

## **Asthma**

### *Major Recommendations*

- Goals of asthma:
  - 1) reduction of impairment
    - freedom from symptoms, such as cough, shortness of breath, wheezing, and disturbed sleep
    - minimal need ( $\leq 2$  times per week) of short acting inhaled beta agonists
    - optimization of lung function, especially FEV1, FVC, or PFR
    - maintenance of normal daily activities of life, including school and work activities
  - 2) reduction in risk
    - prevention of recurrent exacerbations and the need for urgent care, ED, and hospital visits
    - prevention of reduced lung growth in children
    - preservation of lung function in adults
    - avoiding drug-related complications from treatment
- Asthmatics old enough to cooperate with spirometry (generally, age 5, or older), should have baseline testing done.
  - Peak Expiratory Flow Rate, PEFR, is available in many physician offices and can be available in the home setting when the patient is equipped with an inexpensive peak flow meter. (Note: a reduction in PEFR is not diagnostic of airway obstruction; spirometry must be used to exclude restrictive lung disease)
  - Normal PEFR values depend on the gender, height, and age of the patient.
  - Practices that regularly see asthmatics should use spirometry, when possible.
  - Measurement of exhaled nitric oxide (NO) is a promising but, as yet, investigational (Hayes Class C, as of April 2010) means of measuring airway inflammation that leads spasm.
- Patients must become an active partners in managing their asthma.
  - The patient's baseline PEFR can be used to construct a Personal Action Plan (PAP) for management of an emerging exacerbation. The PAP should tell patients (a) how to recognize early flares in asthma, (b) what to do to self-treat various levels of emerging symptoms and signs, and (c) when and how to get urgent or emergent care, when required
  - They must know what triggers their disease.
  - They must understand how and when to use their inhaler(s)
  - They should know and understand the side effects of their medications and comply with physician directions for taking them.
  - They should involve and educate family members about their condition and medications
  - They should learn what triggers or exacerbates their asthma
- Common environment allergens and triggers include, but are not limited to, the following
  - Pet and animal dander

- Dust and mold
- Tobacco smoke
- Inhaled aerosolized chemicals, like cleaning agents, perfumes, *etc.*
- Wood-burning stoves and fire places
- Pollens, trees, and grasses
- Emotional stress
- Some foods, such a peanuts, shell fish, foods containing dietary sulfites (wine, beer, dried fruit) *etc.*
- Cold air
- Exercise
- Some medications, like aspirin, beta-blockers, *etc.*
- Esophageal reflux, or GERD
- Airway infection by virus, bacteria, *etc.*
- Untreated occult sinusitis

#### *Pharmacological Treatment*

- Uses step therapy to use different drugs, depending on the severity of the condition and the age of the patient
- Asthma severity usually is determined by
  - Symptoms experienced over the prior 4 weeks
  - Current lung function levels (FEV1 and FEV1/FVC)
  - Number of attacks needed glucocorticosteroids
- One common approach to step therapy for asthma is shown below.
  - **Intermittent**
    - Daytime asthma symptoms occurring two or fewer days per week
    - Two or fewer nocturnal awakenings per month
    - Use of short-acting beta agonists to relieve symptoms fewer than two times a week
    - No interference with normal activities between exacerbations
    - FEV1 measurements between exacerbations that are consistently within the normal range (*i.e.*,  $\geq 80$  percent of predicted normal)
    - FEV1/FVC ratio between exacerbations that is normal (based on age-adjusted values)
    - One or no exacerbations requiring oral glucocorticosteroids per year

#### Step One Treatment:

- Intermittent use of inhaled fast acting beta-2-selective adrenergic agonists for acute attacks, prn.
  - Inhaler can be used about 10 minutes before exposure to a known trigger agent, if needed
- 
- **Mild Persistent**
    - Symptoms more than twice weekly (although less than daily)
    - Three to four nocturnal awakenings per month due to asthma

- Use of short-acting beta agonists to relieve symptoms more than two times a week (but not daily)
- Minor interference with normal activities
- FEV1 measurements within normal range ( $\geq 80$  percent of predicted normal)
- FEV1/FVC ratio is normal (based on age-adjusted values)
- Two or more exacerbations requiring oral glucocorticosteroids per year

Step Two Treatment:

- Start long-term controller medications. Ordinarily, the controller drug of choice is an inhaled glucocorticosteroid, **and**
- Intermittent use of inhaled fast acting beta-2-selective adrenergic agonists for acute attacks, prn.

– **Moderate Persistent**

- Daily symptoms of asthma
- Nocturnal awakenings more than once per week
- Daily need for short-acting beta agonists for symptom relief
- Some limitation in normal activity
- FEV1 between 60 and 80 percent of predicted
- FEV1/FVC reduced below normal (based on age-adjusted values)
- Two or more exacerbations requiring oral glucocorticosteroids per year

Step Three Treatment:

- Low doses of inhaled glucocorticosteroids plus long acting inhaled beta agonist (preferred), **or**
- Moderate doses of inhaled glucocorticosteroids, **or**
- Low doses of inhaled glucocorticosteroids plus a leukotriene modifier **or**
- Low doses of inhaled glucocorticosteroids plus theophylline, **and**
- Intermittent use of inhaled fast acting beta-2-selective adrenergic agonists for acute attacks, prn.

– **Severe Persistent**

- Symptoms of asthma throughout the day
- Nocturnal awakenings nightly
- Need for short-acting beta agonists for symptom relief several times per day
- Extreme limitation in normal activity
- FEV1 < 60 percent of predicted
- FEV1/FVC reduced below normal (based on age-adjusted values)
- Two or more exacerbations requiring oral glucocorticosteroids per year

Step Four Treatment:

- Medium to high doses of inhaled glucocorticosteroids, in combination with long acting, inhaled beta agonist.
- Possible addition of other agents, such as leukotriene modifiers, theophylline, oral glucocorticosteroids.
- Intermittent use of inhaled fast acting beta-2-selective adrenergic agonists for acute attacks, prn
- Anti-allergen treatments in applicable patients.

*Additional Management Issues*

- Referral to pulmonologist should be considered when
  - Life-threatening flare in asthma
  - Hospitalization
  - Requirement for more than 2 bursts of oral glucocorticosteroids treatment
  - Patient over 5 years of age needs step four (4) level treatment
  - Patient under 5 years of age need step two (2) level treatment
  - Asthma not controlled after 3 months of effort
  - The diagnosis of asthma is uncertain
- Refractory asthmatics with dyspepsia should be evaluated for gastroesophageal reflux (GERD)
- Refractory asthmatics with allergic symptoms should be evaluated by an allergist
- Be alert for psychosocial and environmental triggers for asthma attacks
- An asthma diary kept by the member is helpful in management
- Peak flow meters are inexpensive (about \$20 to \$30) and may help control difficult patients who are also compliant and cooperative
- Improper use of metered dose inhalers is common and may contribute to poor asthma control
- Long acting beta agonists should not be used in most patients if they are not also using inhaled glucocorticosteroids because of an increased risk of cardiac arrhythmias and sudden death
- Chronic asthma may contribute to various psychosocial issues, such as poor school performance, sibling resentment, isolation from friends and peers, sleep deprivation because of drug side-effects and asthma flares, and disruption of family routines
- Children, when less than 5 years old, can have airway spasm with URI symptoms. They may not go on to develop asthma. If the child has several such bouts, the risk for asthma increases.

*Patient Education*

- What is asthma?
- Sign, symptoms, dangers of asthma.
- Symptom diaries
- Correct use of inhalers
- Home peak flow monitoring
- Trigger factors and environmental factors

- Medications
- Fear and misconceptions
- Treatment plan and guidelines
- When to pre-medicate to prevent acute attacks

General principals for asthma management:

[http://www.guideline.gov/summary/summary.aspx?doc\\_id=13014&nbr=006708&string=asthma](http://www.guideline.gov/summary/summary.aspx?doc_id=13014&nbr=006708&string=asthma)

Children, 0-4 years, guideline:

[http://www.guideline.gov/summary/summary.aspx?doc\\_id=13015&nbr=006709&string=asthma](http://www.guideline.gov/summary/summary.aspx?doc_id=13015&nbr=006709&string=asthma)

Children, 4 to 11 years, guideline:

[http://www.guideline.gov/summary/summary.aspx?doc\\_id=13016&nbr=006710&string=asthma](http://www.guideline.gov/summary/summary.aspx?doc_id=13016&nbr=006710&string=asthma)

Youths, 12 years or older, and adults, guideline:

[http://www.guideline.gov/summary/summary.aspx?doc\\_id=13017&nbr=006711&string=asthma](http://www.guideline.gov/summary/summary.aspx?doc_id=13017&nbr=006711&string=asthma)

## References

1. Juniper, EF, O'Byrne, PM, Guyatt, GH, et al. Development and validation of a questionnaire to measure asthma control. *Eur Respir J* 1999; 14:902.
2. Vollmer, WM, Markson, LE, O'Connor, E, et al. Association of asthma control with health care utilization and quality of life. *Am J Respir Crit Care Med* 1999; 160:1647.
3. Boulet, LP, Boulet, V, Milot, J. How should we quantify asthma control? A proposal. *Chest* 2002; 122:2217.
4. Nathan, RA, Sorkness, CA, Kosinski, M, et al. Development of the asthma control test: a survey for assessing asthma control. *J Allergy Clin Immunol* 2004; 113:59.
5. Patino, CM, Okelo, SO, Rand, CS, et al. The Asthma Control and Communication Instrument: a clinical tool developed for ethnically diverse populations. *J Allergy Clin Immunol* 2008; 122:936.
6. Schatz, M, Kosinski, M, Yaras, AS, et al. The minimally important difference of the Asthma Control Test. *J Allergy Clin Immunol* 2009; 124:719.
7. Osborne, ML, Pedula, KL, O'Hollaren, M, et al. Assessing future need for acute care in adult asthmatics: the profile of asthma risk study: a prospective health maintenance organization-based study. *Chest* 2007; 132:1151.
8. Enright, PL, Lebowitz, MD, Cockcroft, DW. Physiologic measures: Pulmonary function test. *Am J Respir Crit Care Med* 1994; 149:S9.
9. Crapo, RO. Pulmonary function testing. *N Engl J Med* 1994; 331:25.
10. Pennock, BE, Cottrell, JJ, Rodgers, RM. Pulmonary function testing. *Arch Intern Med* 1983; 143:2123.
11. Irvin, CG, Eidelman, D. Airways mechanics in asthma. In: Rhinitis and Asthma, Holgate, S, Busse, W (Eds), Blackwell Scientific Publications, Boston 1995.

12. National Asthma Education Program. Expert panel report on diagnosis and management of asthma. U.S. Government Printing Office, Washington D.C. NIH Publication No. 92-2113A, 1992.
13. Standardization of Spirometry, 1994 Update. American Thoracic Society. *Am J Respir Crit Care Med* 1995; 152:1107.
14. Lung function testing: selection of reference values and interpretative strategies. American Thoracic Society. *Am Rev Respir Dis* 1991; 144:1202.
15. Smith, HR, Irvin, CG, Cherniack, RM. The utility of spirometry in the diagnosis of reversible airways obstruction. *Chest* 1992; 101:1577.
16. Yawn, BP, Enright, PL, Lemanske, RF Jr, et al. Spirometry can be done in family physicians' offices and alters clinical decisions in management of asthma and COPD. *Chest* 2007; 132:1162.
17. Kikuchi, Y, Okabe, S, Tamura, G, et al. Chemosensitivity and perception of dyspnea in patients with a history of near-fatal asthma. *N Engl J Med* 1994; 330:1329.
18. Bijl-Hofland, ID, Cloosterman, SG, van Schayck, CP, et al. Perception of respiratory sensation assessed by means of histamine challenge and threshold loading tests. *Chest* 2000; 117:954.
19. Petsky, HL, Kynaston, JA, Turner, C, et al. Tailored interventions based on sputum eosinophils versus clinical symptoms for asthma in children and adults. *Cochrane Database Syst Rev* 2007; :CD005603.
20. Smith, AD, Cowan, JO, Brassett, KP, Herbison, GP, Taylor, DR. Use of exhaled nitric oxide measurements to guide treatment in chronic asthma. *N Engl J Med* 2005; 352:2163.
21. Shaw, DE, Berry, MA, Thomas, M, Green, RH, Brightling, CE, Wardlaw, AJ, Pavord, ID. The use of exhaled nitric oxide to guide asthma management: a randomized controlled trial. *Am J Respir Crit Care Med* 2007; 176:231.
22. Castro, M, Zimmermann, NA, Crocker, S, et al. Asthma intervention program prevents readmissions in high healthcare users. *Am J Respir Crit Care Med* 2003; 168:1095.
23. Gibson, PG, Coughlan, J, Wilson, AJ, et al. Self-management education and regular practitioner review for adults with asthma. *Cochrane Database Syst Rev* 2000; :CD001117.
24. Janson, SL, McGrath, KW, Covington, JK, et al. Individualized asthma self-management improves medication adherence and markers of asthma control. *J Allergy Clin Immunol* 2009; 123:840.
25. Harding, SM. Recent clinical investigations examining the association of asthma and gastroesophageal reflux. *Am J Med* 2003; 115 Suppl 3A:39S.
26. Nelson, HS. Adrenergic bronchodilators. *N Engl J Med* 1995; 333:499.
27. Shim, C, Williams, MH Jr. Bronchial response to oral versus aerosol metaproterenol in asthma. *Ann Intern Med* 1980; 93:428.
28. Shim, C, Williams, MH Jr. Comparison of oral aminophylline and aerosol metaproterenol in asthma. *Am J Med* 1981; 71:452.
29. Haahtela, T, Jarvinen, M, Kava, T, et al. Comparison of a beta 2-agonist, terbutaline, with an inhaled corticosteroid, budesonide, in newly detected asthma. *N Engl J Med* 1991; 325:388.

1. Dutoit, JI, Salome, CM, Woolcock, AJ. Inhaled corticosteroids reduce the severity of bronchial hyperresponsiveness in asthma but oral theophylline does not. *Am Rev Respir Dis* 1987; 136:1174.
2. Juniper, EF, Kline, PA, Vanzielegem, MA, et al. Effect of long-term treatment with an inhaled corticosteroid (budesonide) on airway hyperresponsiveness and clinical asthma in nonsteroid-dependent asthmatics. *Am Rev Respir Dis* 1990; 142:832.
3. Bateman, ED, Bousquet, J, Keech, ML, et al. The correlation between asthma control and health status: the GOAL study. *Eur Respir J* 2007; 29:56.