the long-term impact of an interactive seminar for pediatricians that focused on teaching and communication skills in managing asthma according to published guidelines. Two years after the intervention, physicians who attended the seminar were more likely than controls to deliver asthma education, supply patients with written directions for adjusting medications when symptoms change, and offer more guidance for modifying therapy. Children seen by physicians in the intervention group had fewer hospitalizations and ED visits. Notably, no differences were found between intervention physicians and controls in time they spent with patients at 1-year followup (Clark et al. 1998). In a reanalysis of the trial by Clark and coworkers, Brown and colleagues (2004) found the program was more effective for children in low-income families than children in families with greater income. Cabana and coworkers (2006) replicated the intervention by Clark and colleagues in a large RCT to test whether the seminar could be delivered effectively by local faculty trained by the investigators. One year postintervention, physicians who attended the seminar were more likely than physicians in the control group to ask about patients' concerns about asthma, to encourage patients to be more physically active, and set goals for successful treatment. Compared with patients in the control group, patients of physicians who attended the seminar had greater decreases in ED visits and in days with limited activity at 1-year followup (Cabana et al. 2006).

On the other hand, two trials of methods to increase use of guidelines (Baker et al. 2003; White et al. 2004) had negative results. In an RCT designed to impart techniques for teaching patients about their asthma, White and colleagues (2004) compared a standard didactic lecture for physicians to problem-based learning. Groups did not differ in knowledge gained, but problem-based learning was perceived to have more educational value than the lectures. Baker and coworkers (2003) showed that neither distribution of evidence-based guidelines alone, nor

presentation of guidelines in a prioritized format (with or without performance feedback), led to increased implementation of the guideline recommendations.

To promote use of asthma guidelines, Lozano and colleagues (2004) conducted a 2-year RCT of 422 primary care pediatric practices using two different asthma care improvement strategies. Peer leader education (training one physician per practice in asthma guidelines) was compared to peer leader education combined with nurse-driven organizational change through planned visits focused on assessment, care planning, and self-management support. Children in the planned care approach had significantly reduced symptoms and lower rates of oral steroid bursts, as well as greater adherence to controller medications. The comprehensive approach was an effective model for improving asthma care. A large, 1-year RCT (n = 937) aimed at inner-city PCPs working with 5- to 11-year-old children who had moderate or severe asthma evaluated the benefit of sending timely clinical information regarding the patient's asthma status in a single-page letter to the physicians in the intervention group. The computer-generated letter summarized the results of bimonthly telephone calls to the child's caretaker; provided information on the child's asthma symptoms, health service use, and medication use; and included a corresponding recommendation to step up or step down the child's medication. The letter served as a prompt to the clinician to change treatment. Children who were in the intervention group had significantly more scheduled preventative asthma visits, resulting in appropriate medication changes, and fewer ED visits and fewer school absences as compared with children who were controls (Kattan et al. 2006).

An observational study was conducted to see whether an organized citywide asthma-management program delivered by PCPs would increase adherence to the asthma guidelines (Cloutier et al. 2005). Among the 3,748 children enrolled in the disease-management program, prescriptions for ICS increased by providers' adherence to the guidelines, and overall hospitalization rates and ED visits decreased.

Finkelstein and coworkers (2005) randomized primary care practices to one of two care-improvement strategies—physician peer leaders alone or in combination with asthma education nurses—or to usual care. The primary outcome, prescription of at least one long-term-control medication, improved in all arms of the study, but there were no differences among groups overall except a slight increase in ambulatory visits for asthma.

Observational studies support the value of targeting physicians to participate in workshops. Rossiter and colleagues (2000) conducted a unique study in recruiting physicians to enroll in communication workshops using multimedia and adult learning techniques to improve communication skills. Hands-on workshops that included negotiating treatment plans for asthma were incorporated in the 6-hour sessions. Free continuing medical education, a discount on malpractice insurance, and free patient-education materials were used as incentives. Medicaid claims for ED care for asthma were reduced, with a marked increase in guideline-based asthma prescriptions. Doctors also got feedback reports identifying patients in need of followup because of poor asthma outcomes in terms of emergency room (ER) visits. However, only 33 percent of physicians from the community participated in the intervention.

Reasons for lack of adherence to guidelines were shown in an observational study (Cabana et al. 2001) that is enlightening on the barriers to pediatricians' adherence to asthma guidelines. Lack of time, lack of educational materials, lack of support staff, and lack of reimbursement were cited as major reasons for not adopting guidelines; notably, these are similar to reasons for patients' nonadherence. This study reinforces the need for multifaceted interventions to address characteristic barriers for each guideline component.

Taken together, these findings suggest that multifaceted clinician education programs based on interactive learning strategies (Cabana et al. 2006; Clark et al. 1998, 2000; Kattan et al. 2006; Lagerlov et al. 2000) can improve quality of care and patient outcomes. In the absence of multifaceted tailored interventions, a prioritized guideline format, with or without feedback, is unlikely to promote change in general practice care. However, it is acknowledged that practice-level interventions may have significant effects on subgroups of patients, but these effects are difficult to detect. More research is needed to understand how to increase adherence to guidelines and improved quality of care for asthma. From available evidence, multifaceted clinician education programs based on interactive learning strategies are a promising alternative to noninteractive educational sessions that provide information only.

Communication Techniques

The Expert Panel recommends that:

- **Clinicians consider participating in programs designed to enhance their skills in communicating with patients (Evidence B).**
- **Clinicians consider documenting communication and negotiated agreements between patients and clinicians during medical encounters and that the level of asthma control be documented in the medical record of a patient at every visit to facilitate communication with patients during subsequent visits (Evidence C).**
- **Communication skills-building programs include strategies to increase competence in caring for multicultural populations (Evidence D).**

The RCT reported on by Clark and colleagues (1998, 2000) and Brown and coworkers (2004) demonstrated that a physician education program could improve the communication skills of pediatricians caring for children and adolescents who have asthma and could result in improved patient outcomes. The program involved two educational sessions, each 2.5 hours long, and combined didactic sessions with interactive role playing. Bratton and coworkers (2006) have replicated this study in a population of physicians providing care to Medicaid patients. Data from providers indicate that the intervention improved providers' use of communication skills, efforts to counsel patients in self-management strategies, and provision of written asthma action plans (Bratton et al. 2006). The results among pediatricians suggest that physicians can be taught improved communication skills that enhance patient adherence as well as asthma self-management and control. Love and coworkers (2000) showed that continuity of clinicians' care can improve patient adherence and quality of life but not other outcomes. In qualitative work, Yawn (2003) reported that parents of children who have asthma were frustrated by lack of clear communication with health professionals, especially regarding changes in diagnosis, classification of asthma severity, and methods for asthma management.

In a slightly different variation of patient–health professional communication, Cabana and colleagues (2003, 2005) and Yawn (2004) have shown that the documentation of the content of medical visits for asthma, if not the actual communication that occurs at those visits, frequently lacks information that is necessary to assess either asthma severity or asthma control as well as current adherence to asthma therapy. These studies suggest a need to document patient–clinician communications that occur in the context of asthma care. Such documentation may improve the content of subsequent communication during asthma care visits.

Wondering whether asthma severity was documented in medical records and whether such documentation prompted actions, Cabana and colleagues (2003) conducted an observational review of outpatient pediatric medical records. Only 34 percent of charts showed documentation of asthma severity during the previous 2 years. Documentation of severity, when identified, was associated with use of written asthma action plans and documented asthma education. Documentation of severity appeared to be associated with markers of improved long-term management of asthma.

In a large, prospective cohort 1-year study of 1,663 children receiving Medicaid in five large, nonprofit health plans, Lieu and coworkers (2004) demonstrated that, at sites that promoted cultural competence combined with physician feedback and improved access to care, improved use of long-term control medications and better ratings of care, according to the parents, resulted.

METHODS OF IMPROVING SYSTEM SUPPORTS

Clinical Pathways

The Expert Panel recommends that clinical pathways be considered for the inpatient setting for patients who are admitted to hospital with asthma exacerbations (Evidence B).

Clinical pathways are tools, ideally based on clinical guidelines, that outline a sequence of evaluations and interventions to be carried out by clinicians for patients who have asthma. These pathways are designed to improve and maintain the quality of care while containing costs. Three studies described below reported the outcomes of implementing clinical pathways to guide patient care either in the ED or in the hospital setting.

In an RCT, Johnson and colleagues (2000) demonstrated that, for children hospitalized for asthma, a clinical pathway directed by nurses can safely and reliably wean children from acute treatments and thereby significantly decrease the length of hospitalizations, the cost associated with the hospital admission, and the overall amount of nebulized beta₂-agonist used.

In another RCT, directed at children 2–18 years of age presenting to the ED with acute asthma, Zorc and coworkers (2003) used a clinical pathway to improve followup with PCPs. They found, however that even when followup appointments with the PCP 3–5 days later were scheduled by the ED staff, there was no effect on ED return visits, missed school days, or use of long-term control medications in the 4 weeks after the initial ED visit. The only positive outcome identified was an increased likelihood that urban children who had asthma would keep their followup appointment with the PCP. However, only 29 percent of children in the intervention group saw their PCP within 5 days after their ED visit, as requested, compared to 23 percent in the control group. Overall, 63 percent in the intervention group saw a PCP within 4 weeks versus 44 percent in the control group. No information was provided about the reasons for missed followup visits. This study illustrates the difficulties in scheduling followup appointments after acute exacerbation as well as the problem of ensuring that patients go to PCPs as requested.

A recent observational study showed that education of general practitioners in an asthma clinical pathway for children who have persistent asthma decreased prescription rates of oral beta₂-agonists compared to rates prescribed by clinicians who were not educated in the pathway (Mitchell et al. 2005). Three other observational studies of pediatric patients show that implementation of an asthma clinical pathway may reduce hospital length of stay and costs

without increasing morbidity or rates of readmission (Kelly et al. 2000; McDowell et al. 1998; Wazeka et al. 2001).

These studies show mixed results for the effectiveness of clinical pathways, depending on the outcomes chosen and the setting.

Clinical Decision Supports

The Expert Panel recommends that:

- **Prompts encouraging guideline-based care be integrated into system-based interventions focused on improving the overall quality of care rather than used as a single intervention strategy (Evidence B).**
- **System-based interventions that address multiple dimensions of the organization and delivery of care and clinical decision support be considered to improve and maintain quality of care for patients who have asthma (Evidence B and C).**

(See Evidence Table 8, Methods for Improving Systems Support.)

Some investigators have studied the use of computer-based prompts to encourage the use of guidelines in asthma management. McCowan and colleagues (2001) conducted an RCT of a software decision-support system to prompt use of asthma guidelines. The system had a positive effect resulting in reduction of exacerbations in patients whose physicians used the system, but the system had no effect on reported symptoms, physicians' prescribing of long-term-control medications, or use of hospital services by patients. In another RCT (Tierney et al. 2005), care suggestions were delivered by computerized prompts to physicians and pharmacists in the intervention group. The prompts did not result in improved medication adherence, quality of life, patient satisfaction with care, ED visits, or hospitalizations. Intervention physicians had higher health care costs for asthma care of their patients, but care suggestions had no effect on the delivery or the outcomes of care. The results of these two trials suggest that, although the use of computerized prompts is intuitively appealing, there is insufficient evidence that prompts result in improved asthma care.

In a retrospective analysis of administrative claims data, Dombkowski and colleagues (2005) found that adherence to national asthma guidelines varied widely among health care plans covering 3,970 children who had persistent asthma and were enrolled in Medicaid. After low-income families who had children who had asthma enrolled in a statewide insurance plan, Szilagyi and coworkers (2006) interviewed parents at baseline and 1 year later. They found improvements in access to care and a decrease in asthma exacerbations and hospitalizations for the enrolled children. Quality of asthma care improved for most general measures. Taken together, these observational studies suggest opportunities for population-based health care plan interventions to improve access and quality of asthma care.

In one RCT, Lozano and colleagues (2004) demonstrated that multidimensional system-based interventions improved patient outcomes. Observational analysis (Patel et al. 2004) of a large database of 3,400 patients who had asthma and were in a medical group practice that initiated a multidisciplinary asthma disease-management program showed that the program worked in several, but not all, areas: documentation of diagnoses and patient education improved, and ED visits and hospitalizations were reduced. A multidimensional approach, utilizing all staff to assist in implementation of the program, was an important part of the intervention. The key to

clinicians' ownership of the program included having clinicians lead the design process, using physician champions who had both formal and informal influence, and using rewards and recognition. In a comprehensive program to restructure health care delivery for all patients who had asthma, one large organization serving children instituted a systemwide restructured plan, including a new inpatient unit, standardized treatment protocol, direct admission policies for PCPs with optional specialist consultation, and use of case managers to help families address barriers to care and facilitate adherence (Evans et al. 1999b). The restructured program resulted in significant reductions in ED visits and length of hospital stays, as well as fewer readmissions to the hospital, while maintaining high quality of care and parental satisfaction with care.

Taken together, these system-based interventions for large populations of low-income children and adults who have asthma demonstrate effectiveness in improving quality of care and reducing use of health resources. Compared to provider-dependent strategies, these systemwide interventions may be more likely to result in consistent improved health outcomes for large populations of patients who have asthma.

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