TARGET POPULATION
Eligibility
Inclusion Criterion
Exclusion Criterion

KNOWLEDGE COMPONENTS

DEFINITIONS

Term: Asthma severity
Term Meaning: the intrinsic intensity of disease

Term: Exacerbations of asthma
Term Meaning: acute or subacute episodes of progressively worsening shortness of breath, cough, wheezing, and chest tightness—or some combination of these symptoms. Exacerbations are characterized by decreases in expiratory airflow that can be documented and quantified by simple measurement of lung function (spirometry or PEF). Exacerbations of asthma can vary widely among individuals and within individuals, from very rare to frequent. Although the classification of severity focuses on the frequency of exacerbations, it is important to note that the severity of disease does not necessarily correlate with the intensity of exacerbations, which can vary from mild to very severe and life-threatening. Patients at any level of severity, even intermittent asthma, can have severe exacerbations.

Term: The level of asthma control (well controlled, not well controlled, or poorly controlled)
Term Meaning: the degree to which both dimensions of the manifestations of asthma—impairment and risk—are minimized by therapeutic intervention. The level of control at the time of followup assessment will determine clinical actions—that is, whether to maintain or adjust therapy. In previous guidelines

Term: The Expert Panel recommends that asthma control be defined as follows (Evidence A): Asthma Control
Term Meaning: Reduce impairment — Prevent chronic and troublesome symptoms (e.g., coughing or breathlessness in the daytime, in the night, or after exertion) — Require infrequent use (andlt;2 days a week) of SABA for quick relief of symptoms — Maintain (near) “normal” pulmonary function — Maintain normal activity levels (including exercise and other physical activity and attendance at work or school) — Meet patients’ and families’ expectations of and satisfaction with asthma care
Reduce risk — Prevent recurrent exacerbations of asthma and minimize the need for ED visits or hospitalizations — Prevent progressive loss of lung function; for children, prevent reduced lung growth — Provide optimal pharmacotherapy
with minimal or no adverse effects

**RECOMMENDATION: PULMONARY FUNCTION TESTING (SPIROMETRY)**

### Conditional:
The Expert Panel recommends that spirometry measurements—FEV1, forced expiratory volume in 6 seconds (FEV6), FVC, FEV1/FVC—before and after the patient inhales a short-acting bronchodilator should be undertaken for patients in whom the diagnosis of asthma is being considered, including children 5 years of age.

**Decision Variable:** patients in whom the diagnosis of asthma is being considered

**Decision Variable:** children 5 years of age

**Action:** FEV1 before and after the patient inhales a short-acting bronchodilator

**Action:** forced expiratory volume in 6 seconds (FEV6) before and after the patient inhales a short-acting bronchodilator

**Action:** FVC before and after the patient inhales a short-acting bronchodilator

**Action:** FEV1/FVC before and after the patient inhales a short-acting bronchodilator

**Reason:** These measurements help to determine whether there is airflow obstruction, its severity, and whether it is reversible over the short term (Bye et al. 1992; Li and O'Connell 1996). (See box 3–2 for further information.) Patients’ perception of airflow obstruction is highly variable, and spirometry sometimes reveals obstruction much more severe than would have been estimated from the history and physical examination.

### Conditional:
The Expert Panel recommends that office-based physicians who care for asthma patients should have access to spirometry, which is useful in both diagnosis and periodic monitoring. Spirometry should be performed using equipment and techniques that meet standards developed by the ATS (EPR2 1997). Correct technique, calibration methods, and maintenance of equipment are necessary to achieve consistently accurate test results.

**Decision Variable:** office-based physicians who care for asthma patients

**Action:** have access to spirometry

**Description:** using equipment and techniques that meet standards developed by the ATS (EPR2 1997). Correct technique, calibration methods, and maintenance of equipment are necessary to achieve consistently accurate test results

### Conditional:
The Expert Panel recommends that when office spirometry shows severe abnormalities, or if questions arise regarding test accuracy or interpretation, further assessment should be performed in a specialized pulmonary function laboratory.

**Decision Variable:** office spirometry shows severe abnormalities

**Decision Variable:** questions arise regarding test accuracy or
**RECOMMENDATION: CLASSIFY ASTHMA SEVERITY**

**Imperative:** The Expert Panel recommends that clinicians classify asthma severity by using the domains of current impairment and future risk (Evidence B—secondary analyses of clinical trials, and Evidence C—observational studies, for assessing impairment; Evidence C, for distinguishing intermittent versus persistent asthma by risk of exacerbations; Evidence D, for distinguishing different categories of persistent asthma by varying frequencies of exacerbations).

**Directive:** classify asthma severity by using the domains of current impairment and future risk

**Description:** initial assessment of asthma severity is made immediately after diagnosis, or when the patient is first encountered, generally before the patient is taking some form of long-term control medication. Assessment is made on the basis of current spirometry and the patient’s recall of symptoms over the previous 2–4 weeks, because detailed recall of symptoms decreases over time. If the assessment is made during a visit in which the patient is treated for an acute exacerbation, then asking the patient to recall symptoms in the period before the onset of the current exacerbation will suffice until a followup visit can be made.

**Description:** For population-based evaluations, clinical research, or subsequent characterization of the patient’s overall severity, asthma severity can be inferred after optimal therapy is established by correlating levels of severity with the lowest level of treatment required to maintain control. For clinical management, however, the emphasis is to assess asthma severity prior to initiating therapy and, then, assess control for monitoring and adjusting therapy

**Evidence Quality:** (Evidence B—secondary analyses of clinical trials, and Evidence C—observational studies, for assessing impairment; Evidence C, for distinguishing intermittent versus persistent asthma by risk of exacerbations; Evidence D, for distinguishing different categories of persistent asthma by varying frequencies of exacerbations)

**Recommendation Strength:** recommends

**Imperative:** Assessment of severity requires assessing the following components of current impairment: Symptoms — Nighttime awakenings — Need for SABA for quick relief of symptoms — Work/school days missed — Ability to engage in normal daily activities or in desired activities — Quality-of-life
assessments Lung function, measured by spirometry: FEV1, FVC (or FEV6), FEV1/FVC (or FEV6 in adults).

**Directive:** ASSESS: Nighttime awakenings
**Directive:** ASSESS: Need for SABA for quick relief of symptoms
**Directive:** ASSESS: Work/school days missed
**Directive:** ASSESS: Ability to engage in normal daily activities or in desired activities
**Directive:** ASSESS: Quality-of-life

**RECOMMENDATION:** MEASURES FOR PERIODIC ASSESSMENT AND MONITORING OF ASTHMA CONTROL

**Imperative:** The Expert Panel recommends that ongoing monitoring of asthma control be performed to determine whether all the goals of therapy are met—that is, reducing both impairment and risk (Evidence B); see figures 3–5 a, b, and c for assessing asthma control for different age groups

**Directive:** Monitor asthma control
**Reason:** to determine whether all the goals of therapy are met—that is, reducing both impairment and risk
**Evidence Quality:** Evidence B
**Recommendation Strength:** recommends

**Imperative:** The Expert Panel recommends that the frequency of visits to a clinician for review of asthma control is a matter of clinical judgment; in general, patients who have intermittent or mild persistent asthma that has been under control for at least 3 months should be seen by a clinician about every 6 months, and patients who have uncontrolled and/or severe persistent asthma and those who need additional supervision to help them follow their treatment plan need to be seen more often

**Directive:** Monitor asthma control
**Description:** Monitoring signs and symptoms of asthma  Monitoring pulmonary function — Spirometry — Peak flow monitoring  Monitoring quality of life  Monitoring history of asthma exacerbations  Monitoring pharmacotherapy for adherence and for potential side effects  Monitoring patient–provider communication and patient satisfaction  Monitoring asthma control with minimally invasive markers and pharmacogenetics (requires further evaluation)
**Evidence Quality:** The assessment measures for control monitor six areas described in this section and are recommended based on the opinion of the Expert Panel and review of the scientific literature.
**Recommendation Strength:** recommends

**RECOMMENDATION:** Monitoring Signs and Symptoms of Asthma

**Conditional:** The Expert Panel recommends the following: If peak flow monitoring is performed, the written asthma action plan
should use the patient’s personal best peak flow as the reference value

**Decision Variable:** peak flow monitoring is performed,

**Action:** the written asthma action plan should use the patient’s personal best peak flow as the reference value

### Imperative:

The Expert Panel recommends that every patient who has asthma should be taught to recognize symptom patterns that indicate inadequate asthma control (Evidence A) (See also “Component 2: Education for a Partnership in Asthma Care.”). Either symptom and/or PEF monitoring should be used as a means to determine the need for intervention, including additional medication, in the context of a written asthma action plan.

**Directive:** Teach patients to recognize symptom patterns that indicate inadequate asthma control

**Evidence Quality:** Evidence A

**Recommendation Strength:** recommends

### Imperative:

The Expert Panel recommends that symptoms and clinical signs of asthma should be assessed at each health care visit through physical examination and appropriate questions

**Directive:** Assess symptoms and clinical signs of asthma at each health care visit

**Recommendation Strength:** recommends

### Imperative:

The Expert Panel recommends that the detailed symptoms history should be based on a short (2–4 weeks) recall period

**Directive:** Base detailed symptom history on a short (2-4 week) recall period

**Reason:** Patients’ detailed recall of symptoms decreases over time; therefore, the clinician may choose to assess over a 2-week, 3-week, or 4-week recall period.

**Recommendation Strength:** recommends

### Imperative:

The Expert Panel recommends that assessment of the patient’s symptom history should include at least four key symptom expressions

**Directive:** Assess: Daytime asthma symptoms (including wheezing, cough, chest tightness, or shortness of breath)

**Directive:** Assess: Nocturnal awakening as a result of asthma symptoms

**Directive:** Assess: Frequency of use of SABA for relief of symptoms

**Directive:** Assess: Inability or difficulty performing normal activities (including exercise) because of asthma symptoms

**Evidence Quality:** Evidence B, extrapolation from clinical trials; and Evidence C, from observational studies

**Recommendation Strength:** recommends

### Imperative:

The Expert Panel recommends that, in addition to assessing symptoms, it is also important to assess pulmonary function periodically (Evidence B, extrapolation from clinical trials; and Evidence C, from observational studies).
**Directive**: assess pulmonary function periodically

**Description**: The main methods are spirometry and peak flow monitoring.

**Evidence Quality**: Evidence B, extrapolation from clinical trials; and Evidence C, from observational studies

**Recommendation Strength**: recommends

<table>
<thead>
<tr>
<th>Imperative</th>
<th>The Expert Panel recommends the following frequencies for spirometry measurements: (1) at the time of initial assessment (Evidence C); (2) after treatment is initiated and symptoms and PEF have stabilized, to document attainment of (near) “normal” airway function; (3) during a period of progressive or prolonged loss of asthma control; and (4) at least every 1–2 years to assess the maintenance of airway function (Evidence B, extrapolation from clinical trials). Spirometry may be indicated more often than every 1–2 years, depending on the clinical severity and response to management (Evidence D). These spirometry measures should be followed over the patient’s lifetime to detect potential for decline and rate of decline of pulmonary function over time (Evidence C).</th>
</tr>
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<tbody>
<tr>
<td>Directive: Perform spirometry: at the time of initial assessment (Evidence C)</td>
<td>Directive: Perform spirometry: after treatment is initiated and symptoms and PEF have stabilized, to document attainment of (near) “normal” airway function; Directive: Perform spirometry: during a period of progressive or prolonged loss of asthma control; Directive: Perform spirometry: at least every 1–2 years to assess the maintenance of airway function (Evidence B, extrapolation from clinical trials)</td>
</tr>
<tr>
<td><strong>Description</strong>: Spirometry may be indicated more often than every 1–2 years, depending on the clinical severity and response to management (Evidence D). These spirometry measures should be followed over the patient’s lifetime to detect potential for decline and rate of decline of pulmonary function over time (Evidence C).</td>
<td></td>
</tr>
<tr>
<td><strong>Evidence Quality</strong>: Evidence D</td>
<td><strong>Recommendation Strength</strong>: recommends</td>
</tr>
<tr>
<td>Imperative: Consider long-term daily peak flow monitoring for: — Patients who have moderate or severe persistent asthma (Evidence B). — Patients who have a history of severe exacerbations (Evidence B). — Patients who poorly perceive airflow obstruction and worsening asthma (Evidence D). — Patients who prefer this monitoring method (Evidence D).</td>
<td>Directive: Consider long-term daily peak flow monitoring for: Patients who have moderate or severe persistent asthma (Evidence B) Directive: Consider long-term daily peak flow monitoring for: Patients who have a history of severe exacerbations</td>
</tr>
</tbody>
</table>
Evidence B).

**Directive:** Consider long-term daily peak flow monitoring for: Patients who poorly perceive airflow obstruction and worsening asthma (Evidence D). —

**Directive:** Consider long-term daily peak flow monitoring for: Patients who prefer this monitoring method (Evidence D).

**Evidence Quality:** B-D

**Recommendation Strength:** consider

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**Imperative:** Provide to all patients a written asthma action plan that includes daily treatment and 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 persistent asthma, a history of severe exacerbations, or poorly controlled asthma (Evidence B)

**Directive:** Provide to all patients a written asthma action plan

**Description:** 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

**Benefit:** 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.

Evidence Quality: (Evidence B)
Recommendation Strength: recommends

Imperative: The Expert Panel recommends that several key areas of quality of life and related loss of physical function should be assessed periodically for each person who has asthma (Evidence C). These include: Any work or school missed because of asthma Any reduction in usual activities (either home/work/school or recreation/exercise) Any disturbances in sleep due to asthma Any change in caregivers’ activities due to a child’s asthma (for caregivers of children who have asthma)

Directive: Assess periodically: Any work or school missed because of asthma
Directive: Assess periodically: Any reduction in usual activities (either home/work/school or recreation/exercise)
Directive: Assess periodically: Any disturbances in sleep due to asthma
Directive: Assess periodically: Any change in caregivers’ activities due to a child’s asthma (for caregivers of children who have asthma)

Evidence Quality: Evidence C
Recommendation Strength: recommends

Imperative: The Expert Panel recommends that, during periodic assessments, clinicians should question the patient and evaluate any records of patient self-monitoring (figure 3–7) to detect exacerbations, both those that are self-treated and those treated by other health care providers (Evidence C).

Directive: Inquire and evaluate: records of patient self-monitoring (figure 3–7) to detect exacerbations,

Description: It is important to evaluate the frequency, rate of onset, severity, and causes of exacerbations. A history of previous exacerbations, especially in the past
year, is the strongest predictor of future severe exacerbations leading to ED visits and hospitalizations (Adams et al. 2000; Eisner et al. 2001; Ford et al. 2001; Lieu et al. 1998). The patient should be asked about precipitating exposures and other factors. Specific inquiry into unscheduled visits to health care providers, telephone calls for assistance, and use of urgent or emergency care facilities is helpful. Severity of the exacerbation can be estimated by the increased need for oral corticosteroids. Finally, any hospitalizations should be documented, including the facility, duration of stay, and any use of critical care or intubation.

**Evidence Quality:** Evidence C  
**Recommendation Strength:** recommends

<table>
<thead>
<tr>
<th>Imperative:</th>
<th>The Expert Panel recommends monitoring the following factors at each visit: patient’s adherence to the regimen, inhaler technique, and side effects of medications (Evidence C)</th>
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</thead>
<tbody>
<tr>
<td>Directive:</td>
<td>Monitor at each visit: patient’s adherence to the regimen</td>
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<tr>
<td>Directive:</td>
<td>Monitor at each visit: inhaler technique,</td>
</tr>
<tr>
<td>Directive:</td>
<td>Monitor at each visit: side effects of medications</td>
</tr>
<tr>
<td>Evidence Quality:</td>
<td>Evidence C</td>
</tr>
<tr>
<td>Recommendation Strength:</td>
<td>recommends</td>
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</table>

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<thead>
<tr>
<th>Imperative:</th>
<th>The Expert Panel recommends that health care providers should routinely assess the effectiveness of patient–clinician communication (Evidence D).</th>
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<tbody>
<tr>
<td>Directive:</td>
<td>routinely assess the effectiveness of patient–clinician communication</td>
</tr>
<tr>
<td>Description:</td>
<td>Open and unrestricted communication among the clinician, the patient, and the patient’s family is essential to ensure successful self-management by the patient who has asthma. A patient’s negative attitude toward medication and/or reluctance toward self-management are risk factors for severe exacerbations (Adams et al. 2000). Every effort should be made to encourage open discussion of concerns and expectation of therapy. See “Component 2: Education for a Partnership in Asthma Care” for specific strategies to enhance communication and patient adherence to the treatment plan.</td>
</tr>
<tr>
<td>Evidence Quality:</td>
<td>Evidence D</td>
</tr>
<tr>
<td>Recommendation Strength:</td>
<td>recommends</td>
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<tr>
<th>Imperative:</th>
<th>The Expert Panel recommends that two aspects of patient satisfaction should be monitored: satisfaction with asthma control and satisfaction with the quality of care (Evidence D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directive:</td>
<td>Monitor: satisfaction with asthma control</td>
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<tr>
<td>Directive:</td>
<td>Monitor: satisfaction with the quality of care</td>
</tr>
<tr>
<td>Evidence Quality:</td>
<td>Evidence D</td>
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</table>
**RECOMMENDATION Strength:** recommends

**RECOMMENDATION:** Referral to an Asthma Specialist for Consultation or Comanagement

**Conditional:** The Expert Panel recommends referral for consultation or care to a specialist in asthma care (usually, a fellowship-trained allergist or pulmonologist; occasionally, other physicians who have expertise in asthma management, developed through additional training and experience) when (Evidence D): Patient has had a life-threatening asthma exacerbation. Patient is not meeting the goals of asthma therapy after 3–6 months of treatment. An earlier referral or consultation is appropriate if the physician concludes that the patient is unresponsive to therapy. Signs and symptoms are atypical, or there are problems in differential diagnosis. Other conditions complicate asthma or its diagnosis (e.g., sinusitis, nasal polyps, aspergillosis, severe rhinitis, VCD, GERD, COPD). Additional diagnostic testing is indicated (e.g., allergy skin testing, rhinoscopy, complete pulmonary function studies, provocative challenge, bronchoscopy). Patient requires additional education and guidance on complications of therapy, problems with adherence, or allergen avoidance. Patient is being considered for immunotherapy. Patient requires step 4 care or higher (step 3 for children 0–4 years of age). Consider referral if patient requires step 3 care (step 2 for children 0–4 years of age). Patient has required more than two bursts of oral corticosteroids in 1 year or has an exacerbation requiring hospitalization. Patient requires confirmation of a history that suggests that an occupational or environmental inhalant or ingested substance is provoking or contributing to asthma. Depending on the complexities of diagnosis, treatment, or the intervention required in the work environment, it may be appropriate in some cases for the specialist to manage the patient over a period of time or to comanage with the PCP. In addition, patients who have significant psychiatric, psychosocial, or family problems that interfere with their asthma therapy may need referral to an appropriate mental health professional for counseling or treatment.

**Decision Variable:** Patient has had a life-threatening asthma exacerbation

**Decision Variable:** Patient is not meeting the goals of asthma therapy after 3–6 months of treatment. An earlier referral or consultation is appropriate if the physician concludes that the patient is unresponsive to therapy.

**Decision Variable:** Signs and symptoms are atypical, or there are problems in differential diagnosis.

**Decision Variable:** Other conditions complicate asthma or its diagnosis (e.g., sinusitis, nasal polyps, aspergillosis, severe rhinitis, VCD, GERD, COPD)
**Decision Variable:** Additional diagnostic testing is indicated (e.g., allergy skin testing, rhinoscopy, complete pulmonary function studies, provocative challenge, bronchoscopy)

**Decision Variable:** Patient requires additional education and guidance on complications of therapy, problems with adherence, or allergen avoidance.

**Decision Variable:** Patient is being considered for immunotherapy.

**Decision Variable:** Patient requires step 4 care or higher (step 3 for children 0–4 years of age).

**Decision Variable:** Consider referral if patient requires step 3 care (step 2 for children 0–4 years of age).

**Decision Variable:** Patient has required more than two bursts of oral corticosteroids in 1 year or has an exacerbation requiring hospitalization.

**Decision Variable:** Patient requires confirmation of a history that suggests that an occupational or environmental inhalant or ingested substance is provoking or contributing to asthma.

**Decision Variable:** patients who have significant psychiatric, psychosocial, or family problems that interfere with their asthma therapy

**Action:** referral for consultation or care to a specialist in asthma care

**Evidence Quality:** Evidence D

**Recommendation Strength:** recommends

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### RECOMMENDATION: COST-EFFECTIVENESS

**Imperative:** 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).

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### RECOMMENDATION: Clinical Decision Supports

**Imperative:** 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 Quality:** Evidence B

**Recommendation Strength:** recommends

**Imperative:** 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 Quality:** Evidence B and C

**Recommendation Strength:** recommends
ALGORITHM: