Complete Summary

GUIDELINE TITLE

Pediatric asthma clinical practice guidelines.

BIBLIOGRAPHIC SOURCE(S)

Kaiser Permanente Care Management Institute. Pediatric asthma: clinical practice guideline. Oakland (CA): Kaiser Permanente Care Management Institute; 2006 Aug. 224 p. [169 references]

GUIDELINE STATUS

This is the current release of the guideline.

To keep current with changing medical practices, all Kaiser Permanente Care Management Institute guidelines are reviewed, and, if appropriate, revised at least every two years.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Asthma

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Prevention
Treatment

CLINICAL SPECIALTY

Allergy and Immunology
Emergency Medicine
Nursing
Pediatrics
Pulmonary Medicine

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Emergency Medical Technicians/Paramedics
Nurses
Pharmacists
Physician Assistants
Physicians
Respiratory Care Practitioners

GUIDELINE OBJECTIVE(S)

To provide recommendations (evidence-based and consensus-based) on the diagnosis, treatment, and management of asthma in pediatric patients

TARGET POPULATION

Children with asthma

Patients 18 years and older are not included.

INTERVENTIONS AND PRACTICES CONSIDERED

Diagnosis

1. Medical history and physical examination
2. Assessment of symptoms
    - Exclusion of alternative diagnoses
    - Risk factor evaluation
    - Measurement of peak expiratory flow (PEF)
    - Peak-flow monitoring
    - Measurement of forced expiratory volume in one second (FEV_1)
    - Reversibility testing (short-acting bronchodilator) of airflow obstruction
    - Trials of controller medications
3. Classification of asthma
    - Intermittent
    - Persistent
4. Ongoing evaluation of asthma control
    - Medical history
    - Physical examination
    - Spirometry
    - Peak-flow monitoring

Management

1. First-line control
    - Inhaled corticosteroids
    - Leukotriene receptor antagonists
    - Nedocromil sodium
2. Additional controlled medications, dosing, and adverse events
    - Inhaled corticosteroids (increased dose)
    - Leukotriene receptor antagonist (in addition to inhaled corticosteroids)
    - Long-acting beta-agonist
3. Self-management and education
    - Patient education
    - Provider education
    - Written action plan

Treatment

1. Treatment of exercise-induced asthma
    - Short-acting beta-agonists
    - Low-dose maintenance inhaled corticosteroids
    - Leukotriene receptor antagonists
    - Referral to asthma specialist
2. Preventive treatment of acute asthma exacerbations secondary to viral respiratory tract infections
    - Leukotriene receptor antagonists (in children age 5 or younger)
    - Referral to asthma specialist (in children age 5 or younger)
3. Treatment of acute asthma exacerbations in a clinical setting
    - Mild to moderate exacerbations
        - Albuterol
    - Severe exacerbations
        - Nebulized ipratropium bromide and short-acting beta-agonists
        - Supplemental oxygen
        - Oral or parenteral systemic corticosteroids in addition to short-acting beta-agonist therapy
        - Oral or parenteral prednisone equivalent
        - Hospital admission
    - Exacerbations refractory to first-line and second-line treatments
        - Intravenous magnesium sulphate
4. Discharge after treatment of acute exacerbation
    - Discharge planning including a written action plan
    - Assessment of controller medication use
    - Oral and parenteral prednisone or equivalent
5. Treatment of acute exacerbations at home as part of a written action plan
    - Oral prednisone
    - Inhaled corticosteroid
    - Advair
6. Monitoring
    - Follow-up schedule

MAJOR OUTCOMES CONSIDERED

- Frequency of day and night asthma symptoms (coughing, wheezing, shortness of breath)
- Severity of asthma symptoms due to aeroallergens, irritants, exercise, or other factors
- Worsening of asthma symptoms due to aeroallergens, irritants, exercise, or other factors
- Use of oral corticosteroid bursts
- Quality of life
- Missed work or school days
- Unscheduled medical visits
- Hospitalizations
- Side effects of medications

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Guidelines are developed with the use of an "evidence-based methodology" and involve a systematic literature search, critical appraisal of the research design and statistical results of relevant studies, and grading of the sufficiency (quantity, quality, consistency, and relevancy) of the evidence for drawing conclusions.

During the guideline development process, the Guideline Development Team reviews evidence published in peer-reviewed scientific journals, existing evidence-based guidelines, consensus-based statements from external professional societies and government health organizations, and clinical expert opinion of Kaiser Permanente (KP) regional specialty groups.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Refer to Table 2 in Appendix B of the original guideline document titled, "System for Grading the Strength of a Body of Evidence."

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

The Guidelines Project Management Team performed systematic reviews of the medical literature on each of the clinical questions identified by the workgroup.

Each recommendation within a guideline is labeled as "evidence-based" or "consensus-based." A recommendation is considered "evidence-based" if there are a sufficient number of high-quality studies from which to draw a conclusion and the recommended practice is consistent with the findings of the evidence. A recommendation can also be considered "evidence-based" if there is insufficient evidence and no practice is recommended. A recommendation is considered "consensus-based" if there is insufficient evidence and a practice is recommended on the basis of the consensus or expert opinion of the Guideline Development Team.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

To develop a guideline, Care Management Institute (CMI) consultants work with a multidisciplinary team of physicians and other health care professionals. This Guideline Development Team consists of a core multidisciplinary group of physicians and other health care providers representing the medical specialties most affected by the guideline topic, and other content experts from disciplines such as pharmacy, nursing, and social work, as appropriate. The members of the Guideline Development Team are endorsed by the National Guideline Directors from their region.

During the guideline development process, the Guideline Development Team reviews evidence published in peer-reviewed scientific journals, existing evidence-based guidelines, consensus-based statements from external professional societies and government health organizations, and clinical expert opinion of Kaiser Permanente (KP) regional specialty groups. The members of the Guideline Development Team develop the guideline and facilitate the information exchange in both directions on behalf of the region that they represent. This process includes obtaining the buy-in of the local champions regarding the guideline so that it would be implemented once published.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Recommendations are classified as either "evidence-based (A-D, I)" or "consensus-based." Refer to the table below for full definitions.

Evidence-based: sufficient number of high-quality studies from which to draw a conclusion, and the recommended practice is consistent with the findings of the evidence. A recommendation can also be considered "evidence-based" if there is insufficient evidence and no practice is recommended.

Consensus-based: insufficient evidence and a practice is recommended based on the consensus or expert opinion of the Guideline Development Team.

Label and Language of Recommendations*

Label	Evidence-Based Recommendations
Evidence-based (A)	**Language**: + The intervention is strongly recommended for eligible patients. **Evidence**: The intervention improves important health outcomes, based on good evidence, and the Guideline Development Team concludes that the benefits substantially outweigh the harms and costs. **Evidence Grade**: Good.
Evidence-based (B)	**Language: +** The intervention is recommended for eligible patients. **Evidence**: The intervention improves important health outcomes, based on 1) good evidence that benefits outweigh harms and costs; or 2) fair evidence that benefits substantially outweigh harms and costs. **Evidence** Grade: Good or Fair.
Evidence-based (C)	**Language: +** No recommendation for or against routine provision of the intervention. (At the discretion of the Guideline Development Team, the recommendation may use the language "option," but must list all the equivalent options.) **Evidence**: Evidence is sufficient to determine the benefits, harms, and costs of an intervention, and there is at least fair evidence that the intervention improves important health outcomes. But the Guideline Development Team concludes that the balance of the benefits, harms, and costs is too close to justify a general recommendation. **Evidence Grade**: Good or Fair.
Evidence-based (D)	**Language: +** Recommendation against routinely providing the intervention to eligible patients. **Evidence**: The Guideline Development Team found at least fair evidence that the intervention is ineffective, or that harms or costs outweigh benefits. **Evidence Grade**: Good or Fair.
Evidence-based (I)	**Language: +** The evidence is insufficient to recommend for or against routinely providing the intervention. (At the discretion of the Guideline

Label	Evidence-Based Recommendations
	Development Team, the recommendation may use the language "option," but must list all the equivalent options.) **Evidence**: Evidence that the intervention is effective is lacking, of poor quality, or conflicting and the balance of benefits, harms, and costs cannot be determined. **Evidence Grade**: Insufficient.
Consensus-based	**Language: +** The language of the recommendation is at the discretion of the Guideline Development Team, subject to approval by the National Guideline Directors. **Evidence**: The level of evidence is assumed to be "Insufficient" unless otherwise stated. However, do not use the A, B, C, D, or I labels, which are intended only to be used for evidence-based recommendations. **Evidence Grade**: Insufficient, unless otherwise stated.
For the rare consensus-based recommendations which have "Good" or "Fair" evidence, the evidence must support a different recommendation, because if the evidence were good or fair, the recommendation would usually be evidence-based. In this kind of consensus-based recommendation, the evidence grade should point this out (e.g., "Evidence Grade: Good, supporting a different recommendation").	

*Recommendations should be labeled and given an evidence grade. The evidence grade should appear in the rationale. Evidence is graded with respect to the degree it supports the specific clinical recommendation. For example, there may be good evidence that Drugs 1 and 2 are effective for Condition A, but no evidence that Drug 1 is more effective than Drug 2. If the recommendation is to use either Drug 1 or 2, the evidence is good. If the recommendation is to use Drug 1 in preference to Drug 2, the evidence is insufficient.

[+]All statements specify the population for which the recommendation is intended.

COST ANALYSIS

A study of asthma patients in a staff-model Health Maintenance Organization showed decreased resource use between 57% to 75% by participation in an Asthma Outreach Program (AOP) as compared with a randomized control group receiving only an educational intervention. Substantial savings were achieved compared with the cost of the AOP nurse.

The Guideline Development Team does not believe that the benefits of leukotriene receptor antagonists definitively outweigh the risks and cost. Therefore, leukotriene receptor antagonists are noted as an option for the preventive treatment of exacerbations secondary to viral respiratory tract infections in children aged 5 years and younger.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The National Guideline Directors' Guideline Quality Committee reviewed and approved the guidelines in August 2006.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Recommendations are identified as either "evidence-based (A-D, I)" or "consensus-based." For definitions of the levels of recommendations see the end of the "Major Recommendations" field.

Diagnosis of Asthma in Children and Adolescents

1. Consider the diagnosis of asthma in any child according to the following criteria:
    - Episodic symptoms of airflow obstruction, as noted by:
        - History of recurrent wheezing, cough, shortness of breath, or chest tightness
        - Physical examinations that document recurrent episodes of coughing or wheezing
    - Airflow obstruction that is at least partially reversible, as demonstrated by:
        - Wheezing on physical examination that improves with the use of a bronchodilator
        - An improvement of 12% in forced expiratory volume in 1 second (FEV_1) or 20% in peak expiratory flow (PEF) after inhalation of a short-acting bronchodilator
    - Exclusion of alternative diagnoses:
        - Gastroesophageal reflux disease
        - Obstructive sleep apnea
        - Recurrent or chronic sinusitis
        - Foreign body aspiration
        - Vocal cord dysfunction
        - Panic attack, hyperventilation, tracheoesophageal fistula, vascular rings, or other pulmonary disease (e.g., cystic fibrosis)

(*Note: This should be considered a partial, not a comprehensive list.*)

Consensus-based*

2. In addition to the above definition of asthma, the following are options to help establish the diagnosis of asthma (*Note: No one tool is considered diagnostic.*):
    - Risk factor evaluation (such as a history of asthma in the parents, cigarette smoke exposure, diagnosis of eczema, allergic rhinitis, or positive allergy skin or blood tests)
    - Peak-flow monitoring over one to two weeks that shows $\geq$ 20% diurnal variation

- Trials of controller medication (e.g., Qvar®, Asmanex®, Flovent®, or Pulmicort) for approximately one to three months followed by a clinical reassessment, including peak-flow or spirometry measurement

Consensus-based*

3. For asthma patients who have severe or frequent symptoms or when diagnosis is in doubt, consider referral to an asthma specialist for further evaluation.

Consensus-based*

*There is insufficient evidence to recommend for or against the following methods, in isolation, for establishing a diagnosis of asthma in children or adolescents: assessment of asthma symptoms, risk factor evaluation, physical examination, spirometry, trials of controller medication, response to albuterol, peak-flow meters, or histamine/methacholine/exercise challenge. Evidence-based: I

Initial Classification of Asthma

1. Symptom assessment (while off controller medication) and (if indicated) lung function testing are recommended for classifying asthma as intermittent or persistent in children and adolescents, as defined by National Heart Lung and Blood Institute (NHLBI).

   Intermittent:

   - Symptoms occurring no more than twice a week, asymptomatic with normal PEF between exacerbations, and brief exacerbations (i.e., a few hours to a few days) with varying intensity; AND
   - Nighttime symptoms no more than twice a month; AND
   - FEV_1 or PEF $\geq$ 80% of predicted, PEF variability < 20%

   Persistent:

   - Symptoms occurring more than twice a week, with exacerbations severe enough to affect daily activity; OR
   - Nighttime symptoms more than twice a month; OR
   - FEV_1 or PEF < 80% of predicted, PEF variability 20% to 30%

Consensus-based*

2. In infants and young children 5 years old or younger, where lung function cannot be performed, assessments of additional symptoms and laboratory tests are recommended for classifying asthma as intermittent or persistent, as noted by NHLBI
   - Consider a child to be at risk for persistent asthma who has had more than three episodes of wheezing in the past year that lasted more than a day and affected sleep; AND
   - Has had either:
     - A physician diagnosis of atopic dermatitis or parental history of asthma, OR
     - At least two of the following conditions:

1. Allergist-diagnosed allergic rhinitis
2. Greater than 4% eosinophils on complete blood count
3. Wheezing apart from colds

Consensus-based*

*There is insufficient evidence to recommend for or against the use of symptom assessment or lung function testing for classifying asthma as intermittent or persistent in children or adolescents. Evidence-based: I

Ongoing Evaluation of Asthma Control

1. The following components are recommended for clinical evaluations of asthma control in children and adolescents:
    - A recent medical history covering topics such as waking at night with cough or wheeze, the ability to exercise, attendance at school/preschool, and beta-agonist use (the Childhood Asthma Control Test (ACT) for children aged 4 to 11 and the ACT for children aged 12 to 18 are options)
    - A physical examination, including weight and height percentile information, evaluations of wheezing, auscultation and exhalation, and chest deformity

    Use of spirometry to assess response to albuterol before and after use of bronchodilators is an option in clinical evaluation of asthma control in children and adolescents.

Consensus-based*

2. Clinicians are advised to instruct child and adolescent patients to keep a symptom diary (assessing frequency of cough or wheezing, nocturnal asthma symptoms, and inhibition of daily activities of living) in order to evaluate asthma control.

Consensus-based*

3. When peak-flow monitoring is used to measure control, asthma should be considered poorly controlled when peak flows show > 20% diurnal (a.m. vs. p.m.) variability. Assessment of control using peak-flow information should include a check of patient peak-flow technique and effort.

Consensus-based*

4. The use of peak-flow monitoring in the initial evaluation of asthma control is an option for children and adolescents aged 6 years and older.

Evidence-based: C

5. Ongoing or long-term peak-flow monitoring is an option for select patients with poorly controlled disease or in patients who are poor perceivers of their symptoms.

Consensus-based*

*There is insufficient evidence to recommend for or against the use of the following methods of evaluating asthma control in children and adolescents: spirometry, symptom or beta-agonist use assessments, (e.g., the ACT), nitric oxide evaluation, or peripheral blood eosinophil evaluation. Evidence-based: I

Stepwise Medical Management

First-Line Controller Medications, Dosing, and Adverse Effects

1. Inhaled corticosteroids are strongly recommended as first-line controller medication for children and adolescents with persistent asthma.*

Evidence-based: A

2. When initiating therapy, a low dose of inhaled corticosteroids twice a day is recommended.[a] For patients with severe asthma and/or poor control, an initial medium dose and adjustment to the lowest effective dose is an option.

Consensus-based[b]

3. For children who cannot tolerate or who decline inhaled corticosteroids or those for whom the medication is contraindicated, leukotriene receptor antagonists or nedocromil sodium are recommended as alternative first-line options.[c]

Evidence-based: B

4. Long-acting beta-agonists and cromolyn sodium are not recommended as first-line treatment for children and adolescents with persistent asthma.[c]

Evidence-based: D

*There is insufficient evidence to determine the efficacy of triamcinolone, flunisolide, or mometasone in children and adolescents; however, a class effect is assumed.

[a]See Table 1 in Appendix A for Estimated Daily Dosages of Inhaled Corticosteroids on page 205 in the original guideline document.
Mometasone is indicated once per day.

[b]There is insufficient evidence to recommend the initial dose (high, medium, or low) and frequency of dosing for children and adolescents initiating inhaled corticosteroids. Evidence-based: I

[c]See Table 2 in Appendix A for Usual Dosages for Long-Term Control Medications on page 206 in the original guideline document.

Additional Controller Medications, Dosing, and Adverse Effects*

1. For children whose asthma is not controlled by a long-term controller medication, a referral to an asthma specialist for further evaluation and education is recommended.

Consensus-based

2. In children older than 4 years whose asthma is not controlled with the proper use and administration of inhaled corticosteroids, increasing the dose is recommended.**

Evidence-based: B

3. In children whose asthma is not controlled with the proper use and administration of inhaled corticosteroids alone, adding a leukotriene receptor antagonist is an option.

Evidence-based: C

4. In children older than 4 years whose asthma is not controlled with the proper use and administration of inhaled corticosteroids alone, adding a long-acting beta-agonist is an option.

Consensus-based

5. The addition of cromolyn for children and adolescents whose asthma is uncontrolled by inhaled corticosteroids is not recommended.

Evidence-based: D

*There is insufficient evidence to recommend for or against the addition of the following medications for children and adolescents whose asthma is not controlled by inhaled corticosteroids: long-acting beta-agonists (salmeterol, formoterol), nedocromil, theophylline, or anti-IgE immunotherapy. Evidence-based: I

**See Table 1 in Appendix A for Estimated Daily Dosages of Inhaled Corticosteroids for appropriate low, medium, and high doses on page 205 in the original guideline document.

Asthma Self-Management and Education

1. Ongoing patient education, including the components of clinician follow-up, monitoring, reinforcement, and adherence strategies, is recommended for improving asthma control in children and adolescents.

Consensus-based*

2. Continuing education for providers is recommended for improving asthma control in children and adolescents.

Evidence-based: B

3. Written action plans (peak flow and/or symptom-based) as part of an overall effort to educate patients in self-management are recommended, especially for patients whose asthma is not controlled by long-term controller medication and for patients with a history of severe exacerbations. The goal of the action plan is to provide information on the timing and method of

increasing treatment, the duration of treatment, and when and how to seek medical help.

Consensus-based*

*There is insufficient evidence to recommend for or against extended patient education, psychosocial services, written action plans, adherence strategies, care management, case management, or the use of clinician monitoring and reinforcement for improving asthma control in children and adolescents with asthma.

Treatment of Exercise-Induced Asthma*

1. For children and adolescents with exercise-induced asthma, a short-acting beta-agonist (albuterol, two puffs) 5 to 15 minutes prior to exercise is recommended as initial therapy.

Evidence-based: B

2. For patients for whom pretreatment with an inhaled short-acting beta-agonist does not adequately prevent symptoms, first check inhaler technique, and then check for underlying persistent asthma. If inhaler technique is appropriate, consider a diagnosis of persistent asthma and start a trial of treatment with low-dose maintenance inhaled corticosteroid for 30 days.

Consensus-based

3. For children and adolescents with exercise-induced asthma, leukotriene receptor antagonists (montelukast, 5 mg once a day) are an option.

Evidence-based: C

4. For those patients whose exercise-induced asthma does not respond to short-acting beta-agonists, inhaled corticosteroids, or leukotriene receptor antagonists, a referral to an asthma specialist is recommended.

Consensus-based

*There is insufficient evidence for or against a recommendation of long-acting beta-agonists, loratadine, vitamin C, or omega-3 or -6 supplements for the treatment of exercise-induced asthma in pediatric patients. Evidence-based: I

Preventive Treatment of Acute Asthma Exacerbations Secondary to Viral Respiratory Tract Infections

1. Leukotriene receptor antagonists are an option for the preventive treatment of recurrent asthma exacerbations secondary to viral respiratory tract infections in children aged 5 years or younger who do not have evidence of persistent asthma.

Evidence-based: C

2. When leukotriene receptor antagonists are considered for the preventive treatment of recurrent asthma exacerbations secondary to viral respiratory tract infections in children aged five years or younger, who do not have evidence of persistent asthma, referral to an asthma specialist should be considered.

Consensus-based

3. There is insufficient evidence to recommend for or against the use of leukotriene receptor antagonists for the preventive treatment of acute asthma exacerbations secondary to viral respiratory tract infections in children and adolescents aged 6 years or older who do not have evidence of persistent asthma.

Evidence-based: I

4. There is insufficient evidence, due to conflicting results, to recommend for or against the use of inhaled corticosteroids for the preventive treatment of acute asthma exacerbations secondary to viral respiratory tract infections in children or adolescents who do not have evidence of persistent asthma.

Evidence-based: I

Treatment of Acute Asthma Exacerbations in a Clinical Setting

Mild to Moderate Exacerbations (PEF > 50% and/or oxygen saturation ≥ 92% on room air)

1. For infants aged 2 years or younger presenting in the outpatient clinic, urgent care setting, or emergency department (ED) with mild to moderate exacerbations of asthma, albuterol is an option for the initial treatment of acute asthma.

Evidence-based: C

2. For children and adolescents in the outpatient clinic, urgent care setting, or ED, albuterol is recommended for the initial treatment of mild to moderate acute exacerbations of asthma, administered either by a metered-dose inhaler with spacer (with or without mask) under supervision, or by a hand-held nebulizer.

Evidence-based: B

3. Two to six puffs of albuterol via metered-dose inhaler with spacer or 0.15 mg/kg (2.5 mg minimum dose, 5 mg maximum dose) via hand-held nebulizer every 20 minutes for up to three doses is recommended.

Consensus-based*

*There is insufficient evidence to recommend for or against the use of metered-dose inhaler with spacer vs. hand-held nebulizer, levalbuterol vs. racemic albuterol, or high-dose vs. low-dose albuterol for the treatment of acute exacerbations. Evidence-based: I

Severe Exacerbations (PEF < 50% and/or oxygen saturation < 92% on room air) or Exacerbations Refractory to First-Line Treatment*

1. Nebulized ipratropium bromide and short-acting beta-agonists, every 20 minutes for up to three treatments, are recommended for the treatment of children (250 mcg/dose) and adolescents (500 mcg/dose) with severe exacerbations in the outpatient clinic, urgent care setting, or ED.**

Evidence-based: B

2. Supplemental oxygen (by nasal cannula or mask, whichever is better tolerated) to maintain an oxygen saturation > 92% is recommended during the delivery of short-acting beta-agonists and anticholinergics in patients with severe exacerbations.

   Monitor oxygen until a clear response to bronchodilator therapy has occurred.

Consensus-based

3. For children and adolescents in the outpatient clinic, urgent care setting, or ED with severe exacerbations of asthma, the early addition of either oral or parenteral systemic corticosteroids to short-acting beta-agonist therapy is strongly recommended.

Evidence-based: A***

4. A single dose of either oral or parenteral prednisone equivalent (1 to 2 mg/kg, up to 60 mg) is recommended.

Consensus-based

5. For patients who continue to be hypoxic after guideline-recommended treatment options and/or who require treatment more frequently than every two hours, hospital admission should be considered.

Consensus-based

*There is insufficient evidence for or against the addition of inhaled corticosteroids, leukotriene receptor antagonists, or long-acting beta-agonists to albuterol for children and adolescents presenting with severe exacerbations in the clinical setting. Evidence-based: I

**See the rationale for Recommendation 8A on page 161 in the original guideline document for the appropriate dose of short-acting beta-agonists.

***There is insufficient evidence to determine the difference between oral and parenteral corticosteroids, or high-dose and oral corticosteroids for the treatment of severe acute exacerbations or exacerbations refractory to first-line treatment. Evidence-based: I

Exacerbations Refractory to First- and Second-Line Treatments

1. For patients who are refractory to first- and second-line treatments, intravenous magnesium sulfate (25 to 40 mg/kg as a single dose over 20 minutes, maximum up to 2 g) is an option for children and adolescents treated for acute asthma in a hospital setting. It is recommended that patients be hospitalized for at least 24 hours.

Consensus-based*

*There is insufficient evidence to recommend for or against the use of intravenous or inhaled magnesium sulfate for children and adolescents refractory to first- and second line treatments for acute asthma in a clinical setting. Evidence-based: I

Discharge After Treatment of Acute Exacerbation

1. Discharge planning including a written action plan with clear instructions regarding beta-agonist use and follow-up is recommended. Parents should be instructed to return the patient urgently for further assessment and medical care if symptoms are not controlled by short-acting beta-agonists administered every three to four hours.

Consensus-based*

2. Assessment of controller medication use is recommended for patients with persistent asthma.

   Inhaled corticosteroids are the first-choice controller for persistent asthma and should be started on those patients who are naive to controller therapy. If a patient has been using an inhaled corticosteroid prior to the acute exacerbation, step-up therapy may be needed. (*See Recommendation 4B on page 93 in the original guideline document*.) If a patient has been taking only a leukotriene receptor antagonist, switching to an inhaled corticosteroid is recommended.

   Incorporating the continuation of controller medications into the written action plan is also recommended.

Consensus-based*

3. For children and adolescents who are discharged after having an acute exacerbation, oral prednisone or equivalent (1 to 2 mg/kg/day, maximum 60 mg) for three to seven days** is recommended.

Consensus-based*

4. For children and adolescents temporarily unable to take oral medication, a single parenteral injection of 1 to 2 mg/kg (maximum 60 mg) prednisone equivalent dose is an option.
   Oral medications (as tolerated) should be initiated for three to seven days thereafter.

Consensus-based*

*There is no evidence to recommend for or against the use of inhaled, systemic, or parenteral corticosteroids, leukotriene receptor antagonists, ipratropium bromide, or short-acting beta-agonists for patients discharged after successful treatment of an acute asthma exacerbation in the outpatient clinic, urgent care, or ED settings. Evidence-based: I

**The consensus of the Guideline Development Team is that four days of oral corticosteroid therapy is optimal.

Treatment of Acute Exacerbations at Home as Part of a Written Action Plan

1. Oral prednisone (1 to 2 mg/kg/day, maximum 60 mg) or equivalent for three to seven days is recommended for home management of acute asthma exacerbations in children and adolescents.

Evidence-based: B

2. For children and adolescents with persistent asthma (i.e., who are already using inhaled corticosteroids for home management of asthma):
    - If mild exacerbations continue to occur, an increased dose of inhaled corticosteroid is an option.

    Consensus-based

    - If moderate or severe exacerbations continue to occur, or mild exacerbations persist in spite of an increased dose of inhaled corticosteroid, oral corticosteroids are an option.

    Consensus-based

    - If exacerbations persist in children and adolescents already using high-dose inhaled corticosteroid (e.g., 800 mcg/day), an increased dose of inhaled corticosteroid (e.g., 1,600 mcg/day) is an option.

Evidence-based: B

3. For children and adolescents already using Advair (salmeterol plus fluticasone), doubling the dosage of this medication is not recommended for home management of acute asthma exacerbations. If asthma exacerbations at home are not controlled by the baseline dose of Advair, additional inhaled corticosteroids or oral corticosteroids are options.

Consensus-based

Monitoring

Follow-up of pediatric asthma patients may be conducted by phone or in person, may include physical examination and/or spirometry, and may be performed by a case manager, registered nurse, nurse practitioner, or physician. Follow-up is recommended:

- Within one week of an asthma exacerbation

- Within four weeks after initiation of therapy or any significant change in therapy, and every two to four weeks thereafter until control is obtained
- Every four to six months to assess control for patients with persistent asthma; if asthma is well controlled, stepping down on therapy is an option

Consensus-based*

*There is insufficient evidence to recommend for or against any specific interval for systematic follow-up in children and adolescents with persistent or intermittent asthma or following an exacerbation. Evidence-based: I

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	Evidence: Evidence is sufficient to determine the benefits, harms, and costs of an intervention, and there is at least fair evidence that the intervention improves important health outcomes. But the Guideline Development Team concludes that the balance of the benefits, harms, and costs is too close to justify a general recommendation. **Evidence Grade**: Good or Fair.
Evidence-based (D)	**Language: +** Recommendation against routinely providing the intervention to eligible patients. **Evidence**: The Guideline Development Team found at least fair evidence that the intervention is ineffective, or that harms or costs outweigh benefits. **Evidence Grade**: Good or Fair.
Evidence-based (I)	**Language: +** The evidence is insufficient to recommend for or against routinely providing the intervention. (At the discretion of the Guideline Development Team, the recommendation may use the language "option," but must list all the equivalent options.) **Evidence**: Evidence that the intervention is effective is lacking, of poor quality, or conflicting and the balance of benefits, harms, and costs cannot be determined. **Evidence Grade**: Insufficient.
Consensus-based	**Language: +** The language of the recommendation is at the discretion of the Guideline Development Team, subject to approval by the National Guideline Directors. **Evidence**: The level of evidence is assumed to be "Insufficient" unless otherwise stated. However, do not use the A, B, C, D, or I labels, which are intended only to be used for evidence-based recommendations. **Evidence Grade**: Insufficient, unless otherwise stated.
For the rare consensus-based recommendations which have "Good" or "Fair" evidence, the evidence must support a different recommendation, because if the evidence were good or fair, the recommendation would usually be evidence-based. In this kind of consensus-based recommendation, the evidence grade should point this out (e.g., "Evidence Grade: Good, supporting a different recommendation").	

*Recommendations should be labeled and given an evidence grade. The evidence grade should appear in the rationale. Evidence is graded with respect to the degree it supports the specific clinical recommendation. For example, there may be good evidence that Drugs 1 and 2 are effective for Condition A, but no evidence that Drug 1 is more effective than Drug 2. If the recommendation is to use either Drug 1 or 2, the evidence is good. If the recommendation is to use Drug 1 in preference to Drug 2, the evidence is insufficient.

[+]All statements specify the population for which the recommendation is intended.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is specifically stated for each recommendation.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate prevention, treatment, and management of asthma in children to control symptoms and decrease the incidence of exacerbations

POTENTIAL HARMS

Side effects of pharmacological agents

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These guidelines are informational only. They are not intended or designed as a substitute for the reasonable exercise of independent clinical judgment by practitioners, considering each patient's needs on an individual basis.
- Guideline recommendations apply to populations of patients. Clinical judgment is necessary to design treatment plans for individual patients.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Quick Reference Guides/Physician Guides

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Kaiser Permanente Care Management Institute. Pediatric asthma: clinical practice guideline. Oakland (CA): Kaiser Permanente Care Management Institute; 2006 Aug. 224 p. [169 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2006 Aug

GUIDELINE DEVELOPER(S)

Kaiser Permanente Care Management Institute - Managed Care Organization

SOURCE(S) OF FUNDING

Kaiser Permanente Care Management Institute

GUIDELINE COMMITTEE

Kaiser Permanente Pediatric Asthma Guidelines Project Management Team

Kaiser Permanente Pediatric Asthma Guidelines Development Team

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

To keep current with changing medical practices, all Kaiser Permanente Care Management Institute guidelines are reviewed, and, if appropriate, revised at least every two years.

GUIDELINE AVAILABILITY

Electronic copies may be requested from: Kaiser Permanente Care Management Institute, One Kaiser Plaza, 16th Floor, Oakland, CA 94612

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Kaiser Permanente Care Management Institute. Pediatric asthma clinical practice guidelines. Oakland (CA): Kaiser Permanente Care Management Institute; 2006 Aug. 13 p.

Electronic copies: Available in Portable Document Format (PDF) from the Kaiser Permanente Care Management Institute Web site.

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on February 21, 2007. The information was verified by the guideline developer on March 14, 2007.

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