Guidelines for the Diagnosis and Management of Asthma in Adult and Pediatric Patients

Guidelines are designed to assist clinicians by providing a framework for the evaluation and treatment of patients. These guidelines outline the preferred approach for most patients. They are not intended to replace a clinician's judgement or to establish a protocol for all patients. It is understood that some patients will not fit the clinical condition contemplated by a guideline and that a guideline will rarely establish the only appropriate approach to a problem.

The goals of asthma therapy are to prevent chronic asthma symptoms and asthma flare-ups during the day and night, maintain normal activity levels, have normal or near normal lung function, no or minimal side effects and have patient satisfaction with asthma care.

1 . Major Recommendations for the Diagnosis and Management of Asthma

1. Diagnose asthma and initiate a partnership with the patient.

Diagnose asthma by

- Establishing a history of recurrent symptoms
- Establishing reversible airflow obstruction using spirometry, and
- Excluding alternative diagnoses

Establish a patient-clinician partnership

- Address the patient's concern
- Agree upon the goals of asthma therapy
- Agree upon a written action plan for patient self-management – See example, Appendix A.

2. In treatment, reduce inflammation, symptoms and exacerbations

Prescribe anti-inflammatory medications to patient with MILD, MODERATE, or SEVERE PERSISTENT asthma

Reduce exposures to precipitants of asthma symptoms

- Assess the patient's exposure and sensitivity to precipitants (e.g. allergens, irritants).
- Provide written and verbal instructions on how to avoid or reduce factors that make the patient's asthma worse

3. Monitor and manage asthma over time

Teach all patients to monitor their asthma

- All patients should monitor symptoms
- Patients with moderate or severe persistent asthma should monitor their peak flow

See patients at least every 1 to 6 months

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

4. Treat asthma episodes promptly

- Prompt use of short acting inhaled $beta_2$-agonist and, if an episode is moderate to severe, a course of oral corticosteroids is appropriate.
- Prompt communication and follow-up between the patient and clinician

2. Treatment Objectives and Considerations

RESCUE MEDICATION MUST BE DELIVERED BY AN AGE-APPROPRIATE DOSAGE FORM. PATIENTS WITH ASTHMA MUST HAVE A RESCUE INHALED BETA-AGONIST AVAILABLE TO TAKE AS NEEDED FOR SYMPTOMS

Repeated attempts to achieve the lowest effective dose of inhaled corticosteroids should be made to avoid adverse systemic effects such as adrenal suppression and growth suppression

- Inhaled corticosteroids differ in potency and are not all equal on a mcg per mcg basis.
- Asthma death rate decreased by 21% with each additional canister of inhaled corticosteroids used during the previous year.
- Inhaled corticosteroids are associated with a slower short-term vertical growth rate, but the overall effect is small and may not be sustained.[27]

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- **Salmeterol should not be used as monotherapy in asthma.**[10-25]
- All patients should be provided with a written action plan for asthma exacerbations and a phone number to contact their prescriber for worsening asthma. The red/yellow/green zone format is recommended.

3. Initial Assessment and Diagnosis of Asthma in Adults.

Recurrent episodes of coughing or wheezing are almost always due to asthma.

Cough can be the sole symptom. To establish a diagnosis of asthma, determine the following:

- **Episodic symptoms of airflow obstruction are present**
  - Asthma symptoms vary throughout the day; absence of symptoms at the time of examination does NOT exclude the diagnosis of asthma.
  - Medical History - Findings that increase the probability of asthma include: episodic wheezing, chest tightness, SOB or cough, symptoms that worsen in presence of allergens, exercise or irritants, allergic rhinitis or atopic dermatitis, nocturnal symptoms, relatives with asthma, allergy, sinusitis or rhinitis.
- **Physical examination of airways, chest and skin may include**
  - Hyperexpansion of the thorax, sounds of wheezing or prolonged phase of forced exhalation, increased nasal secretions, mucosal swelling, sinusitis, rhinitis, nasal polyps, atopic dermatitis/eczema.
- **Airflow obstruction is at least partially reversible**
  - Establish airflow obstruction: FEV_1 <80% prediction and/or FEV_1/FVC <65% or below the normal limit of normal. If obstruction is absent, tests for determining bronchial responsiveness to inhaled methacholine will define this feature of asthma.
  - Establish reversibility: FEV_1 increases 12% or more and at least 200 ml after using a short-acting inhaled $beta_2$-agonist such as albuterol or terbutaline.
- **Alternative diagnoses are excluded** –vocal cord dysfunction, vascular rings, foreign bodies or other pulmonary disease

4. Diagnosis and Assessment of Asthma in Children 5 Years of Age or Less

Asthma is the most common chronic disorder in children under the age of 5 years with 50-80% of children with asthma developing symptoms before 5 years of age.

Factors associated with ONSET of asthma symptoms in children include: allergy, a family history of asthma and/or allergy, perinatal exposure to tobacco smoke, viral respiratory infections, male gender, and low birth weight.

In infants and young children who wheeze with viral upper respiratory infections (URIs), different patterns of illness may emerge over time. Symptoms may remit in the preschool years. Asthma symptoms, however, may persist throughout childhood. There are no clear markers to predict the prognosis for an individual child. Factors associated with continuing asthma include: allergy, a family history of asthma and/or allergy, and perinatal exposure to passive smoke and aeroallergens.

Pathogenesis of Asthma in Children

Asthma, whatever the severity, is a chronic, inflammatory disorder of the airways. Most studies of inflammation in asthma have been conducted in adults, but studies in children with diagnosed asthma show similar findings. In infants and young children who wheeze with acute viral URIs, the relative contributions of airway inflammation, bronchial smooth muscle abnormalities, and/or other structural factors in producing wheeze are not clear. However, anti-inflammatory treatment for these children can reduce morbidity and mortality from wheezing in early childhood.

The Diagnosis of Asthma in Young Children

To diagnose asthma in children, the clinician must determine that:
(1) episodic symptoms of airflow obstruction are present
(2) airflow limitation is at least partially reversible
(3) alternative diagnoses are excluded

Signs and symptoms of asthma can vary widely and may mimic other common childhood illnesses. Diagnosis can be difficult and has important implications. On the one hand, asthma is frequently underdiagnosed and, thus, many infants and young children do not receive adequate therapy. On the other hand, not all wheeze and cough are caused by asthma, and caution is needed to avoid giving these patients inappropriately prolonged asthma therapy. However, the diagnosis of asthma should be strongly considered if there are recurrent episodes of cough with or without wheezing. COUGHING MAY BE THE ONLY SYMPTOM PRESENT.

Consider asthma in children with repeated diagnoses of: reactive airway disease, allergic bronchitis, wheezy bronchitis, asthmatic bronchitis, recurrent pneumonia, and recurrent bronchiolitis. Less common causes of persistent or recurrent cough and/or wheeze in children include: upper airway noise/congestion, cystic fibrosis, tracheoesophageal fistula/gastroesophageal reflux, bronchopulmonary dysplasia, foreign body aspiration, vascular ring, primary immuniodeficiency, congenital heart disease, and vocal cord dysfunction. Due to the inability to perform pulmonary function tests adequately in young children, the diagnosis of asthma is based on the medical history, the physical examination, and use of other studies (CTR, sweat test, etc.) to rule out other conditions in the differential diagnoses.

Classifying Asthma Severity in Young Children
For any child with asthma, the severity of the disease can change over time. Any child with asthma, even those with mild persistent disease may have a severe exacerbation. Children with viral-induced wheezing may have severe episodes with complete resolution between episodes, and may remain symptom free for months. CHILDREN WITH MORE THAN TWO EPISODES OF ASTHMA SYMPTOMS PER WEEK HAVE PERSISTENT ASTHMA AND ARE CANDIDATES FOR A "CONTROLLER" THERAPY.

Assessment and Monitoring of Young Children with Asthma
Children with asthma need to be monitored regularly. At clinic/office visits, ask about asthma symptom patterns over the past two weeks: nighttime (or early morning) symptoms, daytime symptoms, daycare or preschool absences, limitations of play activities, use of rescue medications. For infants, ask about: difficulty with feeding (grunting sounds, poor sucking), changes in respiratory rate, altered sleep patterns, retractions, irritability, lethargy, decreased appetite, weight loss.

See referral recommendations for children with asthma under the section titled: Referral to an Asthma Specialist

5. Control of Factors Contributing to Asthma Severity

Avoiding or controlling factors that contribute to asthma severity will reduce symptoms and the need for medication.

To reduce the effects of specific allergens on a patient with persistent asthma:
- **Identify the specific allergens to which the patient is exposed**
- **Determine and confirm sensitivity to the allergen (skin or in vitro tests, medical history)**
- **Obtain agreement with the patient to initiate one or two simple control measures**

Advise patient to control other factors that contribute to asthma severity:
- Stop smoking (see Tobacco Guideline for more information on how to quit smoking), avoid second hand smoke, control allergic rhinitis, treat sinusitis, avoid known triggers, control GERD, educate about sulfite sensitivity, avoid harmful medications, and give an annual influenza vaccine

6. Pharmacologic Therapy

Refer to the *Stepwise Approach to Managing Asthma in Adults and Children*

Gain control of asthma
Start treatment at the step appropriate to severity at the time of evaluation. If control is not achieved "step up" therapy OR
At onset, give therapy at higher level to achieve rapid control and then "step down" to the minimum therapy needed to maintain control

Maintain control
"Step Down Therapy" – Gradually reduce long-term control medications after several weeks or months of controlling persistent asthma (i.e. goals of therapy are achieved). Anti-inflammatory medications should be continued for persistent asthma.
"Step Up Therapy" – The presence of one or more indicators of poor asthma control may suggest a need to increase or 'step up' therapy. Indicators of poor asthma control include: nocturnal awakening, emergency room or hospitalization, increased use of short-acting beta$_2$-agonist

Assess other reasons for poor control – ICE **I**nhaler technique/**C**ompliance/**E**nvironment

7. Stepwise Approach to Managing Acute or Chronic Asthma

Shaded areas represent the PREFERRED TREATMENT – Non shaded areas represent ALTERNATIVE TREATMENT
* Referral to an asthma specialist is recommended for Step 3 and 4. Consider for Step 2
**Inhaled corticosteroids have consistently shown to be superior to leukotriene modifiers for monotherapy in children. They should be considered an alternative if the medication needs to be administered orally rather than via inhalation.

Treatment of Persistent Asthma in Children ≤ 5 Years of Age

Mild Intermittent - Step 1	Mild Persistent - Step 2	Moderate Persistent- Step 3	Severe Persistent - Step 4
Symptoms Day / Night ≤2days/week / ≤2 nights/month	**Symptoms Day / Night** >2/week but <1x/day / >2 nights/month	**Symptoms Day / Night** Daily / >1 night/week	**Symptoms Day / Night** Continual / Frequent
No daily medication needed	budesonide nebs 0.25 mg/day [1,2] **or** fluticasone MDI [a] w/facemask 44 mcg (1-2 puffs BID) **or if ≥ 4 yr old** fluticasone DPI [b] 50-100 mcg (BID)	budesonide nebs 0.25-0.5 mg/day [1,2] **or** fluticasone MDI [a] w/facemask 110 mcg (1-2 puff BID) **or if ≥ 4 yr old** fluticasone DPI [b] 100-200 mcg (BID)	budesonide nebs 0.5 mg QD-BID [1,2] **or** fluticasone MDI [a] w/facemask 110 mcg (2 puffs BID) **or if ≥ 4 yr old** fluticasone DPI [b] 250 mcg (1 puff BID)
	or	+/-	+/-
	If ≥ 12 months old montelukast 4mg chew tab HS	**If ≥ 12 months old** montelukast 4 mg chew tab HS	**If ≥ 12 months old** montelukast 4 mg chew tab HS
	or	+/-	+/-
	cromolyn nebs 20 mg QID	**If ≥ 1 yr old**: theophylline 10-16 mg/kg/day (adjust dose q 3 days to serum theophylline levels of 10-15 mcg/ml)	**If ≥ 1 yr old**: theophylline 10-16 mg/kg/day (adjust dose q 3 days to serum theophylline levels of 10-15 mcg/ml)
	or		**If needed** add systemic steroids (0.25-2 mg/kg/day). Reduce to lowest dose (QD or QOD) to stabilize symptoms. **Repeat attempts to reduce**
	If ≥ 1 yr old: theophylline 10-16 mg/kg/day (adjust dose q 3 days to serum theophylline levels of 10-15 mcg/ml)		

Abbreviation Key:
[a] MDI = Meter Dose Inhaler
[b] DPI = Diskhaler
[1,2 etc] Please see the Clinical Reference Abstract Summary for corresponding reference numbers.

Shaded areas represent the PREFERRED TREATMENT – Non shaded areas represent ALTERNATIVE TREATMENT
* Referral to an asthma specialist is recommended for Step 3 and 4. Consider for Step 2

Treatment of Persistent Asthma in Children 6 to <12 Years of Age

Mild Intermittent - Step 1

Symptoms Day / Night
≤2 days/week / ≤2 nights/month
PEF or FEV_1 / PEF Variability
≥80% / <20%

No daily medication needed.
Severe exacerbations may occur, separated by long periods of normal lung function and no symptoms. A course of systemic corticosteroids is recommended.

Mild Persistent - Step 2

Symptoms Day / Night
>2/week but <1x/day / >2 nights/month
PEF or FEV_1 / PEF Variability
≥80% / 20%-30%

fluticasone MDI[a] w/facemask 44 mcg (1-2 puffs BID) **or** fluticasone DPI [b] 50-100 mcg (BID) **or** budesonide turbuhaler 200 mcg (1 puff QD) [1,2]

+/-

montelukast 5 mg chew tab HS

+/-

theophylline 10-16 mg/kg/day
(adjust dose q 3 days to serum theophylline levels of 10-15 mcg/ml)

Moderate Persistent - Step 3

Symptoms Day / Night
Daily / >1 night/week
PEF or FEV_1 / PEF Variability
>60%-<80% / >30%

fluticasone MDI[a] w/facemask 110 mcg (1-2 puff BID) **or** fluticasone DPI[b] 100-200 mcg (BID) **or** budesonide turbuhaler 200 mcg (1 puff QD-BID) [1,2]

+/-

salmeterol MDI[a] 84 mcg/day (2 puffs BID) [11-18]
salmeterol DPI[b] 100 mcg/day (1 puff BID) [11-18]

+/-

montelukast 5 mg chew tab HS

+/-

theophylline 10-16 mg/kg/day
(adjust dose q 3 days to serum theophylline levels of 10-15 mcg/ml)

Severe Persistent - Step 4

Symptoms Day / Night
Continual / Frequent
PEF or FEV_1 / PEF Variability
≤60% / >30%

fluticasone MDI[a] w/facemask 110 mcg (2 puffs BID) **or** fluticasone DPI[b] 250 mcg (1 puff BID) **or** budesonide turbuhaler 200 mcg (1 puff BID) [1,2]

+/-

salmeterol MDI[a] 84 mcg/day (2 puffs BID) [11-18]
salmeterol DPI[b] 100 mcg/day (1 puff BID) [11-18]

+/-

montelukast 5 mg chew tab HS

+/-

theophylline 10-16 mg/kg/day
(adjust dose q 3 days to serum theophylline levels of 10-15 mcg/ml)

If needed add systemic steroids 2 mg/kg/day (generally not to exceed 60 mg/day). Reduce to lowest dose (QD or QOD) to stabilize symptoms.
Repeat attempts to reduce

Abbreviation Key
[4a] MDI = Meter Dose Inhaler
[b] DPI = Diskhaler (fluticasone); Diskus (salmeterol)
[1,2 etc.] Please see the Clinical Reference Abstract Summary for corresponding reference numbers.

Shaded areas represent the PREFERRED TREATMENT – Non shaded areas represent ALTERNATIVE TREATMENT
* Referral to an asthma specialist is recommended for Step 3 and 4. Consider for Step 2

Treatment of Persistent Asthma in Patients Age 12 - Adult

Mild Intermittent - Step 1

Symptoms Day / Night
≤2 days/week / ≤2 nights/month
PEF or FEV_1 / PEF Variability
≥80% / <20%

No daily medication needed. Severe exacerbations may occur, separated by long periods of normal lung functions and no symptoms. A course of systemic corticosteroids is recommended.

Mild Persistent - Step 2

Symptoms Day / Night
>2/week but <1x/day / >2 nights/month
PEF or FEV_1 / PEF Variability
≥80% / 20%-30%

fluticasone MDI[a] w/spacer 88-264 mcg/day (1-2 puffs BID)
or fluticasone DPI[b] 100-300 mcg/day (1 puff BID)
or budesonide turbuhaler 200-400 mcg/day (1-2 puffs QD-BID)
or triamcinolone 400 mcg (4 puffs BID) [3-10]

or

fluticasone 100 mcg/salmeterol 50 mcg DPI BID [11-18]
(if titration to next step necessary use fluticasone)

+/-

montelukast 10 mg HS

+/-

theophylline 10-16 mg/kg/day (adjust dose q 3 days to serum theophylline levels of 10-15 mcg/ml)

Moderate Persistent - Step 3

Symptoms Day / Night
Daily / >1 night/week
PEF or FEV_1 / PEF Variability
>60% -< 80% / >30%

fluticasone MDI[a] w/spacer 264-660 mcg/day (BID)
or fluticasone DPI[b] 300-600 mcg/day (BID) **or** budesonide turbuhaler 400-600 mcg/day (1 puff BID or TID) **or** triamcinolone 600 mcg BID (6 puffs BID) [3-10]
+/-
salmeterol MDI[a] 84 mcg/day (2 puffs BID) [11-18] **or** salmeterol DPI[b] 100 mcg/day (1 puff BID) [11-18]

or

fluticasone 250 mcg /salmeterol 50 mcg DPI BID [11-18]
(if titration to next step necessary use fluticasone)

+/-

montelukast 10 mg HS

+/-

theophylline 10-16 mg/kg/day (adjust dose q 3 days to serum theophylline levels of 10-15 mcg/ml)

Severe Persistent - Step 4

Symptoms Day / Night
Continual / Frequent
PEF or FEV_1 / PEF Variability
≤60% / >30%

fluticasone MDI[a] w/spacer >660 mcg/day
or fluticasone DPI[b] >500-600 mcg/day
or budesonide turbuhaler >600 mcg/day
+/-
salmeterol MDI[a] 84 mcg/day (2 puffs BID) [11-18]
or salmeterol DPI[b] 100 mcg/day (1 puff BID) [11-18]

or

fluticasone 500 mcg /salmeterol 50 mcg DPI[b] BID [11-18]

+/-

montelukast 10 mg HS

+/-

theophylline 10-16 mg/kg/day (adjust dose q 3 days to serum theophylline levels of 10-15 mcg/ml)

Systemic steroids (2 mg/kg/day).
Reduce to lowest dose (QD or QOD) to stabilize symptoms.
Repeat attempts to reduce.

Abbreviation Key
[a] MDI = Meter Dose Inhaler
[b] DPI = Diskhaler (fluticasone); Diskus (salmeterol)
[1,2] Please see the Clinical Reference Abstract Summary for corresponding reference numbers.

8. Periodic Assessment and Monitoring

Periodic assessments every 1 to 6 months and patient self-monitoring (i.e. asthma action plan) are essential for asthma care

At each visit:
- Identify patient's concerns and expectations of the visit
- Assess achievement of the goals of therapy
- Prevent chronic asthma symptoms and asthma exacerbations during the day and night
- Strive to maintain normal activity levels and have normal or near-normal lung function

9. Patient Education in Asthma Care

The goal of all patient education is to help patients take the actions needed to control their asthma

To increase adherence ask patients at every visit if they…..
Take daily medications for long-term control as prescribed. Fit the daily medication regimen into the routine of the patient and family.
- Use delivery devices properly
- Identify and control factors that worsen their asthma
- Monitor peak flow and/or symptoms. Patients with moderate to severe persistent asthma should have a peak flow meter to monitor their PEF
- Follow a written action plan when symptoms worsen. Develop an asthma action plan form – this is especially important for patients who have moderate to severe persistent asthma

Provide patients with tools for self-management, such as a peak flow meter, an asthma action plan and information on how to control factors that worsen their asthma. Explain to patients that by monitoring their lung function with a peak flow meter and by adjusting their medications using their individualized action plan form, they can reduce asthma exacerbations.

10. Referral to an Asthma/Allergy Specialist

Communication between the primary care practitioner and specialist will be the key to coordinated, quality care for a patient with asthma.

Referral to an asthma/allergy specialist for consultation or co-management should be considered in several instances. Specific recommendations for consideration for referral include:
- **Severity Considerations**
  - The patient has moderate to severe persistent asthma
  - The patient is under 3 years and has moderate persistent asthma
  - The patient has had a life-threatening asthma exacerbation
- **Pharmacotherapy Considerations**
  - Young children, particularly infants, who are being given daily medication
  - The patient has used long-term oral corticosteroid therapy, medium or high-dose inhaled corticosteroid therapy, or more than two bursts of oral corticosteroids in 12 months.
- **Treatment Complications**
  - Goals of asthma therapy are not being met after 3-6 months of continuous treatment; earlier if the patient appears unresponsive to treatment
  - Signs and symptoms are atypical, or there are problems in the differential diagnosis
  - Other conditions complicate asthma or its diagnosis (e.g. untreated sinusitis, rhinitis)
  - Confirmation is needed on the contribution of occupational or environmental exposure
  - Additional diagnostic testing is indicated (e.g. allergy skin testing)
  - The patient or family needs additional education and guidance on complications of therapy, problems with adherence, or avoidance of triggers
  - The patient is being considered for immunotherapy
- **Psychiatric or Psychosocial Complications**
  - Patients with significant psychiatric, psychosocial or family problems that interfere with their asthma therapy should be referred to an appropriate mental health professional for counseling or treatment.

11. Medication Reference Guide and HMO Formulary Comparison

DRUG	DOSE (mcg/puff)	UNITY HEALTH INSURANCE	PHYSICIANS PLUS INSURANCE CORP	GROUP HEALTH COOPERATIVE	NAVITUS	DEAN
INHALED CORTICOSTEROIDS						
Beclomethasone dipropionate						
Vanceril MDI, Vanceril DS MDI	42, 84	3	3	NC	3	NC
Qvar MDI	40 and 80	3	2	2	2	2
Budesonide						
Pulmicort Turbuhaler	200	2	2	2	2	2
Pulmicort Respules	250, 500	2	2**	2	2	2
Flunisolide						
Aerobid MDI	250	3	3	NC	3	NC
Fluticasone						
Flovent MDI	44,110,220	2	2	2	2	2
Flovent DPI	50,100,250	2	2	2	2	2
Triamcinolone Acetonide						
Azmacort MDI with spacer	100	2	3	NC	3	NC
INHALED B_2 AGONISTS – SHORT ACTING						
Albuterol	90	1	1	1	1	1
Proventil, HFA		3,2	3,2	NC	3	NC
Ventolin		3	3	NC	3	NC
Metaproterenol	650	1	1	NC	1	1
Pirbuterol	200					
Maxair Autoinhaler		2	2	2	2	2
INHALED B_2 AGONISTS- LONG ACTING						
Formoterol						
Foradil	12	2	2	2	2	NC
Salmeterol						
Serevent Diskus	50	2	2	2	2	2
COMBINATION INHALED CORTICOSTEROID AND LONG ACTING B_2-AGONIST						
Fluticasone/salmeterol		2	2	2	2	2
Advair Diskus	100/50 250/50 500/50					
LEUKOTRIENE ANTAGONISTS	**Dose (mg/tab)**					
Montelukast – Singulair	4 , 5mg chew tab 10mg tab	2*	2	2*	2*	2*
Zafirlukast –Accolate	10, 20 mg tab	3	2	2	3*	NC
MISC	**Dose (mcg/puff)**					
Ipratropium bromide/albuterol sulfate		2	2	2	2	2
Combivent	18/103					
Cromolyn		2	2	2	2	2
Intal	800					
Ipratropium		1	1	1	1	1
Atrovent	18	2	2	2	2	2
Nedocromil	1750	2	2	2	2	2
Tilade						
Theophylline, SR	100, 200, 300, 400, 500, 600**mg tab**	1,2	1,3	1,2	1,2	1,2

1,2,3 = Tier Copay NC= Not Covered * PA required for use in allergic rhinitis **covered for members ≤ 8 years of age

Approximate Equipotent Dosing Table For Inhaled Corticosteroids

Fluticasone 1: budesonide or beclomethasone 2-4: triamcinolone or flunisolide 4-8

References

1. Agertoft L, Pedersen S. Effect of long-term treatment with inhaled budesonide on adult height in children with asthma. *N Engl J Med* 2000;343:1064-1069.
2. The Lung Health Study Research Group. Effect of inhaled triamcinolone on the decline in pulmonary function in chronic obstructive pulmonary disease. *N Engl J Med.* 2000.343;1902-1909.
3. Mapp CE. Inhaled glucocorticoids in chronic obstructive pulmonary disease. N *Engl J Med.* 2000;343:1960-1961.
4. Lipworth BJ, Jackson CM. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. *N Engl J Med.* 2001;344:1553-1556
5. DeMaria A, Canonica GW. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. N *Engl J Med.* 2001;344:1553-1556.
6. Reid DW, Soltani A, Walters H. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. *N Engl J Med.* 2001;344:1553-1556.
7. O'Connor S. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. N Engl J Med. 2001;344:1553-1556.
8. Wise R, Connett J, Scanlon P. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. *N Engl J Med.* 2001;344:1553-1556.
9. Mapp CE. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. *N Engl J Med.* 2001;344:1553-1556.
10. Lazarus SC, Boushey HA, Fahy JV, et al. Long-acting beta$_2$-agonist monotherapy vs continued therapy with inhaled corticosteroids in patients with persistent asthma. *JAMA.* 2001;285:2583-2593.
11. Lemanske RF, Sorkness CA, Mauger EA, et al. Inhaled corticosteroid reduction and elimination in patients with persistent asthma receiving salmeterol. A randomized controlled trial. *JAMA* 2001;285:2594-2603.
12. Holgate ST. Therapeutic options for persistent asthma [Letter]. *JAMA.* 2001;285:2637-2639.
13. Matz J, Emmett A, Rickard K, Kalberg C. Addition of salmeterol to low-dose fluticasone versus higher dose fluticasone: an analysis of asthma exacerbations. *J Allergy Clin Immunol.* 2001;107:783-789.
14. Aubier M, Pieters WR, Schlosser NJJ, Steinmetz KO. Salmeterol/fluticasone propionate (50/500 mcg) in combination in a Diskus‰ inhaler (Seretide") is effective and safe in the treatment of steroid-dependent asthma. *Respir Med.* 1999;93:876-884.
15. Kuvuru M, Melamed J, Gross G, et al. Salmeterol and fluticasone proionate combined in a new powder inhalation device for the treatment of asthma: a randomized, double-blind, placebo-controlled trial. *J Allergy Clin Immunol* 2000; 105:1108-1116.
16. Shapiro G, Lumbry W, Wolfe J, et al. Combined salmeterol 50 mcg and fluticasone propionate 250 mcg in the Diskus" device for the treatment of asthma. *Am J Respir Crit Care Med* 2000;161:527-534.
17. The Lung Health Study Research Group. Effect of inhaled triamcinolone on the decline in pulmonary function in chronic obstructive pulmonary disease. *N Engl J Med.* 2000;343:1902-1909.
18. Mapp CE. Inhaled glucocorticoids in chronic obstructive pulmonary disease [Letter]. N Engl J Med. 2000;343:1960-1961.
19. Lipworth BJ, Jackson CM. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. *N Engl J Med.* 2001;344:1553.
20. De Maria A, Canonica GW. . Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. *N Engl J Med.* 2001;344:1553-4.
21. Reid DW, Soltani A, Walters H. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. *N Engl J Med.* 2001;344:1554.
22. O'Connor S. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. *N Engl J Med.* 2001;344:1554.
23. Wise R, Connett J, Scanlon P. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. *N Engl J Med.* 2001;344:1554-1555.
24. Mapp CE. Inhaled triamcinolone and chronic obstructive pulmonary disease [Letter]. *N Engl J Med.* 2001;344:1555.
25. Nelson HS. Advair: combination treatment with fluticasone propionate/salmeterol in the treatment of asthma. *J Allergy Clin Immunol.* 2001;107:397-416.
26. NAEPP Expert Panel Report, Guidelines for the Diagnosis and Management of Asthma – Update on Selected Topics 2002 (update to the NAEPP Expert Panel Report 2). NIH Publication No. 02-5075. June 2002
27. Kallstrom, Thomas J. Evidence Based Asthma Management. Respir Care 2004; 49 (7) 783-792.
28. Sin DD, ManUJ, Sharpe H, GanWQ, Man SF. Pharmacological Management to Reduce Exacerbations in Adults with Asthma. JAMA 2004; 292(3): 367-376.

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