

ASTHMA MANAGEMENT™

The Complete Asthma Disease State Management Resource

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Asthma project cuts ER visits by 87%, hospitalizations by 95%

Multidisciplinary team develops treatment plans in one visit

When patients with severe asthma receive extensive patient education and close follow-up care, emergency room visits and hospital admissions can drop dramatically. You've probably heard that before, but now you can see it in action: A quality improvement project at the Burlington, MA-based Lahey Clinic slashed hospitalizations by 95% and emergency room visits by 87% in a year and a half.

At the Lahey Clinic, quality improvement has become an integral part of routine practice in many areas. But asthma specialists felt not enough attention was being paid to improving care for their sickest patients, so they formed a multidisciplinary team to study the issue.

"We were frustrated that we really didn't have a good system for taking care of a certain fraction of asthma patients," says **Andrew Villanueva, MD**, a pulmonologist and critical care specialist who is director of the Lahey Clinic's Asthma Center. "Most of the time asthma is a mild or moderate disease that you can take care of in a routine office visit, but there are some patients that really are quite costly. Between 5% and 10% of patients account for 70% to 80% of costs because they use the emergency room a lot and are hospitalized frequently."

The team — made up of pulmonologists, allergists, pediatricians, internists, emergency room physicians, respiratory therapists, nurses, pharmacists and quality resource personnel — included benchmarking in the process. External benchmarking included conversations with

KEY POINTS

- Multidisciplinary asthma care team members see patients and develop treatment plan during one office visit.
- Education sessions and packets teach patients how to handle flare-ups without going to the emergency room.
- Patients are monitored for correct use of peak flow meters and metered dose inhalers.

Boston-area physicians and a literature review, while internal benchmarking came through setting up data collection on four parameters: clinical outcomes, functional health status, patient satisfaction, and cost.

Data collection is ongoing in these areas, Lahey says. Clinical measures include number of prescriptions filled of beta agonists each month, use of anti-inflammatory medications, and average morning peak flows. The team wants to see patients using less than one canister a month of a beta agonist and to have 80% to 90% of patients taking anti-inflammatory medications. Functional health status is measured using the SF-36 quality of life survey as well as anxiety and depression scores. Satisfaction is measured through questionnaires for patients and soon, referring physicians. Cost will be measured on emergency visits and hospitalizations.

A team approach to patient care

It's clear so far that the dramatic reductions in two problem areas — emergency visits and hospitalizations — can be achieved through extensive education and a multidisciplinary approach to following patients, Villanueva says.

The Asthma Center accepts patients who have been hospitalized or have been to the emergency room twice in a six-month period for their asthma. The patients make an initial visit of about four hours in which they see all the members of the multidisciplinary care team: a nurse (who will be their nurse permanently), a pulmonologist, an allergist, a pharmacist, and a respiratory therapist.

The nurse takes the patient history on a standardized form, the pulmonologist looks at the medication regimen and any medical confounding factors that might be causing the symptoms, the allergist focuses on environmental aspects and skin testing, and the pharmacist goes over the medications. The respiratory therapist administers pulmonary function tests and watches how the patient uses a metered dose inhaler and peak flow meter.

At the end of the visit, the entire team meets to discuss the patient's status and determine the cause of the difficulty, Villanueva says. The team comes up with a treatment plan, which the physician discusses with the patient before he or she leaves that same day. The nurse and pharmacist go over the details, especially the action plan for how to handle symptoms, as well as any changes in medications. The plan always includes keeping in touch with the patient's primary care physician.

"[Patients] now have a person they can call if they have any questions or problems. Rather than going to the emergency room, they can call us and we can take care of the asthma flare ups at home or they can come to our office right away and we can help them," Villanueva says.

Deborah McManus, RN, an Asthma Center nurse, says the fact that patients see everyone on the team and hear the evaluation of their status on the same day makes a big difference.

"Everyone gets different information from the patient, so collectively we have a better picture of the patient than we would separately," she says.

Patients leave that day with their medications, spacers, peak flow meters, or whatever equipment they need to control their asthma. Follow-up visits are scheduled within a month and then again four to five months later. "We empower the patients to take care of themselves and understand their own asthma," McManus says. "We want to make life as easy as possible for them."

Patients also go home with a binder that includes 24-hour phone numbers for accessing a nurse and a personal treatment plan that tells them what to do if their symptoms fall within certain zones. The nurses are responsible for much of the education process and can schedule return visits for the sole purpose of teaching something to a patient.

"We can reduce 70% of the problems over the phone," McManus says. "We develop a rapport with them that allows them to feel comfortable calling us." ■

COMING IN FUTURE MONTHS

■ Focus on comorbidities: Prioritizing and treating

■ Educational and motivational approaches for adult compliance

■ Understanding and integrating new delivery systems and medications into your program

■ New guidelines for asthma management in minority pediatric populations

■ Quantifying asthma management efforts — translating outcomes into dollars

Asthma programs bring costs down

Home care agency provides asthma education

A review of its 1995 claims data revealed that six of Blue Care Network of Southeast Michigan in Southfield primary care groups had exceptionally high utilization among its pediatric asthma patients. The HMO immediately pulled together representatives from every facet of the organization to develop an asthma management program that successfully reduced annual utilization costs an average of \$673 per program participant. (For other program results, see box, below right.)

“Our approach was to go after those high utilizers of service, the patients with obvious treatment failures. Asthma is a disease that responds well to treatment. Good management can make a difference in medical costs and quality of life,” says **James J. Lewandowski**, RN, MHSA, manager of health promotion and disease management for the HMO.

Blue Care Network called in representatives from all departments to work on the program. “You really need all departments to get a disease management program up and running,” says Lewandowski. “Our provider representatives and the relationships with our providers get our message out. Our quality management department had the necessary expertise in the continuous quality improvement method to help us look at outcomes management.”

Blue Care Network first launched the Asthmatter of Fact program in those six primary care groups with the high utilization rate for pediatric asthma. “We sent postcards describing the program to the families of children who had experienced treatment failures,” he says. “This was a targeted, personalized communication that said the health plan was aware the child might be having an asthma-related condition and inviting them to participate.”

Many of the families didn’t understand what the health plan was offering and didn’t express an interest in enrolling in the program, Lewandowski notes. “Each time the child was admitted to the hospital or emergency room, we sent another letter to the family,” he says. In addition, a Blue Care Network nurse called the family to offer information about the Asthmatter of Fact

program soon after the child’s inpatient admission or emergency room visit. “We know that in terms of changing patient behavior our best chances come during the event and immediately after the event. If we approach them several weeks or months after an asthma episode, they have no interest in a management program.”

On the provider side, Blue Care Network developed a comprehensive patient profile for each child in the high utilization group. The profile lists what medications the child was taking, and how often the prescriptions had been filled in the past 12 months, as well as any admissions. “This is the first time these physicians had seen this type of administrative report for their patients,” says Lewandowski. “We made it clear in a letter that accompanies the reports that we would like them to recommend their patients participate in the program.”

Physicians were reluctant to accept the information contained in the profiles, he says. “They wanted to know where our information was coming from. It’s simple, 90% of our members have pharmacy coverage, so we can track their prescription history.” In fact, one physician called him to inform him that the profile of his patient was wrong. “He said I prescribed this drug for my patient that doesn’t appear on the patient’s profile. I suggested he call the family and check to see if the prescription had been filled. He later called me back and told me the family hadn’t filled the prescription because the child improved.” Physicians now receive patient profiles on a quarterly basis.

Portrait of Success

- Hospital admissions for the 54 Asthmatter of Fact pilot participants were reduced from 14 in 1995 to three in 1996.
- Emergency room visits for the 54 pilot participants were reduced from a 21 in 1995 to six in 1996.
- The average annual inpatient cost per pilot participant was \$720 in 1995 compared to \$178 in 1996.
- The average post-intervention inpatient cost savings per pilot participant was \$542.
- The average post intervention emergency room cost savings per pilot participant was \$131.

Source: Blue Care Network of Southeast Michigan, Southfield.

Tools for Success

The *Asthmatter of Fact Patient Handbook* includes the following teaching modules:

- Program overview
- What is asthma?
- Asthma triggers
- Asthma medications
- Managing asthma episodes
- Personalized asthma tool kit
- Living with asthma
- Asthma support services

The *Asthmatter of Fact Provider Handbook* includes the following:

- Program overview

Source: Blue Care Network of Southeast Michigan, Southfield.

In addition to trying to change member behavior, Blue Care Network was also interested in changing physician behavior. "In reviewing these profiles, I often didn't see the numbers of refills or types of prescriptions I would have expected," says Lewandowski.

Once a physician approves a patient's participation in the program, Blue Care Network sends the referral to a local home care agency, he says. "We surveyed local providers and found those that met our specifications for what we considered asthma expertise. We worked with them to develop two asthma manuals — one for patients and one for providers."

Blue Care Network also had a nurse clinician train physician office staff how to deliver asthma education to their patients. "It's more often the office staff that educates the patient, not the physician. We felt including the staff in asthma education was an important step. Luckily, we received an educational grant from a pharmaceutical company to cover the costs of staff education," he explains.

A home care nurse goes to the patient's home to deliver the eight teaching modules in the patient manual. **(For a list of modules covered in both manuals, see box, above.)** The home care nurse makes an average of four visits to cover the information in the manual. "We average between two to up to eight visits for a family that is really having trouble," says Lewandowski. "The learning visits take place over no more than a four week period, and ideally are completed in two weeks."

In addition to asthma education, the home care nurse provides the following services:

- evaluates the home for environmental asthma triggers and discusses them with the family;
- observes the children using their inhalers and peak flow meters;
- helps the physician develop a personal asthma kit or management plan for each child and then goes over that plan with the family;
- coordinates visits with an allergist.

Patients enrolled in the Asthmatter of Fact program receive quarterly phone calls from the home care nurse. "The nurse goes over compliance issues, asks how the child's peak flows have been," says Lewandowski. "The nurse also checks for potential signs of trouble our claims data might not pick up, such as missed days from school due to asthma." ■

Inhaled steroids effective for moderate asthmatics

Physicians think it will aid in compliance

The once-a-day Pulmicort Turbuhaler, approved by the U.S. Food and Drug Administration (FDA) in October, has created quite a stir among asthma patients and physicians.

With some qualification, experts agree the Pulmicort Turbuhaler by Astra Pharmaceuticals in Westborough, MA, will be effective in encouraging compliance among mild to moderate asthmatics.

Linda Ford, MD, president of the American Lung Association who practices at the Asthma and Allergy Center in Omaha, NE, says the product is not effective for severe asthmatics.

"Where those with milder asthma can get by on once-a-day inhaled steroids, whether it is Pulmicort or any other product, severe asthmatics need a heftier dose," Ford says. "We know that inhaled steroids work best when divided into several doses during the day."

On the other hand, Ford thinks once-a-day dosage will improve compliance among appropriate patients who use it.

She says patients with mild persistent asthma who have peak flow plans and follow them can use Pulmicort or any other inhaled steroids on a once-a-day basis, although Astra is the only company that has done a study on that type of usage.

"It's nice to know, but it's probably not brand-specific, but class-specific," she adds. "We've been doing it that way for a long time with mild asthma."

However, Pulmicort may have a very specific affect on "real world" compliance, says **James L. Sublett**, MD, FAAAI, national medical director of Vivra Asthma and Allergy Research Institute in Louisville, KY, a practicing allergist who participated in the Pulmicort clinical trials. "Especially for that group of mild to moderate persistent asthmatics, I think the biggest advantage of single daily dosing will be improving compliance," he says. "I think the patients' perception of single daily dosing is better and the likelihood of them following a treatment plan will be enhanced."

Pulmicort is not much different from several other inhaled steroids not technically approved by the FDA for that purpose which could be used with the same results in mild to moderate persistent asthmatics, Sublett says, "It's just that [Astra] is the first one to get FDA approval."

Sublett sees Pulmicort and Flovent (Glaxo-Wellcome's new and slightly more potent inhaled steroid) as "the next generation of asthma treatment drugs."

Common for patients to miss doses

And while clinical results show a slightly better outcome for patients with twice daily dosing, Sublett says, "When you come down to real world situations, a lot of patients miss dosages anyway, so in the real world quality of life studies, a lot of times single daily dosage is just as effective."

Ford agrees. "People who have mild persistent asthma don't have a lot of symptoms, and they don't like taking medications two times or three times a day. So they are probably [taking one dose a day] anyway."

To Ford there is another key benefit to this new generation of drugs: Physicians have learned that single daily dosage steroids can provide day-to-day disease management for mild to moderate asthmatics. "If [the FDA approval of Pulmicort] does nothing more than teach physicians that, yes, you can alter, you can step up and step down therapy with inhaled steroids, it would be helpful," she explains.

Ford says many physicians may not realize that with a competent management plan, severe or moderate persistent asthmatics can be converted to a mild persistent form of the disease,

and over time, benefit from once-a-day dosage.

Ross Rocklin, MD, Astra's senior director of clinical research, says Pulmicort is different from other inhaled steroids because most inhaled steroids are administered two to four times a day. "We were originally approved for twice-a-day dosing, and this approval is to have once-a-day dosing. This means a patient receiving a total dose of 400 mg a day in two, three, or four doses can be transferred to two inhalations of Pulmicort either in the morning or evening and you can achieve or maintain the same clinical control."

"The advantage for the patient is for compliance," he says. "They can take it once a day, but get their full dose with Pulmicort."

Rocklin says the Turbuhaler delivery system is unique, as the first dry powder inhaler to win FDA approval two years ago: "The advantage is that it delivers approximately twice as much drug to the lung" as other inhalers.

As a delivery system, Sublett and Ford agree, Astra's Turbuhaler gets good reviews from patients and physicians alike.

The non-aerosol, non-fluorocarbon inhaler works on a different principle than other types, requiring the patient to breathe in slowly and hold for a count of ten to release the drug.

"For some people who have difficulty taking inhalers and can't get that eye-hand coordination well, this works quite well," Ford says. "It's like a sucking action. The inspiratory pressure has to be quite high."

Sublett says the nonmetered dose inhalers are probably "the wave of the future." Patients like the Turbuhaler, he says, because "you can't feel the drug going in at all, which in some ways is a plus because you don't have to worry about the taste factor, but it is different from what some patients are used to."

He says new drugs such as Pulmicort provide the quality of life for patients and positive outcomes in terms of emergency room admissions. "It's another tool we can use to improve our care."

Sublett notes technology is changing rapidly in terms of asthma management. Several new drugs and delivery systems are "on the horizon," including a nebulizer solution for Pulmicort nearing FDA approval that provided "very dramatic" results in asthmatics as young as one year old.

[For more information, contact the American Lung Association, (800) LUNGUSA, or Ross Rocklin, MD, Astra Pharmaceuticals, (508) 366-1100.] ■

Yoga as an adjunct in long-term relief of asthma

Alternative therapies continue to gain foothold

By **Russell H. Greenfield, MD, FACEP**

Currently, an estimated 15 million Americans have asthma, and more than half were diagnosed with the disease before age 17.¹ In 1990, costs associated with asthma care alone were estimated to be \$6.2 billion, or 1% of all U.S. health care costs that year.² In spite of the significant therapeutic advances witnessed in recent years, morbidity and mortality rates in industrialized nations have actually been increasing.³

Asthma is a chronic inflammatory disorder of the tracheobronchial tree. Its clinical appearance as airway obstruction occurs through a number of pathophysiologic processes. Some experts believe that exaggerated activity of the parasympathetic nervous system may have a negative influence on airway caliber and resistance. Emotional stress, in addition to other commonly noted physiologic triggers, is a recognized precipitant of asthma exacerbation.

Yoga, the Indian discipline said to enhance physical, mental, and spiritual health, has long been promoted in Europe and Asia as a useful adjunct in the treatment of asthma. With the practice of yoga gaining popularity in the United States, and with additional research examining its effects and use, more asthmatic patients are exploring its potential therapeutic benefits.

History and culture

The discipline of yoga is thousands of years old and is an essential part of the practice of Ayurveda, one of the oldest complete medical systems in the world. Many ancient texts mention yoga, including the Rig-Veda (written approximately 4000 years ago), the Upanishads (scriptures of ancient Hindu philosophy), and the Bhagavad Gita (perhaps the most famous Hindu text).

Yoga was introduced to America at the 1893 Chicago World's Fair.⁴ The word yoga is derived from a Sanskrit root meaning to yoke or unite, and the practice of yoga traditionally has been held to unite body, mind, and spirit in an attempt to enhance health and quality of life.

A common misconception is that yoga is a religious practice. Instead, yoga is a discipline of conscious living that encourages, but does not mandate, spiritual reflection. Yoga helps those who practice it to improve overall fitness and well-being. It can complement any religious or spiritual practice, or yoga can be practiced completely apart from one.

Technique

There are many different forms of yoga and many ways to practice the art, but perhaps the most common components of the discipline as taught in the United States are postures (asanas), breathing practices, and meditation.

The postures are designed to increase flexibility and to induce both physical and mental relaxation. There are literally thousands of asanas, but most people use only a few in their personal practice.

During the performance of these postures, great effort is made to concentrate on the breath. Breathing exercises (called pranayama) are performed both in association with asana practice and by themselves. The breathing exercises are seen as vital to the maintenance of health, and while most are intended to be deep and diaphragmatic, they need not be demanding. Breathing techniques are viewed as the foundation for meditative work.

Typical yoga sessions last for one hour and end with five to 20 minutes of meditation.

Yoga practice has traditionally been viewed as appropriate for anyone regardless of age or ability. The object of yoga practice is not competition but to take the body from a place of discomfort to one of comfort by relaxing and strengthening it. Participants are instructed to practice slowly and carefully and not to force their bodies or invite discomfort.

Yoga therapy has not been considered disease-specific in that distinct practices generally have not been taught only to patients with a particular malady. More prescriptive forms of yoga have become available only recently.

Mechanism of action

Yoga's potentially therapeutic mechanisms have not been determined precisely. One of the most common explanations, not specific to asthma, is stress reduction with concomitant physical and psychological relaxation.

Physiologic changes associated with deep relaxation include diminished muscle tension, which allows for more efficient use of the diaphragm and thoracic musculature. Decreased oxygen use is also generally noted with various stress reduction techniques. These changes are consistent with an overall calming of autonomic tone,⁵ which may manifest as a decrease in vagal efferent activity. The result is enhanced bronchodilation and diminished bronchial reactivity.

Another explanation, more specific to asthma, suggests that yoga practice may improve the mechanical aspects of breathing. The postures and breathing exercises used improve flexibility, massage the thoracic musculature, encourage increased tidal volume and decreased respiratory rate, and decrease bronchial reactivity. The end result is an increase in the efficiency of chest wall movement during the respiratory cycle.

Enhanced adrenocortical activity⁶ has been reported in association with the practice of yoga, although the degree of enhancement has not been quantified. It is postulated that symptoms improve as a consequence of this increased activity and the resultant decrease in bronchial inflammation and hyperreactivity, as well as a blunted physiologic response to stress.

Clinical studies

The majority of reports suffer from serious methodologic flaws. Many of the studies provide data on only a small number of patients, are uncontrolled, include confounding factors, and use various "cleansing procedures." Publication bias is also evident, as a thorough literature search failed to identify a single study in which yoga did not produce improvement or had a negative effect.

Several studies, however, are worth examining. One randomized, controlled study followed 106 asthmatic patients for a six-week period.⁷ The 53 patients in the treatment group received training in postures, breath-slowing techniques, and meditation. Then, they were instructed to practice for approximately one hour each day.

At randomization, the control group was felt to be equally as inclined toward the practice of yoga as the treatment group. At the end of the study period, the treatment group experienced a significant decrease in the number of weekly asthma exacerbations, an increase in peak expiratory flow rate (PEFR), and a decrease in the amount of medication used.

The same authors also reported a parallel

study of 570 patients who trained in and practiced yoga, and who were followed for periods ranging from three to 54 months.⁸ They noted an improvement in PEFR and a significant decrease in the need for medication. Those who practiced regularly had the greatest improvement.

Khanam et al, in a pre-/post-period analysis trial, were able to show benefit for asthmatic patients after only one week of intensive training in postures, breathing techniques, and the underlying philosophy of yoga.⁹ Subjects served as their own controls, ate a strictly vegetarian diet, and were maintained in an environment described only as one of "maximum relaxation."

At the end of the trial there was no significant difference in forced expiratory volume in one second (FEV₁) or PEFR, but significant improvement was noted for peak inspiratory flow rate, breath holding time, and the degree of chest expansion. Resting heart rate decreased ($P < 0.05$), and patients reported an improved sense of overall well-being.

Another study used a randomized, double-blind, placebo-controlled, crossover design to evaluate the effects of pranayama breathing exercises on 18 patients with mild asthma (mean FEV₁ = 3.2 L).¹⁰

All subjects initially practiced 15 minutes of slow, deep-breathing exercises twice a day for two weeks. During the active phase of the study, patients in the treatment arm used a device that imposes a 1:2 inspiration to expiration ratio equivalent to a form of pranayama breathing. The control group was provided a placebo device of similar appearance. At the end of the four-week trial, there was a significant decrease in bronchial reactivity, on the order of one doubling dose of histamine, in the group practicing pranayama. No other significant differences were found.

Singh previously noted a beneficial effect in a small, six-week study using the same device for patients with mild asthma and nocturnal wheezing.¹¹ Patients in this randomized, crossover trial used the device alone and in combination with warmed, humidified air. A beneficial effect on nocturnal wheezing and PEFR was noted at the end of the study. There was a slight trend toward improved results with combination therapy.

Adverse effects

The practice of yoga is safe provided patients do not push themselves beyond their limits of comfort.

The patient should be instructed to go the

point of minimum tension and not to the point of stress. A sense of competition often leads to straining to maintain a pose and subsequent physical injury.

However, there are rare reports of disability related to the practice of yoga, including vertebral artery dissection,¹²⁻¹⁵ persistent out-of-body experiences,¹⁶ and the development of orbital varices.¹⁷ Patients with known cerebrovascular insufficiency should be cautioned against prolonged head turning during yoga practice.

Prescription and availability

Yoga requires commitment, both with respect to time and practice. The beginning student may choose to observe a class and the instructor before deciding whether to experience yoga.

No national standard for teacher certification exists, unfortunately, and credentials vary greatly. It is prudent to recommend that patients find a highly regarded instructor with at least four years of teaching experience.

Prior to entering an open class, they should consider reserving a private session, which may cost from \$25 to \$45. During this pre-program evaluation, patients can advise the yoga teacher of any medical problems or injuries that might limit their ability to participate in the various aspects of the discipline. This will allow the instructor to tailor a comfortable practice that does not compel the patient to compete with those more flexible or in better health.

Individual hour-long group classes cost approximately \$6 to \$8 each, but discounts are usually available when several classes are purchased. Ideally, one should develop a yoga practice that becomes a part of a regular daily routine.

Conclusion

Yoga is safe, affordable, and potentially beneficial to the asthmatic patient's health and sense of well-being. Whether that benefit is due to a direct effect on bronchodilation and inflammation or to a reduction in stress has yet to be determined. Yoga provides a sense of control and involvement in disease treatment that medications alone cannot offer. In the end, this may be the single most important reason to consider including yoga in the treatment plan for asthmatic patients.

While the scientific data to support the use of yoga is suggestive at best, there does appear to be

support for consideration of its use as an adjunct for most stable patients with mild to moderate asthma.

Our clinic experience also suggests that asthmatic patients who are motivated to decrease the use of medications, who believe that stress plays a significant role in their disease process, and whose expectations support a positive response tend to have the greatest improvement in function and quality of life with a regular yoga practice.

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References

1. Daniele RP. Asthma. In: Wyngaarden JB, Smith LH, eds. *Cecil Textbook of Medicine*. 18th ed. Philadelphia: WB Saunders; 1988.
2. Weiss KB, et al. An economic evaluation: Asthma in the United States. *N Engl J Med* 1992; 326:862-866.
3. CDC. Asthma mortality and hospitalization among children and young adults — United States, 1980-1993. *MMWR* 1996; 45:350-353.
4. Knaster M. *Discovering the Body's Wisdom*. New York City: Bantam Books; 1996.
5. Benson H, et al. Body temperature changes during the practices of g Tum-mo yoga. *Nature* 1982; 295:234-236.
6. Udupa KN, Singh RH. The scientific basis of yoga. *JAMA* 1972; 220:1,365.
7. Nagarantha R, Nagendra HR. Yoga for bronchial asthma: A controlled study. *BMJ* 1985; 291:1,077-1,079.
8. Nagendra HR, Nagarantha R. An integrated approach of yoga therapy for bronchial asthma: A 3-54 month prospective study. *J Asthma* 1986; 23(3):123-137.
9. Khanam AA, et al. Study of pulmonary and autonomic functions of asthma patients after yoga training. *Indian J Physiol Pharmacol* 1996; 40(4):318-324.
10. Singh V, et al. Effect of yoga breathing exercises (pranayama) on airway reactivity in subjects with asthma. *Lancet* 1990; 335:1,381-1,383.
11. Singh V. Effect of respiratory exercises on asthma. The Pink City lung exerciser. *J Asthma* 1987; 24(6): 355-359.
12. Pryse-Phillips W. Infarction of the medulla and cervical cord after fitness exercises. *Stroke* 1989; 20(2): 292-294.
13. Nagler W. Vertebral artery obstruction by hyperextension of the neck. *Arch Phys Med Rehabil* 1973; 54: 237-240.
14. Hanus SH, et al. Vertebral artery occlusion complicating yoga exercises. *Arch Neurol* 1977; 34:574-575.
15. Russell WR. Yoga and the vertebral arteries. *BMJ* 1972; 1:685.
16. Kennedy RB. Self-induced depersonalization syndrome. *Am J Psychiatry* 1976; 133(11):1,326-1,328.
17. Cohen JA, Char DH. Bilateral orbital varices associated with habitual bending. *Arch Ophthalmol* 1995; 113:1,360-1,361. ■

A practical approach for the adult asthma patient

By **Richard L. Sheldon, MD, FACP, FCCP**
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Theodore Shankel, MD

(Editor's note: This is the first of a multi-part series on a practical, structured approach to managing asthma in the adult patient. In this issue of Asthma Management, we will cover the epidemiology, etiology, definition, and pathophysiology of asthma.

In next month's issue, we will cover clinical features and differential diagnosis, as well as special tests. In future issues, we will cover disease management procedures, pharmacology, hospital treatment, and alternative medicine therapies.)

Although it is so commonly seen in the ambulatory setting, primary care physicians (PCPs) have in recent years received poor marks from specialists for properly diagnosing and treating asthma. National attention has identified increasing mortality rates in asthma, and PCPs have been criticized for using improper and often inadequate prescribing protocols. Theophylline, once a mainstay of asthma therapy, has recently fallen from favor because of its toxicity and the availability of more effective and safer agents.

In recent years, several newer drugs have come to the market, and these drugs provide the clinician with more choices. These newer and more potent agents (such as leukotriene-blocking agents) have targeted other avenues to reverse or modify the primary causative factor in asthma inflammation.

Managed care has taken greater interest in asthma because of the high cost and complications associated with hospitalization for status asthmaticus. Many of these admissions could and should have been averted through wider education of patients and family, use and monitoring of peak flow meters, and prompt recognition and physician intervention to anticipate exacerbations and inciting events.

The National Asthma Education and Prevention Program (NAEPP) of the National Institutes of Health (NIH) has identified classification of asthma severity and has recommended a step-wise therapeutic approach for long-term control and quick relief. Advances in home therapy for interventions in asthma exacerbations have also been developed.

The lay press has recently highlighted several deaths due to the inappropriate use of over-the-counter asthma remedies, which has led to the re-emphasis on the importance of early identification of the asthma patient and the necessity of prompt and rational medical therapy. This issue addresses these concerns and underscores the etiology, pathogenesis, and effective treatment options for asthmatic patients in our practices.

Epidemiology

Among disease entities, concern about asthma has managed to dominate the last decade due to its remarkable increase in incidence, mortality,

Table 1

Comparison of Direct & Indirect Costs of Asthma from Five Countries, Adjusted to 1990 U.S. Dollars

Country, Year of Data	Asthma Prevalence in 1990	Direct Medical Costs	Indirect Costs	Total Costs	Cost per Patient per Year
Australia, 1991	8.5%	\$250 million	\$207 million	\$457 million	\$326
Canada, 1989	2.5%	\$355 million	\$181.1 million	\$536.1 million	\$1021
Sweden, 1975	3.0%	\$90.8 million	\$257.5 million	\$348.3 million	\$1315
United Kingdom, 1988	3.0%	\$722.5 million	\$1.07 billion	\$1.79 billion	\$1043
United States, 1990	4.0%	\$3.6 billion	\$2.6 billion	\$6.4 billion	\$640

Source: Adapted from *Am J Respir Crit Care Med*. Supplement on National Asthma Education and Prevention Program Task Force Report on the Cost Effectiveness, Quality of Care and Financing of Asthma Care 1996; 154:S87.

and, thus, economic importance.¹ Epidemiologists, in frustration, report on this increase despite a better understanding of asthma's pathogenesis and better means of treatment.

Most asthma begins in childhood and early teens. However, the 64 years and older population is the fastest growing population in the United States and represents the second most important group at risk for asthma-related morbidity and mortality. The presence of coexisting diseases requires the elderly to take, on the average, six to eight different medications, making the addition of asthma medications a serious complicating factor to their health care.² More than 14 million U.S. citizens are afflicted, with 450,000 hospital admissions and 5000 deaths reported annually.³ Primary care physicians provide 65% of the ambulatory care to asthmatics. Allergists and pulmonologists deliver 30% of the outpatient care.⁴

It is useful to compare methods of treatment, outcomes, and cost within different national systems (see Table 1). It will be interesting to see how costs have changed when the year 2000 data are published.

Etiology triggers

There are many culprits implicated in the etiology of asthma (see Table 2). Among them are the following interesting concepts: There may be synergy between air pollution and allergies to dust mites, pollens, cats, and mold,⁵ lower socioeconomic status,⁶ occupational dust exposure,⁷ attitudes of adolescents about smoking,⁸ race and gender (blacks and males having a higher incidence of asthma),⁹ and harsh climatic conditions.¹⁰

Special mention should be made of the relationship between viruses and wheezing. In infants, the respiratory syncytial virus (RSV) is responsible for recurrent but transient wheezing. Early viral infections may affect the developing immune system, thereby modifying the subsequent risk of asthma. In children and adults with asthma, the common cold viruses can trigger an acute attack of asthma.¹¹

The genetics of asthma are being studied more intensely. Currently, researches suggest that there are strongly inherited components of the asthma phenotype. Specific genes responsible for the phenotype have not been identified. It is anticipated that discovery of primary asthma genes, asthma severity-modifying genes, and asthma

Table 2

Common Asthma Triggers

Allergic

- House dust mites
- Mold or yeast spores
- Pollen
- Cat hair, saliva, and urine
- Dog hair and saliva
- Cockroach particles
- Aspirin and other non-steroidal anti-inflammatory drugs
- Metabisulfite, used as a food and drink preservative

Non-Allergic

- Tobacco smoke
- Smog
- Natural gas, propane, or kerosene
- Wood smoke
- Coal smoke
- Gas, wood, coal, and kerosene heating units
- Paint fumes
- Viral respiratory infections
- Exercise
- Weather with climactic changes

Source: Adapted from *Managing Asthma Today: Integrating New Concepts*. American Medical Association Publication. Chicago; 1997.

treatment-modifying genes will provide tools that can improve diagnosis and management.¹²

Exposure of asthma patients to irritants to which they are sensitive will increase asthma symptoms and cause exacerbations. All patients with asthma, regardless of its severity, should avoid: exposure to allergens to which they have a known sensitivity, tobacco smoke, exercise when air pollution is significant, use of beta-blockers, and eating foods containing sulfites.³

Patients with asthma, nasal polyps, and sensitivity to aspirin/non-steroidal anti-inflammatory drugs (NSAIDs) should refrain from using these drugs. Furthermore, patients with rhinitis, sinusitis, and gastroesophageal reflux should be vigorously treated for these disorders since they can cause exacerbations of wheezing.³

Definition

The definition of asthma has expanded as the understanding of the inciting factors, pathophysiology, and new treatment modalities have expanded. The current working definition from

the Expert Panel Report of the NAEPP is as follows:

“Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, in particular: mast cells, eosinophils, T lymphocytes, macrophages, neutrophils, and epithelial cells. In susceptible individuals, this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning.

These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment.

The inflammation also causes an associated increase in the existing bronchial hyperresponsiveness to a variety of stimuli. Moreover, recent evidence indicates that subbasement membrane fibrosis may occur in some patients with asthma and that these changes contribute to persistent abnormalities in lung function.”³

Pathophysiology

The description of the pathophysiology of asthma now includes new ways to characterize this disorder—upper airway and lower airway, mild, moderate, and severe, childhood onset and adult onset, and early and late phase—all making the old concept of “extrinsic” vs. “intrinsic” mostly inadequate.

The factors that lead to the chronic inflammation of the airways are multiple but involve a variety of different inflammatory cells and “mediators.” The implicated cells are mast cells, eosinophils, epithelial cells, macrophages, and activated T-lymphocytes.

Resident cells of the airways, such as fibroblasts and endothelial and epithelial cells, can also release mediators.

No single cell or “mediator” is involved, but, rather, a complex interaction between cells and their preformed mediators. Additionally, “on the spot,” newly produced mediators react to inflame the airways and sensitize smooth muscle lining the airway.

Cell derived mediators alter airway smooth muscle tone, increase vascular permeability, activate neurons, and increase mucus secretion. The mediators involved include histamine, leukotrienes, chemokines, cytokines, chemotactic factors, and platelet activating factor.¹³

Virus-induced wheezing is due to the ability

of viruses to coordinately activate epithelial cells and endothelial cells and leukocytes to cause airway edema, obstruction and increased airway responsiveness by producing pro-inflammatory cytokines and mediators.¹⁴

Once the asthma “cascade” is initiated by one or more triggers, the pathophysiologic process can be seen as three phases:

- the early (acute);
- subacute;
- late (chronic) phases.

The early phase almost always leads to the later phases if it is left to proceed untreated.

Permanent complications

Chronic asthma, with inadequate control of inflammation, will lead to lung remodeling, chronic airway edema, and increased mucus viscosity and secretion. The net effect of these actions is permanent changes in lung function, mucosal thickening, and persistent airway plugging.

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Editorial Questions

For questions or comments, call **Milo Falcon** at (404) 262-5541.

Newly described "adhesion proteins" found in the bronchial epithelium, vascular tissue, and lung parenchyma play an important role in maintaining the inflammation found in the airways.¹⁵

S-nitrosothiol concentrations in the trachea of asthmatic children is lower than in the trachea of normal children. Low concentrations of airway S-nitrosothiols may represent a distinct metabolic consequence of asthmatic inflammation and provide an easy way to measure nitric oxide in asthmatics. This could help to identify subgroups of asthmatics needing specific interventions.¹⁶

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The article was peer reviewed by Felipe A. Rubio, MD, Clinical Chief of the Department of Medicine at Kettering Medical Center; and Theodore Shankel, MD, Pulmonary and Critical Care Medicine, Beaver Medical Clinic in Redlands, CA.

References

1. *Global Initiative for Asthma*. National Heart, Lung, and Blood Institute/World Health Organization Workshop Report. Bethesda, Md: National Institutes of Health; 1995; 95:3659.
2. Bardana EJ Jr. Is asthma really different in the elderly patient? *J Asthma* 1993; 30:77-79.
3. Guidelines for the Diagnosis and Management of Asthma: Expert Panel Report II. Bethesda, MD: National Institutes of Health; 1997; 97:4,051.
4. Weiss KB, et al. An economic evaluation of asthma in the United States. *N Engl J Med* 1992; 326:862-866.
5. Corbo GM, et al. Effects of environment in atopic status and respiratory disorders in children. *J Allergy Clin Immunol* 1993; 92:16-23.
6. Willies-Jacobo LJ. Socioeconomic status and allergy in children with asthma. *J Allergy Clin Immunol* 1993; 92:630-632.
7. Xiping X, et al. Occupational exposures and physician-diagnosed asthma. *Chest* 1993; 104:1,364-1,370.
8. Brook U, et al. Attitudes of asthmatic and nonasthmatic adolescents toward cigarettes and smoking. *Clin Pediatr* 1993; 32(11):642-646.
9. Gold DR, et al. Race and gender differences in respiratory illness prevalence and their relationship to environmental exposures in children 7 to 14 years of age. *Am Rev Respir Dis* 1993; 148:10-18.
10. Larsson K. High prevalence of asthma in cross country skiers. *BMJ* 1993; 307:1,326-1,329.
11. Folkerts G, et al. Virus-induced airway hyperresponsiveness and asthma. *Am J Respir Crit Care Med* 1998; 157:1,708-1,720.

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12. The genetics of asthma. *Supp Am Rev Respir Dis* 1997; 156:4.
13. Beasley R, et al. Pathology of asthma and its clinical implications. *J Allergy Clin Immunol* 1993; 92:148-154.
14. Folkerts G, et al. Virus-induced airway hyperresponsiveness and asthma. *Am J Respir Crit Care Med* 1998; 157:1,708-1,720.
15. Albelda SM. Endothelial and epithelial cell adhesion molecules. *Am J Respir Cell Mol Biol* 1991; 4:195-203.
16. Gaston B, et al. Bronchodilator S-nitrosothil deficiency in asthmatic respiratory failure. *Lancet* 1998; 351:1,317-1,319. ■

CE objectives

After reading this month's issue of *Asthma Management*, continuing education participants should be able to:

1. Understand how intensive patient education can impact emergency room visits and hospitalization rates.
2. Cite the components of an effective patient profile for each pediatric patients in a high utilization group.
3. List the potential benefits of yoga for asthma patients.
4. List the common asthma triggers. ■