

# Asthma Disease Management and the Respiratory Therapist

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**Introduction**  
**Disease Management**  
**Prevention**  
**Pharmacologic Management**  
**Tracking and Follow-Up**  
**Cost of Care**  
**Protocol-Based Asthma Treatment**  
**Emergency Department**  
**Ambulatory Settings**  
**Asthma Educators**  
**Summary**

**The role of the respiratory therapist (RT) is expanding with the growing acceptance and use of the disease-management paradigm for managing chronic diseases. RTs are key members of the asthma disease-management team, in acute-care settings, patients' homes, out-patient clinics, emergency departments, and in the community. Utilizing RTs as disease managers allows patients to be treated faster and more appropriately, discharged to home sooner, and decreases hospital admissions. RT are leaders in the emerging field of asthma disease management.** *Key words: asthma, disease management, respiratory therapist.* [Respir Care 2008;53(6):770–776. © 2008 Daedalus Enterprises]

## Introduction

Approximately 22 million Americans have asthma (6 million are children), and that number continues to

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rise.<sup>1</sup> The challenge for the respiratory care community is to identify undiagnosed patients, treat them appropriately, and to teach them self-management skills to minimize symptoms, avoid exacerbations, and maintain a normal and undisturbed lifestyle. In meeting this challenge, respiratory therapists (RTs) play an important part. Over the past 2 decades the RT's role in asthma disease-management has grown, in acute-care settings, patients' homes, out-patient clinics, emergency departments, and in the community.<sup>2</sup> Chronic obstructive pulmonary diseases, including asthma, are ideal for the disease-management paradigm, and RTs can apply their abilities in treating and teaching patients in various settings.

RTs' scope of care in asthma management will probably continue for the foreseeable future. According to the American Association for Respiratory Care (AARC)<sup>3</sup> and the United States Bureau of Labor Statistics,<sup>4</sup> there will be a substantial need for more RT manpower in the coming years. The need for RTs is expected to grow faster than the need for many other health care professions through 2014,

because of the growing number of middle-age and elderly patients, which will increase the incidence of cardiopulmonary disease. RTs have an expanding role in early detection of pulmonary disorders, case management, disease prevention, and emergency care.

The National Heart, Lung, and Blood Institute's National Asthma Education and Prevention Program (NAEPP) asthma guidelines highlight the evidence that RT-driven protocols are effective and improve asthma care.<sup>1</sup> The 2007 edition of the NAEPP guidelines frequently mentions the importance of RTs in asthma management.

There is increasing need for the disease-management paradigm of managing chronic diseases, because chronic respiratory diseases are on the rise. According to the Centers for Disease Control and Prevention, in 2000, over 90 million Americans had a chronic condition, and chronic conditions accounted for 70% of all deaths.<sup>5</sup> Patients with asthma are a substantial proportion of that number. By 2020 the number of Americans with at least one chronic condition may grow to 157 million, of whom many will have asthma.<sup>5</sup>

### Disease Management

Disease management is a comprehensive and coordinated system of care that focuses on the chronic disease state rather than on just the acute episode. Disease management includes prevention, treatment, and patient tracking and follow-up.<sup>6</sup> About 2 decades ago the focus of asthma care shifted away from exacerbation treatment toward daily management.

### Prevention

Although pharmacologic intervention to treat established asthma is highly effective in controlling symptoms and improving quality of life, measures to prevent the development of asthma, including avoiding or reducing exposure to risk factors, should be implemented wherever possible.<sup>7</sup> Asthma prevention is a subject of increasing interest, and much research is underway to investigate the pathophysiology and pathogenesis of asthma. Because asthma and allergies often go hand-in-hand, much research is aimed at the prevention of allergic sensitization in the prenatal and perinatal period,<sup>8,9</sup> and at the prevention of asthma development in sensitized patients with atopy. One subject of research is the hygiene hypothesis, that inadequate childhood exposure to various substances leads to hyperresponsiveness later in life, because the immune system did not learn to deal with various substances during a crucial formative period. For those who have developed asthma, the focus of prevention is environmental control (ie, reducing or eliminating exposure to asthma triggers).

### Pharmacologic Management

Pharmacologic management is the component of asthma management that gets the most daily focus. The goal is to achieve and maintain control of symptoms and prevent exacerbations; full control can be achieved in the majority of patients with a pharmacologic strategy developed in a partnership between the patient/family and health care provider.<sup>10</sup> The current pharmacologic asthma-management method relies on frequent monitoring and assessment of asthma control and adjustment of the dosages and/or addition (or subtraction) of medications. The 2007 NAEPP guidelines<sup>1</sup> use 6 levels ("steps") of pharmacologic management (Fig. 1). In the various "steps," the dosages are increased or decreased and drugs are added to or subtracted from the treatment regimen, based on the symptoms and severity.

### Tracking and Follow-Up

All patients should be assessed to determine their current level of asthma control and treatment, and their ability to adhere to the treatment regimen. Disease-management follow-up is multi-focused but customized to the individual patient. Asthma control should be regularly and frequently monitored by the health care team and the patient or caregiver. Asthma is a variable disease, and even if the patient adheres to the treatment regimen, there will be episodes of worsening symptoms, loss of control, and possibly exacerbation, all of which require adjusting the medication dosage and/or adding medications to the regimen. When control is regained, the dosage and/or types of medications are decreased to the minimum amount that sustains control.

The disease-management paradigm requires that clinicians (1) understand and consistently pursue the benefits of evidence-based medicine, (2) know and fully utilize education concepts and strategies that promote patient self-management, and (3) have the tools to measure patient outcomes and the effectiveness of the disease-management regimen. Asthma is exactly the kind of chronic disease that is best handled with the disease-management paradigm. There is a growing body of peer-reviewed literature to guide and support evidence-based disease management of asthma, and RTs' didactic and clinical experience positions them as key members of the asthma disease-management team. After many inquiries from RTs to the AARC, the AARC partnered with the NAEPP to develop a document that describes RTs' role in asthma disease management.<sup>2</sup> The AARC conducted an informal survey of RTs practicing in asthma disease management, which revealed that many RTs were doing what they called "disease management," but less than half were tracking outcomes, which is a vital

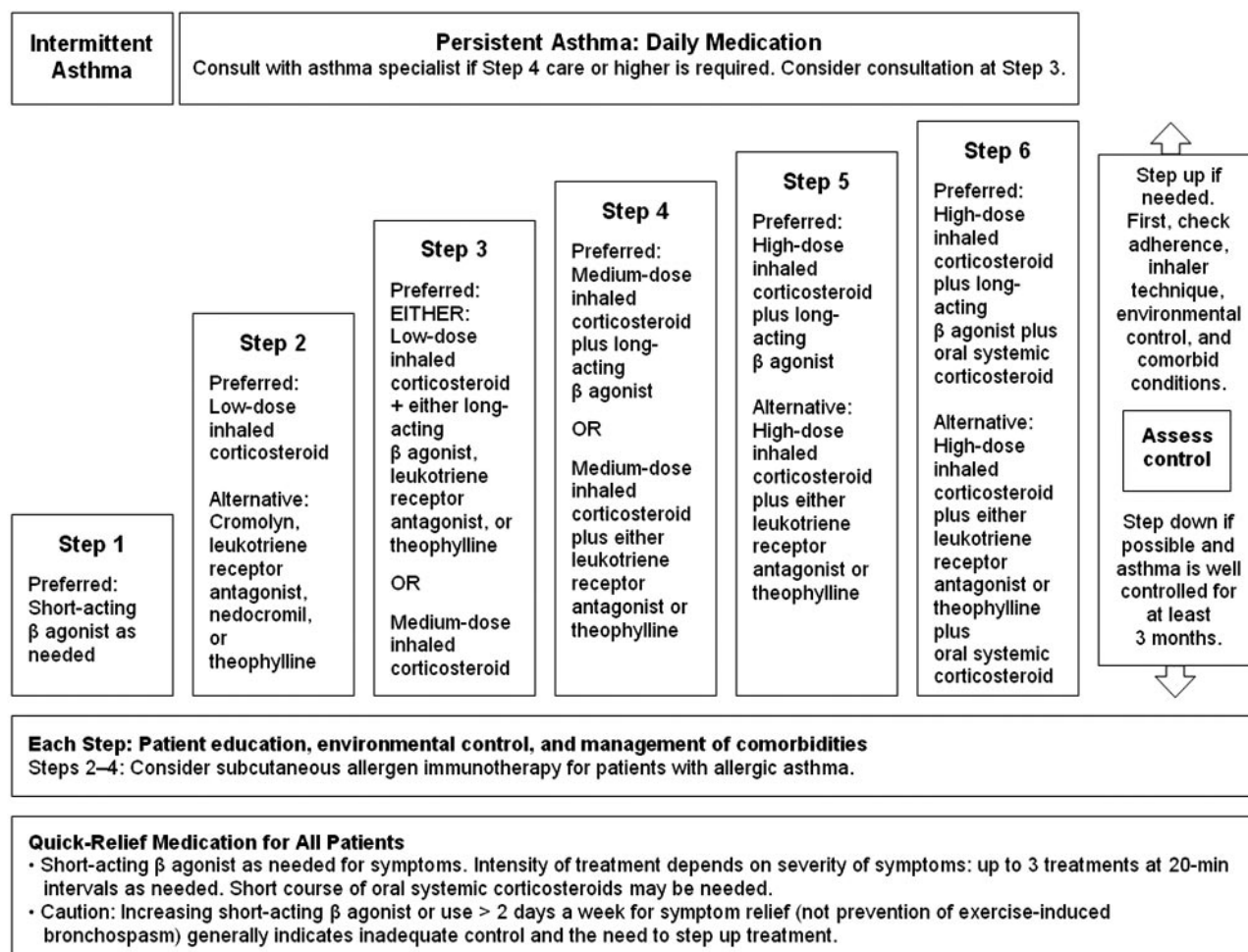


Fig. 1. Stepwise approach to asthma management in children 5–11 years old. (Based on a figure in Reference 1.)

component of disease management. Asthma interventions, like most interventions, are typically general and use a “one size fits all” approach, but maximizing effectiveness requires individualizing the regimen to the patient’s specific situation and conditions. The 4 key components of individualizing the disease-management interventions are: (1) physician-patient interaction, (2) case management, (3) patient-specific medications, and (4) interventions tailored to patient-specific risks.

At the very least, an asthma disease-management program should focus its outcome goals on asthma control and should monitor items such as daytime and nocturnal symptoms, activity limitations, frequency of exacerbations, unscheduled ambulatory and emergency-department asthma visits, hospitalizations, intensive care admissions, intubation history, absenteeism from work and school, frequency of  $\beta$ -agonist use, objective measurement of lung function, and quality-of-life indices.

Because key elements and outcome monitoring and tracking of disease-management interventions were missing in the majority of the survey responses, a team of asthma

disease-management experts, including RTs, nurses, physicians, and scientists, was convened to research and write an asthma disease-management guide for RTs, “Making a Difference in the Management of Asthma: A Guide for Respiratory Therapists,” which was published in May 2003.<sup>2</sup> It describes practical aspects of disease management and gives examples of how RTs have been key figures in asthma disease management in the hospital, home, community, emergency department, and out-patient clinic.

RTs are well-suited for asthma disease management:

- Asthma is one of the most common diseases that RTs treat in the acute-care setting.
- Many RTs regularly conduct patient education about asthma devices, medicines, and self-management.
- In many states, RTs’ licensure allows them to go beyond task-oriented duties, and to implement asthma protocols, interventions, and programs.
- RTs’ academic preparation includes the components and concepts of asthma management, treatment, and patient

Table 1. Days Missed Due to Asthma\*

	Days Missed (millions)	
	2002	2003
School days (children 5–17 y old)	14.7	12.8
Work days (currently employed adults ≥ 18 y old)	11.8	10.1

\*In the United States, among those who reported at least one asthma attack in the previous year.  
(Data from Reference 12.)

education.

- The majority of Certified Asthma Educators are RTs.
- RTs practice in various settings, including the hospital, home, emergency department, out-patient clinic, and community.

### Cost of Care

The cost of asthma care is substantial. The direct costs are easily tracked (eg, hospital admissions, visits to the emergency department, physician office, or clinic, and pharmaceutical costs). According to the National Heart, Lung, and Blood Institute’s 2007 Morbidity and Mortality Chart Book, the annual direct cost of asthma is approximately \$14.7 billion,<sup>11</sup> of which prescription drugs is the largest component (\$6.2 billion), followed by \$4.7 billion for hospital care, and \$3.8 billion for physician services.

The indirect costs of asthma are difficult to ascertain, but they include costs and losses caused by missed work or school (Table 1), both by the asthma sufferer and family members who devote time to taking care of the asthmatic family member, and various costs related to asthma mortality. The total indirect-plus-direct cost of asthma is conservatively estimated at approximately \$19.7 billion.<sup>12</sup>

Respiratory care accounts for a substantial portion of acute asthma care costs. In 1999, respiratory care services for asthma accounted for 11% of emergency-department total costs. For patients who were admitted to the hospital the respiratory therapy costs were 14% of the total in-patient charges.<sup>12</sup> In a 1999 study by Stanford et al,<sup>13</sup> the average stay was 3.8 days, and that stay was not unusual. In 2007 the average stay was down to 2–2.7 days.<sup>14</sup> Duration of stay is an important concern in all branches of in-patient care, and RTs can significantly improve stay and other clinical, patient, and financial outcomes by implementing asthma protocols. Asthma protocols decrease the likelihood of hospital admission from the emergency department and shorten asthma-caused hospital stay. Respiratory-care protocols have been successful in various venues.

### Protocol-Based Asthma Treatment

A protocol-based treatment model assigns the RT some decision-making responsibility in responding to changes in the patient’s condition. An RT-driven asthma protocol allows the RT to initiate, alter, or discontinue care as the patient’s condition dictates, which, ultimately, is a more cost-effective way of managing asthma. For the respiratory care manager such protocols offer the opportunity and flexibility for better staffing decisions (eg, providing care to patients who need it vs those who do not). In addition, asthma protocols decrease the risk of clinical errors, improve the effectiveness of treatments, and provide data by which to assess current practices and study possible changes in practice.<sup>15-19</sup>

Protocols are essentially operational practice guidelines for common procedures and tasks related to specific diseases. Protocols are optimal for diseases/treatments for which there is strong scientific evidence and well-established care practices. The diseases best treated via protocol are those that have a large number of patients, high cost of care, large number of emergency-department patients, higher risk of medications being improperly prescribed, an opportunity to lower the cost of care through patient-education, and relatively easy and inexpensive ways to measure outcomes.

One of the pioneers in pediatric asthma protocols is the respiratory therapy department at Rainbow Babies and Children’s Hospital in Cleveland, Ohio. A benchmarking study of 26 children’s hospitals found that Rainbow Babies and Children’s Hospital had the longest stay (3.2 d per patient). They implemented an asthma protocol based on the exacerbation components of the 1997 NAEPP asthma guidelines,<sup>20</sup> and utilized RTs to assess and treat asthma as indicated by the patient’s condition. A study of their inner-city asthma in-patients found shorter stay after they implemented the asthma protocol.<sup>21</sup> The same researchers did a follow-up study in their dedicated asthma unit, which was staffed primarily by RTs, who provided most of the clinical care. In the asthma care unit the protocol significantly decreased stay and lowered the overall cost of care and readmission rate.<sup>22</sup> In addition to clinical and financial outcomes, protocols may also reduce the number of bronchodilator treatments administered and minimize unnecessary interactions with RTs during an admission.<sup>23</sup> A respiratory department in a nonacademic acute-care hospital adopted the Rainbow Babies and Children’s Hospital asthma protocol and had similar success.<sup>24</sup>

### Emergency Department

Protocol care succeeds in the emergency department as well.<sup>25</sup> In the emergency department there is not as much time to spend with the patient, but we can nevertheless



follow the NAEPP guidelines, make more appropriate use of systemic corticosteroids, and teach the use of the peak flow meter. McFadden et al found, in a sequential-design study of one of the first asthma protocols, that using the protocol in the emergency department decreased hospital admissions, time spent in the emergency department, and recidivism.<sup>26</sup> Their printed protocol included a decision-making algorithm and a standardized documentation area to record the assessment and treatment. They standardized the assessment procedure, medications, administration routes, and discharge criteria. The outcomes data from the protocol period were compared with data from the 8 months prior to implementation of the protocol. Data from a 12-month period after strict protocol adherence had declined (admixture period) were also analyzed. The strict protocol period had significantly shorter stay ( $p < 0.001$ ) and lower hospital admission rate, in both divisions ( $p < 0.005$  in the medical intensive care unit, and  $p < 0.005$  compared to the 8 months prior to protocol implementation). The protocol also decreased 1-week recidivism ( $p < 0.05$ ) and reduced the charges per case ( $p < 0.01$ ), compared to the pre-protocol period. There were also significant differences between the protocol and admixture periods in stay ( $p < 0.01$ ), general-division admission rate ( $p < 0.05$ ), and charges per case ( $p < 0.01$ ). McFadden et al concluded that their protocol offered quick, efficient treatment for asthma exacerbations, substantial cost savings, and decreased unnecessary and inappropriate physician practices.<sup>26</sup>

### Ambulatory Settings

RTs can greatly benefit asthma management in ambulatory care settings, including in patients' homes. Beaver Medical Group, a private pulmonology practice in California, uses RTs in their clinical and patient-education operations.<sup>2</sup> In the clinic the RTs participate in diagnostic support, patient self-management education, assessment of patients' adherence to regimen, device allocation, and smoking-cessation counseling. After RTs had been added to the practice, a post-intervention measurement compared Beaver Medical Group to other area practices from 2000 to 2002. Beaver Medical Group believes that using RTs improves appropriate ordering of medicines and decreases emergency-department utilization in their asthma patients.

Shelledy et al<sup>27</sup> studied a pediatric asthma disease-management program that involved 8 weekly home visits from an RT. All the RTs underwent a standardized training program to maximize proper and consistent application of the program's components (eg, procedures at each home visit, patient assessment, program assessment, patient education, and record-keeping). The 8-week duration was based on the key elements they needed to include in the program and the objective of keeping the sessions to

1–2 hours. Though we must be cautious in interpreting data from a nonrandomized, unblinded study with a small sample size ( $n = 18$ ), during the 12-months study period there were significant reductions in asthma exacerbation visits per patient ( $1.78 \pm 3.0$  vs  $0.33 \pm 0.77$ ,  $p = 0.001$ ), costs ( $\$7,867 \pm \$12,627$  vs  $\$806 \pm 1,783$ ,  $p = 0.001$ ), intensive-care hospital days and non-intensive-care hospital days ( $p \leq 0.05$ ), emergency department visits ( $4.22 \pm 4.92$  vs  $0.61 \pm 1.04$ ,  $p = 0.001$ ), ambulatory physician visits ( $p < 0.001$ ), and school absenteeism ( $19.0 \pm 11.98$  d vs  $6.69 \pm 7.47$  d,  $p = 0.002$ ). Shelledy et al estimated an average total savings of \$8,542 per patient per year.

In another home-care pilot study, pediatric asthma disease management provided by RTs decreased hospitalizations, emergency department visits, unscheduled office visits, and missed school days.<sup>28</sup> These benefits can be realized by providing asthma education, including education about avoiding and eliminating asthma triggers, proper use of devices, and use of monitoring (peak flow meters and asthma diaries).<sup>29</sup>

### Asthma Educators

Teaching and reinforcing optimal inhaler technique is essential. The clinician should never assume that the patient uses optimal inhaler technique, even if the patient has used an inhaler for years, because it is possible to forget components of optimal technique.<sup>30</sup> The clinician should check the patient's inhaler technique at every opportunity. Teaching and reinforcing optimal inhaler technique in the out-patient clinic can improve the patient's understanding.<sup>31</sup> In a prospective trial in an out-patient clinic, Minai et al studied a strategy in which physicians and RTs collaborated to improve metered-dose inhaler (MDI) technique and asthma outcomes in an inner-city clinic. The children underwent a standardized assessment based on the NAEPP asthma guidelines, and the clinicians used a standardized form to collect data on demographics, MDI-technique score (MDI steps done correctly, 0–8 scale), pulmonary function, and asthma severity. RTs demonstrated and reinforced correct MDI technique at each visit. Forty-five patients underwent the assessment and education interventions. The mean time between visit 1 and visit 2 was  $11.8 \pm 9.5$  months. At visit 1 and visit 2, respectively, the mean MDI-technique scores were 53% and 81% ( $p < 0.001$ ), the mean overall asthma severity scores were 2.6 and 2.3, and the mean overall pulmonary function scores were 2.4 and 2.1. The African-American children had the largest MDI-technique improvement ( $p < 0.001$ ), but other outcomes (pulmonary function and severity) did not improve significantly. The white children had significantly improved MDI technique ( $p = 0.004$ ) and overall asthma severity score ( $p = 0.005$ ). Minai et al

concluded that the children showed sustained improvement in MDI technique, and some of the patients improved in pulmonary function and overall asthma severity.<sup>31</sup>

Positive results are also seen in the in-patient setting when RTs take advantage of “teachable moments” to instruct patients on proper inhaler technique per the NAEP guidelines. Song et al studied the effects of RT instruction on MDI technique in 58 hospitalized adults with obstructive lung disease.<sup>32</sup> In the control group, a physician counted the number of correct/incorrect steps (based on the NAEP’s recommended 8 steps) the patients made while performing 2 actuations with an MDI. Another group underwent an MDI-education intervention (which included encouragement to use a spacer) conducted by RTs, then those patients were also observed by a physician to determine their MDI-technique error rate. The control group’s error rate was 6.72 (out of 15 possible) errors per patient, whereas the intervention group made 2.43 errors per patient ( $p < 0.001$ ). That significant difference remained after controlling for greater spacer use in the post-instruction group (27.6% vs 91.7% spacer use before vs after education). Song et al concluded that RT instruction of hospitalized patients with obstructive lung disease significantly improved MDI technique and increased spacer use while in the hospital. The take-home message is that RT should use every patient interaction as an opportunity to teach as well as treat patients with asthma exacerbations.

Clinician and patient adherence to the asthma guidelines is essential for optimal asthma therapy.<sup>33</sup> Poor patient adherence to the guidelines is a major cause of poor outcomes. Among children adherence is often below 50%.<sup>34</sup> For an asthma regimen to be effective, the medication must be administered correctly. With poor adherence and/or poor inhaler technique the patient will not obtain full benefit from the medication, which could lead some patients to be less adherent. Clinicians should not assume that patients will follow the step-by-step instructions once they are on their own, particularly with inhalers. There is a correlation between education and adherence.<sup>35,36</sup> Improved adherence improves asthma control, but only if the medical care system encourages and supports the allocation of sufficient resources to allow discussion of the barriers to self-management and negotiation of solutions. Attempts to improve adherence outside of the caregiver-patient relationship are less likely to succeed.<sup>37</sup>

It is also important to consider the perceptions of health care providers. Some providers (physicians, pharmacists, nurses, and RTs) report that their most pressing concern about aerosol medications is the time it takes to deliver them,<sup>38</sup> especially in the acute-care setting. That concern could negatively influence the adoption of inhalers and holding chambers, as could an imagined superiority of nebulizers over MDIs or powder inhalers. Some nurses still favor nebulizers over MDIs and powder inhalers, de-

spite the compelling evidence that inhalers are as clinically effective and more cost-effective than nebulizers, and that bias could affect physician decisions and ordering. All aspects of an aerosol device should be considered and practice should be based on solid scientific evidence. Though it is important to match the device to the patient and the situation, all current aerosol devices are equally efficacious if the treatment is administered correctly.<sup>39</sup>

RTs are the logical and often preferred providers to deliver aerosol device education. Their skills and experience make them well qualified to teach MDI use.<sup>40,41</sup> One study found that only 1 in 3 patients used powder inhalers correctly, but with training by a medical professional the correct-use rate was higher.<sup>42</sup> A 2005 paper reported that 28–68% of patients do not use MDIs or powder inhalers well enough even to obtain benefit,<sup>43</sup> so thorough and repeated inhaler education is very important.

## Summary

Self-management of asthma is crucial, and RTs can help patients and families develop the knowledge and techniques to achieve asthma control, avoid asthma triggers, and correctly handle worsening asthma symptoms, with minimal disruption of normal life. The RT is a key member of the asthma disease-management team.

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**Discussion**

**Kercsmar:** Tom, why do you think so few people have taken the asthma educator examination? Should we promote it more? There has been discussion of making asthma education reimbursable if it's from a certified educator. Who is going to pay to take the test? Who is going to pay for the service?

**Kallstrom:** The asthma educator examination costs \$295 presently, which is a minor deterrent. The more important deterrent is the question, "OK, I've passed the test: now what?" We need to merge the education with reimbursement. There are CPT [Current Procedural Terminology] codes for asthma education reimbursement, but the caveat is that you need to have that program credentialed through a professional organization. We're working on solving that within the AARC.

Another thing about the asthma educator examination is that RTs don't

do as well as nurses, believe it or not. That's partly because many of the questions focus on the clinical aspects of care, and most RTs work in the acute-care setting, so they don't deal with situations such as not having enough money to buy medications or psychosocial issues. We prepare RTs for the examination with workshops that we take around the country.

**Kercsmar:** Now that you have 2,000 people certified, is there any evidence that the education provided by certified asthma educators improves outcomes?

**Kallstrom:** Not that I know of. We need to obtain that data to increase the impetus for people to take the examination.

**Giordano:\*** Tom, you mentioned RTs' obligations in patient educa-

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tion. What about educating physicians, nurses, and pharmacists? It's impossible for RTs, even if they were as readily accessible as others, to interface with *all* the asthmatic patients.

**Kallstrom:** In the hospitals, many respiratory departments put on competency days where they go over these things. One thing I think would be useful, and that we're moving toward, is something like the book we produced about aerosol devices for patients. We should put together a book directed at physicians and nurses. That would be useful. We had over 120,000 hits on our Web site<sup>1</sup> for the book on aerosol devices; that's almost more than there are RTs in the country. So there's a great deal of interest, and we want to take that to the next level.

1. From: Hess DR, Myers TR, Rau JL. A guide to aerosol delivery devices. Irving TX: American Association for Respiratory Care; 2007. Available from [http://www.aarc.org/education/aerosol\\_devices/aerosol\\_delivery\\_guide.pdf](http://www.aarc.org/education/aerosol_devices/aerosol_delivery_guide.pdf).