Study objectives: The emergency department (ED) is an important focal point for asthmatic individuals with uncontrolled illness. Anecdotally, many adults presenting to the ED with acute asthma are active cigarette smokers. The present study determined the prevalence of cigarette smoking among adults presenting to the ED with acute asthma and identified the factors associated with current smoking status.

Design: A prospective cohort study conducted as part of the Multicenter Airway Research Collaboration.

Patients: A structured interview was performed in 1,847 patients, ages 18 to 54 years, who presented to the ED with acute asthma.

Setting: Sixty-four EDs in 21 US states and 4 Canadian provinces.

Results: Thirty-five percent of the enrolled asthmatic patients were current smokers with a median of 10 pack-years (interquartile range, 4 to 20 pack-years), while 23% were former smokers, and 42% were never-smokers. Current smokers comprised 33% of asthmatic patients aged 18 to 29 years, 40% for ages 30 to 39 years, and 33% for ages 40 to 54 (p < 0.001). In a multivariate analysis, the factors independently associated with current smoking status (p < 0.05) were as follows: age 30 to 39 years; white race/ethnicity; non-high school graduate; lower household income; lack of private insurance; no recent inhaled steroid usage; and no history of systemic steroid usage. Although 50% of current smokers admitted that smoking worsens their asthma symptoms, only 4% stated that smoking was responsible for their current exacerbation.

Conclusions: Although cigarette smoke is generally recognized as a respiratory irritant, cigarette smoking is common among adults presenting to the ED with acute asthma. The ED visit may provide an opportunity for patients to be targeted for smoking cessation efforts.

(CHEST 2003; 123:1472–1479)

Key words: acute disease; asthma; emergency medicine; smoking

Abbreviations: ED = emergency department; IQR = interquartile range; MARC = Multicenter Airway Research Collaboration; PCP = primary care provider; PEFR = peak expiratory flow rate

Cigarette smoking is a common problem among adults with asthma. The ED visit may offer an opportunity for targeted smoking cessation efforts.
experience that many patients presenting to the emergency department (ED) with acute asthma actively smoke cigarettes.

With > 2 million annual visits to the ED for asthma in the United States, the ED is an important focal point of care for patients with severe or uncontrolled illness. In addition, many patients with acute asthma use the ED as their primary source of general asthma care. The ED visit therefore provides an opportunity to identify patients with asthma who could benefit from outpatient preventive asthma care. This might include the identification of cigarette smokers and the provision of counseling or referral to a smoking cessation program.

The objectives of the present study were to determine the prevalence of cigarette smoking among adults presenting to the ED with acute asthma and to identify the factors associated with current smoking status.

**Materials and Methods**

This study combines data from four prospective cohort studies performed during 1996 to 1998, as part of the Multicenter Airway Research Collaboration (MARC). Using a standardized protocol, investigators at 64 EDs in 21 US states and 4 Canadian provinces provided coverage 24 h per day for a median duration of 2 weeks. The inclusion criteria included physician diagnosis of acute asthma, age 18 to 54 years, and the ability to give informed consent. Of 2,496 eligible patients with acute asthma, 1,847 (74%) were enrolled into the study. All patients were managed at the discretion of the treating physician. The institutional review board at each of the 64 participating hospitals approved the study, and informed consent was obtained for all participants.

**Data Collection**

The ED interview assessed patients’ demographic characteristics, asthma history, details of their current asthma exacerbation, and smoking history. The ED clinician determined that the patient was in the ED for an acute asthma exacerbation. Smoking status was coded as current smoker, former smoker, and never-smoker. Current smokers were defined as patients who reported the current use of cigarettes or that they had stopped smoking during the previous 28 days. Former smokers were defined as people who were regular smokers at some point in the past but who had stopped smoking for > 28 days prior to their ED visit. Never-smokers were identified as those who never had smoked cigarettes on a regular basis.

Primary care provider (PCP) status was assigned on the basis of the answer to the following question: “Do you have a primary care provider (such as a family doctor, internist, or nurse practitioner)?” If yes, patients were asked to provide the name and address of their PCP. Median family income was estimated using patients’ home ZIP codes. Data on ED management and disposition were obtained by chart review. Peak expiratory flow rate (PEFR) was measured and was expressed as the percentage of the patient’s predicted value, based on age, sex, race, and height. Changes in PEFR are expressed as the absolute change in percent predicted values (eg, an improvement from 40% of predicted to 70% of predicted would be expressed as a change of 30%).

In two of the four cohorts (1,281 patients), patients were interviewed using a standardized list of potential triggers to determine which ones they believed to be common precipitants of their asthma exacerbations. The potential triggers included the following: tobacco smoke; respiratory infections; environmental allergens (eg, dust, pets, and pollen); other environmental factors (eg, perfume, paint, pollution, weather changes, and cold air); exercise; ingested substances (eg, aspirin, sulfites, and food); reproductive factors; psychological stress; and other factors. Also, patients were asked which of these triggers they believed was responsible for their current exacerbation.

**Statistical Analysis**

All analyses were performed using a statistical software package (STATA, version 7.0; StataCorp; College Station, TX). The data are presented as proportions, means (SD), or medians (interquartile range [IQR]). The association between patient factors and smoking status was examined using the chi² test, the Student t test, and the Wilcoxon rank sum test, as appropriate. Age, sex, race, and estimated median household income were included in multivariate logistic regression models because of their potential clinical significance. Other variables associated with current smoking status at p < 0.10 in univariate analysis were manually evaluated for inclusion in the models. Factors that retained significance on entry into the model or confounding factors already entered were retained in the multivariate model. All odds ratios are presented with 95% confidence intervals. The final model was further evaluated using the Hosmer-Lemeshow test. All p values were two-sided, with p < 0.05 considered to be statistically significant.

**Results**

A total of 1,847 patients with acute asthma were surveyed. Overall, 35% were current smokers, 23% were former smokers, and 42% had no prior smoking history (Fig 1). The median number of pack-years was 10 (IQR, 4 to 20 pack-years) for current smokers, and 8 pack-years (IQR, 2 to 18 pack-years) for former smokers. The average age of the cohort was 35 years, and the breakdown of smoking status by age group is shown in Figure 2. Current smoking was most common in individuals aged 30 to 39 years, although smoking was still relatively common in the younger and older adults. Former smokers were more likely to be older, and those with no prior smoking history were the least likely to be in the older age groups.

A number of demographic and historical factors were associated with current smoking status (Table 1). These included age, white race/ethnicity, lack of private insurance, not a high school graduate, lower household income, lack of a PCP, and reliance on the ED for acute asthma problems. There was a trend for women to be nonsmokers, but this was not statistically significant (p = 0.07).

Patients who had recently used inhaled or systemic steroids or who owned a home nebulizer were less likely to be active smokers. Across the many assessed clinical parameters, including initial...
PEFR, response to ED therapy, and hospitalization rates, current smokers had values that were similar to those of never-smokers and former smokers (Table 2). These results did not differ after controlling for age and the number of pack-years smoked.

A multivariate logistic regression model was developed to determine the relationship of relevant demographic, historical, and clinical variables with current smoking status. Among those independently associated with current smoking \((p < 0.05)\) were the following: age 30 to 39 years; white race/ethnicity; not a high school graduate; lack of private insurance; and no recent inhaled or systemic steroid usage (Table 3). This model gives a good fit to the data with a Hosmer-Lemeshow statistic of 4.48 on 8 degrees of freedom \((p = 0.81)\).
Although cigarette smoking was common among these patients, it was not typically identified as a precipitant for their current asthma attack. Only 4% of current episodes were considered by the smokers to be primarily caused by tobacco smoke, a percentage that is similar to that given by former smokers (2%) and never-smokers (2%; p = 0.09). However, when patients were asked to identify the factors that worsen their asthma symptoms in general (not necessarily related to the current episode), 50% of current smokers admitted that tobacco was a factor. This percentage was lower than that estimated by former smokers (59%) and never-smokers (65%; p < 0.01).

Table 1—Demographic and Chronic Asthma Factors, According to Smoking Status

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Never-Smoker (n = 773)</th>
<th>Former Smoker (n = 426)</th>
<th>Current Smoker (n = 648)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age,* yr</td>
<td>33 ± 10</td>
<td>37 ± 10</td>
<td>35 ± 10</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Female gender, %</td>
<td>68</td>
<td>62</td>
<td>63</td>
<td>0.07</td>
</tr>
<tr>
<td>Race, %</td>
<td></td>
<td></td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>White (n = 454)</td>
<td>21</td>
<td>25</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Black (n = 935)</td>
<td>53</td>
<td>48</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Hispanic (n = 411)</td>
<td>23</td>
<td>25</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Other (n = 44)</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>High school graduate, %</td>
<td>72</td>
<td>68</td>
<td>63</td>
<td>0.002</td>
</tr>
<tr>
<td>Has private insurance,† %</td>
<td>33</td>
<td>29</td>
<td>23</td>
<td>0.001</td>
</tr>
<tr>
<td>Has PCP, %</td>
<td>69</td>
<td>66</td>
<td>60</td>
<td>0.001</td>
</tr>
<tr>
<td>Household income‡</td>
<td>29,112 (20,297–38,080)</td>
<td>27,190 (18,999–37,112)</td>
<td>26,953 (18,999–35,813)</td>
<td>0.005</td>
</tr>
<tr>
<td>Inhaled corticosteroids during past 4 wk, %</td>
<td>47</td>
<td>52</td>
<td>37</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Systemic steroids during past 4 wk, %</td>
<td>27</td>
<td>34</td>
<td>22</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Use of home nebulizer, %</td>
<td>31</td>
<td>34</td>
<td>24</td>
<td>0.005</td>
</tr>
<tr>
<td>Ever intubated, %</td>
<td>16</td>
<td>19</td>
<td>16</td>
<td>0.17</td>
</tr>
<tr>
<td>ED visits during past 12 mo‡</td>
<td>2 (0–5)</td>
<td>3 (1–6)</td>
<td>2 (0–5)</td>
<td>0.002</td>
</tr>
<tr>
<td>Ever admitted for asthma, %</td>
<td>60</td>
<td>67</td>
<td>61</td>
<td>0.07</td>
</tr>
<tr>
<td>ED usual site for problem asthma care</td>
<td>70</td>
<td>74</td>
<td>79</td>
<td>0.001</td>
</tr>
<tr>
<td>Years since asthma diagnosis*</td>
<td>18 ± 12</td>
<td>20 ± 13</td>
<td>17 ± 12</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*Values given as mean ± SD.  †Values given as median (IQR).

DISCUSSION

Our results indicated that cigarette smoking was quite common among adults presenting to the ED with acute asthma. Overall, 35% of asthmatic pa-

Table 3—Multivariate Predictors of Being a Current Smoker Among Asthmatics Presenting to the ED

<table>
<thead>
<tr>
<th>Predictors</th>
<th>OR</th>
<th>95% CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–29</td>
<td>1.0</td>
<td>Reference value</td>
<td></td>
</tr>
<tr>
<td>30–39</td>
<td>1.6</td>
<td>1.2–2.0</td>
<td>0.001</td>
</tr>
<tr>
<td>40–54</td>
<td>1.2</td>
<td>0.9–1.6</td>
<td>0.14</td>
</tr>
<tr>
<td>Female gender, †</td>
<td>0.9</td>
<td>0.8–1.2</td>
<td>0.63</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1.0</td>
<td>Reference value</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>0.6</td>
<td>0.4–0.7</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.4</td>
<td>0.3–0.6</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Other</td>
<td>0.4</td>
<td>0.2–0.9</td>
<td>0.04</td>
</tr>
<tr>
<td>High school graduate</td>
<td>0.7</td>
<td>0.6–0.9</td>
<td>0.009</td>
</tr>
<tr>
<td>Has private insurance</td>
<td>0.7</td>
<td>0.6–0.9</td>
<td>0.01</td>
</tr>
<tr>
<td>Has PCP</td>
<td>0.8</td>
<td>0.6–1.0</td>
<td>0.03</td>
</tr>
<tr>
<td>Household income‡</td>
<td>0.8</td>
<td>0.8–0.9</td>
<td>0.001</td>
</tr>
<tr>
<td>Inhaled corticosteroids during past 4 wk</td>
<td>0.7</td>
<td>0.6–0.9</td>
<td>0.004</td>
</tr>
<tr>
<td>Systemic steroids during past 4 wk</td>
<td>0.7</td>
<td>0.5–0.9</td>
<td>0.008</td>
</tr>
<tr>
<td>Years since asthma diagnosis*</td>
<td>1.0</td>
<td>0.9–1.0</td>
<td>0.10</td>
</tr>
</tbody>
</table>

*CI = confidence interval; OR = odds ratio.

Table 2—Acute Asthma Factors and ED Course, According to Smoking Status

<table>
<thead>
<tr>
<th>Variables</th>
<th>Never-Smoker (n = 773)</th>
<th>Former Smoker (n = 426)</th>
<th>Current Smoker (n = 648)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial PEFR, % predicted</td>
<td>48 ± 20</td>
<td>47 ± 20</td>
<td>50 ± 21</td>
<td>0.10</td>
</tr>
<tr>
<td>Change in PEFR, % predicted</td>
<td>25 ± 19</td>
<td>25 ± 19</td>
<td>23 ± 19</td>
<td>0.43</td>
</tr>
<tr>
<td>Initial respiratory rate, breaths/min</td>
<td>24 ± 5</td>
<td>24 ± 6</td>
<td>24 ± 5</td>
<td>0.76</td>
</tr>
<tr>
<td>Initial O₂ saturation, %</td>
<td>96 ± 3</td>
<td>96 ± 3</td>
<td>96 ± 3</td>
<td>0.72</td>
</tr>
<tr>
<td>Admitted, %</td>
<td>19</td>
<td>22</td>
<td>20</td>
<td>0.43</td>
</tr>
</tbody>
</table>

*Values given as mean ± SD, unless otherwise indicated.
tients between the ages of 18 and 54 years were current smokers with a median 10 pack-year history, and 23% were former smokers with a median 8 pack-year history. Only 42% of patients who presented to the ED with acute asthma did not have a history of smoking cigarettes or were currently smoking. Those patients who were more likely to be current smokers included patients with the following demographic characteristics: age 30 to 39 years; white race; non-high school graduates; lack of private insurance; and lower household income. Additionally, patients who had not recently used inhaled or systemic steroids were more likely to be current smokers. Contrary to expectations, pulmonary function on ED arrival was unrelated to smoking history, as were the response to treatment and the need for hospitalization.

The smoking habits of various nonasthmatic and asthmatic US populations have been surveyed. Data from the Centers for Disease Control and Prevention have indicated that 24% of the general US adult population currently smoke. Cigarette smoking among ED patients (regardless of diagnosis) ranges from 21% in a suburban population to 41% in an urban population. There are very few studies reporting smoking prevalence among asthmatic individuals in the general US population. In a population of adult asthmatic patients from northern California, 42% were ever-smokers (i.e., former or current smokers), and only 10% actively smoked at the time of the assessment. These rates were considerably lower than those observed in our sample, and this may have to do with the recruitment of patients from specialty practices or the geographic region. Therefore, compared against the available literature on smoking in the general population, general ED samples, and outpatient asthmatic patients, adults visiting the ED for acute asthma appear to have rather high smoking rates. This is surprising since individuals with asthma severe enough to prompt an ED visit would seem the most likely to avoid cigarettes.

The current study found no significant gender differences in current smoking status. This is consistent with patterns noted in the general population, in which the smoking gap between men and women has narrowed markedly since 1965. Higher rates of smoking among our participants who had less education and lower incomes also reflects trends found in the general population and those found by Eisner and colleagues in community-dwelling asthmatic patients. The finding that patients aged 30 to 39 years have higher current smoking rates than those aged 18 to 29 years or 40 to 54 years differs from the general population data, in which smoking rates are fairly similar among adults across the 18 to 54-year age range. Finally, whites were more likely than blacks and Hispanics to be current smokers, which also was observed by Eisner et al. In the general population, smoking rates are equal among blacks, whites, and Hispanics. The reason for these differences cannot be determined from the current data, and this merits further study.

Participants who reported that they were current smokers were less likely to report the recent use of inhaled steroids or systemic steroids. It is possible that patients who smoke have less severe chronic asthma and require fewer controller medications (such as inhaled steroids) or rescue medications (such as prednisone). Alternatively, it is possible that patients who smoke cigarettes are prescribed these drugs at the same rate as nonsmokers but are simply less compliant with medical advice and avoid taking long-term medications or seeking urgent care when ill.

The relatively high rate of cigarette use among our sample of ED asthmatic patients is surprising since smoking is known to cause a number of serious respiratory problems. Cigarette smoking leads to reduced lung function, even among young people who smoke for relatively short periods of time, and long-term smoking can lead to chronic bronchitis and emphysema. Passive smoke exposure is associated with higher rates of asthma, more frequent asthma exacerbations and ED visits, and an increased likelihood of using asthma medications, and earlier onset of the disease.

The relationship between active cigarette smoking in adults and the development of asthma is less clear, with some studies reporting no link and others implicating cigarettes as a causal factor. It has been speculated that individuals who are the most sensitive to the irritating effects of tobacco are more likely to quit smoking or are less likely to become regular smokers. Only those individuals who are “resistant” to the short-term effects of smoking continue to smoke. This has been labeled the healthy smoker effect. If the healthy smoker effect is, in fact, an actual phenomenon, this would diminish the overall apparent risk for cigarette smokers for developing chronic asthma. Still, this concept is controversial, and evidence that contradicts this notion includes a report linking active smoking with more frequent exacerbations and higher asthma severity scores.

Studies of passive smoke exposure in the laboratory support the idea that individual asthmatic patients differ in their susceptibility to the short-term effects of cigarette smoke. It should be noted that while some active smokers appear to be immune to the deleterious short-term and long-term effects of smoking, this could simply mean that they are not cognizant of the process or that the relation-
ship may be more complicated than a simple dose-response relationship. It is well-established that active cigarette smoking leads to increased levels of inflammatory mediators in the airways, and it seems possible that the resulting inflammation could predispose the individual to asthma flares from other triggers. This has been suggested by a study that found that heavy tobacco use among inner-city asthmatic patients acted as an effect modifier for ozone-associated ED visits. The acute effects of smoking also may be underestimated by the patient, since some individuals may not consider cigarettes to be a potential precipitant of acute asthma worsening and therefore may attribute any increase in symptoms to other causes. Such a possibility is supported by the responses of current smokers, of whom only 4% reported cigarettes as the primary trigger for their current attack, while 50% stated that cigarettes have a deleterious impact on their overall asthma health.

Our study documented the high prevalence of smoking among patients who visit the ED with acute asthma. From a practical perspective, the ED visit represents an opportunity to identify these patients and to refer them to outpatient or inpatient smoking-cessation programs, particularly since many people use the ED as a source of both emergency and primary asthma care. Studies have indicated that a person’s readiness to quit smoking is a powerful predictor of their compliance and success, and it is possible that even a few moments of the patient’s attention at a critical “teachable moment” may prompt the patient to consider changing their smoking habits. To this end, ED staff should work with smoking-cessation programs to target patients and to facilitate referral.

The potential limitations of this study include the use of self-reported data that were not confirmed through interviews with family members or biological sampling for nicotine byproducts. We were unable to cross-check or validate the data from the ED chart for most fields, since the most comprehensive ED history was obtained through the study interview process. Data that were important to the study objectives were not routinely obtained by the treating ED clinician, were not routinely documented in a usable or organized manner, or were not documented at all in the ED charts. Since many patients have fragmented outpatient care, do not have PCPs, or obtain their emergency care from a number of different institutions, it was also not possible to corroborate data accuracy from other sources. To deal with these limitations, we used a structured, focused, and highly scripted data collection instrument to maximize the collection of reliable information. The data collection instrument contained prompts and instructions that were intended to increase the uniformity of responses.

It is possible that the prevalence of smoking in this population is actually higher due to underreporting. A previous study found that smoking prevalence is underestimated to a greater degree among blacks than whites, among former smokers than nonsmokers, and among those with high school or less education. The race differences in self-reporting may help to explain the unusual race finding reported herein (ie, that blacks are less likely to report being current smokers than are whites). Another potential limitation is that most of the sites were inner-city EDs that were affiliated with an emergency medicine residency program, and therefore, they may not have been representative of ED populations throughout the United States and Canada. While not generalizable to all ED populations, this cohort consisted of predominately low-income and minority patients, a population that has been identified as a high-risk group for asthma morbidity and mortality. And finally, because we enrolled patients to age 54 years, some patients also may have had COPD. Still, we found a high prevalence of smoking in all age groups, including the youngest group (age, 18 to 29 years) in whom COPD would be very unlikely. This consistency across age groups should provide reassurance that the results are not the result of including large numbers of patients with smoking-related COPD.

Conclusions

Cigarette smoking is common among adults presenting to the ED with acute asthma. While certain factors such as socioeconomic status and race/ethnicity were associated with current smoking, even patients without the at-risk characteristics reported smoking at surprisingly high rates. More investigation needs to be done to understand why cigarette smoking is so common among patients presenting to the ED with acute asthma. In the meantime, the ED visit provides an opportunity for these patients to be targeted for smoking-cessation efforts, and further work should be done to determine the optimal strategies for patient screening, referral, and successful participation in smoking-cessation programs.

Acknowledgment: We thank the MARC Investigators for their ongoing dedication to emergency airway research.

Appendix: The MARC Investigators

EMNet Steering Committee

Edwin D. Boudreaux, PhD; Barry E. Brenner, MD, PhD; Carlos A. Camargo, Jr., MD (Chair); Rita K. Cydulka, MD, MS; Theodore J. Gaeta, DO, MPH; and Michael S. Radeos, MD, MPH.

www.chestjournal.org
EMNet Coordinating Center (at Massachusetts General Hospital, Boston, MA)

Keith Brinkley, MA; Carlos A. Camargo, Jr, MD (Director); Sunday Clark, MPH; Jennifer A. Emond, MS; Jessica L. Hohrmann, MPH; Sung Hy Kim, MD.

Principal Investigators at the 64 Participating Sites

F.C. Baker, III (Maine Medical Center, Portland, ME); J.M. Basior (Buffalo General Hospital, Buffalo, NY); C.A. Bethel (Mercy Hospital, Philadelphia, PA); L. Bielory (University Hospital, Newark, NJ); M.P. Blanda (Summa Health System, Akron, OH); D. Bond (Gray Nun’s Community Hospital, Edmonton, AB, Canada); G.W. Bota (Sudbury General Hospital, Sudbury, BC, Canada); E.D. Bondureaux (Earl K. Long Memorial Hospital, Baton Rouge, LA); B.E. Brenner (The Brooklyn Hospital Center, Brooklyn, NY); J. Brown (Messicordia Community Hospital, Edmonton, AB, Canada); C.A. Camargo, Jr. (Massachusetts General Hospital, Boston, MA); F.L. Counselman (Sentara Norfolk General Hospital, Norfolk, VA); G. Ramalanjoana (Newark Beth Israel Hospital, Newark, NJ); R.K. Cydulka (MetroHealth Medical Center, Cleveland, OH); D.J. Dire (University of Oklahoma Medical Center, Oklahoma City, OK); N. El Sanafi (Broward General Hospital, Ft. Lauderdale, FL); S.D. Emond (St. Luke’s/Roosevelt Hospital Center, New York, NY); T.J. Gaeta (Methodist Hospital, Brooklyn, NY); T.J. Gaeta (St. Barnabas Hospital, Bronx, NY); M.A. Gibbs (Carolina’s Medical Center, Charlotte, NC); T.E. Glynn (Brooke Army Medical Center, Fort Sam Houston, TX); L.G. Graff, IV (New Britain General Hospital, New Britain, CT); R.O. Gray (Hennepin County Medical Center, Minneapolis, MN); S.K. Griswold (Thomas Jefferson University Hospital, Philadelphia, PA); A. Gutman (Sir Mortimer B. Davis-Jewish General Hospital, Montreal, PQ, Canada); P. Hachem (McMaster University, Hamilton, ON, Canada); D. Harchelroad (Allegheny General Hospital, Pittsburgh, PA); R. Harrigan (Temple University Hospital, Philadelphia, PA); S.E. Hughes (Albany Medical College, Albany, NY); A.H. Idris (University of Florida Health Center, Gainesville, FL); G.D. Innes (St. Paul’s Hospital, Vancouver, BC, Canada); M.E. Johnson (Jackson Memorial Hospital, Miami, FL); D.M. Joyce (University Hospital, State University of New York Health Sciences Center, Syracuse, NY); L.W. Kreplicek (Christ Hospital & Medical Center, Oak Lawn, IL); E.C. Leibner (Detroit Research Hospital, Detroit, MI); L.F. Lobon (Beth Israel Medical Center, New York, NY); A. Mangione (Albert Einstein Medical Center, Philadelphia, PA); M.F. McDermott (Cook County Hospital, Chicago, IL); J.S. Mylinski (Richland Memorial Hospital, Columbia, SC); E.S. Nadler (Brigham and Women’s Hospital, Boston, MA); R.M. Nowak (Henry Ford Hospital, Detroit, MI); E. Paul (Charity Hospital, New Orleans, LA); C.V. Pollack, Jr. (Maricopa Medical Center, Phoenix, AZ); M.S. Radeos (Lincoln Medical Center, Bronx, NY); D.J. Robinson (University of Maryland Medical Center, Baltimore, MD); R.M. Rodriguez (University of California at San Francisco Medical Center, San Francisco, CA); L. White (Akon General Medical Center, Akron, OH); and J.L. Zimmerman (Ben Taub General Hospital, Houston, TX).

References

31 Murray AB, Morrison BJ. The effect of cigarette smoke from the mother on bronchial responsiveness and severity of symptoms in children with asthma. J Allergy Clin Immunol 1986; 77:575–581
42 Plasschke F, Janson C, Normann E, et al. Association of skin test reactivity, specific IgE and total IgE with asthma and bronchial hyper-responsiveness in Swedish adults: pets and not mites are the most important allergens. J Allergy Clin Immunol 1999; 103:58–65
44 Strachan DP, Butland BK, Anderson HR. Incidence and prognosis of asthma and wheezing illness from early childhood to age 33 in a national British cohort. BMJ 1996; 312:1195–1199
45 Plasschke FP, Janson C, Normann E, et al. Onset and remission of allergic rhinitis and asthma and the relationship with atopic sensitization and smoking. Am J Respir Crit Care Med 2000; 162:920–924