Preventive Pulmonary Medical Education*
A Review of Its Importance, Status, and Challenge
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Lung diseases are among the leading causes of death in the United States today. Much work remains in order to reduce morbidity and mortality due to preventable respiratory diseases. Recent documents released by the Surgeon General, the US Public Health Service, and expert medical committees underscore the need for today's physicians to become practitioners of preventive pulmonary medicine.1-3 Advances in preventive pulmonary medical education can help meet this challenge.

This article reviews recent developments and the current state of preventive pulmonary medicine and medical education. It documents substantial progress in defining physicians' roles and practices to reduce morbidity and mortality due to lung diseases, and summarizes recent initiatives in preventive medical education. Finally, recommendations are made for integrating prevention into pulmonary medical education at all levels of training and continuing education.

Health Risks Related to Pulmonary Diseases
Pulmonary risks are major contributors to cardiovascular diseases and cancer, and are implicated in the development of numerous other diseases. Currently, one American dies of lung cancer every 5 min.1 Twenty percent of the US population has a chronic respiratory problem,4 and at some time in their lives, about 10 percent of Americans will have asthma or frequent wheezing.5 An estimated 10 million Americans suffer from chronic obstructive pulmonary disease (COPD).4 Chronic lung dysfunctions can also appear as symptoms or sequelae of other diseases, such as cystic fibrosis and acquired immunodeficiency syndrome (AIDS). Deaths attributable to COPD, including emphysema and chronic bronchitis, have increased sharply in recent years, especially among women. This phenomenon parallels the trend for lung cancer and appears to be tied to patterns of cigarette smoking.4

Respiratory diseases are costly to the medical care system and to society. Pulmonary diseases rank first as a cause of both doctor visits and bed disability days, accounting each year for 22 million physician visits and 21 million days of hospital care.4 In 1981, lung diseases cost $7.2 billion in direct costs and $18.8 billion in indirect costs.4 In 1985, cigarette smoking was associated with an estimated $23 billion in health care costs annually.1 Much of this burden on the health-care system can be reduced through prevention.

Cigarette smoking has been identified as the single most important source of preventable morbidity and premature mortality.1 It is a major contributor to deaths from coronary heart disease, lung cancer, and chronic obstructive lung disease.1,4

The Potential of Disease Prevention in Medical Care
Mausner and Kramer2 define prevention as "the means of inhibiting the development of a disease before it occurs." Prevention can be classified into three levels: primary, secondary, and tertiary. They include, respectively, efforts that include general health promotion and specific protective measures (eg, immunization), early detection (screening and case finding) and risk factor management, and limitation of disability and rehabilitation.

Recommendations of the 1984 GPEP Report "Physicians for the Twenty-First Century" emphasize the physician's role as the responsible agent for health promotion and disease prevention.9 There is an emerging consensus in the health professions that recognizes the potential for incorporating all levels of prevention into health care.

Most preventive pulmonary medicine can be classified into three broad areas: (1) smoking control, (2) occupational exposures, and (3) chronic lung diseases (COPD, asthma, and cystic fibrosis). Applications in these categories roughly parallel the three levels of

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prevention: for example, smoking cessation counseling as primary prevention; occupational history assessment or screening as secondary prevention; and management of or rehabilitation from chronic lung diseases as tertiary prevention. Additional topics include screening for lung cancer, AIDS prevention, and patient education about pulmonary complications of AIDS.

In the past 20 years, advances in diagnosis and management of respiratory disorders have significantly increased the successes of preventive efforts. The American Thoracic Society states its long-range objective in terms of prevention, as "to prevent and diminish death and disability from diseases of the lung and respiratory system." Pulmonary medical education is one avenue for training primary-care physicians and other health professionals, who will see the majority of at-risk patients and those with respiratory symptoms and diseases.

**Prevention in Medical Care**

Physicians are viewed as leaders of the complex health system. National surveys indicate that Americans have great confidence in their physicians as sources of health information. Both physicians and consumers are receptive to patient education in medical practice settings. However, both the public and medical educators note that preventive care is not practiced consistently in clinical settings. Also, most adults report that they have not been advised to make life-style changes by a physician.

Numerous authorities have stressed the importance of introducing more preventive medicine into medical care, and stressing the physicians' responsibility for prevention. Practice-oriented guides to clinical prevention have recently become available. Still, there are obstacles in the structure of care and the confidence, knowledge, and skills of practitioners that limit physicians' practice of health promotion.

Societal factors are beginning to pressure medical professionals to focus on prevention. Advocacy and public pressure have focused attention on the dangers of passive smoke and side-stream smoke. Mass public education campaigns and private-sector initiatives have raised public consciousness regarding blood cholesterol and high-fat foods. Environmental policies such as smoking policies are also encouraging practitioners to incorporate the basics of prevention into primary care and persuading consumers to expect incorporation of disease prevention into medical practice.

The traditional focus of medical care has been on treating people when they get sick, not on helping them to avoid getting sick. There remains a gap between physicians' opportunities to adopt preventive health measures and their actual practice of prevention, due both to system barriers and to physicians' reluctance and/or lack of basic skills.

**Prevention in Medical Education**

Medical education at all levels (undergraduate, graduate, and continuing medical education [CME]) is central to any effort to increase prevention in health care. The 1979 Surgeon General's report, *Healthy People*, cited the need to change health professionals' education in order to achieve progress toward national health promotion goals. In 1981, the federal government sponsored a symposium to review progress and stimulate medical educators toward the challenge of training physicians in prevention and health promotion. The goal of the resulting federal recommendations was to support the incorporation of prevention into medical education.

Bartlett recently traced the teaching of health education in medical education. Based on his review and characterizations of programs, he concluded that in undergraduate medical education programs, most health education curricula are general rather than integrated into specific content areas. Although prevention has not been prominent in undergraduate medical education in the past, several model programs are under way, and there appears to be a trend toward introducing such innovations. Prevention in medical education will grow if it receives better funding and gains wider acceptance among leaders in academic medicine.

**Prevention in Pulmonary Medicine**

The current state of prevention in pulmonary disease mirrors the status of prevention in general medicine. In a study of hospital physicians' practices regarding pulmonary disease, the doctors consistently rated disease diagnosis as more important than disease management, and they felt better prepared to diagnose than to manage patient problems. While great progress has recently been made in pulmonary medical education, much more is needed in the areas of prevention and patient education.

Counseling for smoking cessation is undoubtedly the most important primary prevention skill physicians can use. This will require the teaching of problem-solving, decision-making and communication skills. Ockene suggests that physicians' perceptions of having low success rates with smokers are likely to inhibit their desires and ability to provide necessary counseling to smoking patients. Attention to physician's current practices and attitudes can provide a foundation for successful innovation in preventive pulmonary medical education.

**Physicians and Pulmonary Disease Prevention: Practices and Attitudes**

**Smoking Cessation**
The impact of smoking on morbidity and mortality has now been well documented for many years. In 1985, smoking was responsible for 87 percent of lung cancer deaths, 82 percent of deaths due to COPD, and approximately 20 percent of deaths due to coronary heart disease and stroke.\textsuperscript{1} While the prevalence of smoking has decreased, it remains higher among blacks, blue-collar workers, and less educated people. Public education and cessation programs have been developed and disseminated by voluntary health agencies, such as the American Cancer Society, the American Heart Association and the American Lung Association.\textsuperscript{1} During the past decade, physicians and medical organizations have begun to play a more pivotal role in educating the public about the hazards of tobacco use.\textsuperscript{1} The smoking cessation efforts of physicians have been extensively reviewed elsewhere,\textsuperscript{1,20-29} thus, we will provide only highlights of physician-based smoking initiatives in this section.

The US Preventive Services Task Force has strongly recommended that tobacco counseling be offered consistently to patients who smoke.\textsuperscript{3} Every smoker should be considered a candidate for smoking cessation because even minor improvements in smoking cessation rates produce major health benefits in view of the current high prevalence of smoking.\textsuperscript{29}

Physicians are the linchpin for any successful smoking cessation effort. Today most physicians are nonsmoking role models who can provide an environment that directly and indirectly teaches smoking control skills.\textsuperscript{30} Physicians report lower smoking rates than the general public,\textsuperscript{31} and several studies have found that physicians believe that smoking is the most important modifiable health risk.\textsuperscript{32,33} However, it has also been found repeatedly that physicians lack confidence in their ability to successfully counsel patients to stop smoking.\textsuperscript{33,34}

In a 1987 study, Ockene et al\textsuperscript{35} found that two-thirds of 97 smokers who were patients at a university medical center reported ever having been advised to stop smoking by their current physician. While most physicians state that they advise their patients about the risk of smoking, many fewer actually provide treatment or referral to smoking cessation programs,\textsuperscript{34} and many do not advise symptom-free patients to quit.\textsuperscript{32,34,35} The most commonly used interventions that physicians report are counseling, counseling with written materials, referrals, and recommendations to stop smoking.\textsuperscript{36} Research suggests that a physician's direct advice to stop smoking is one of the most important components of an effective smoking control program.\textsuperscript{36,37}

Based on their observation that physicians rarely carried out preventive procedures, such as smoking counseling, Cohen et al\textsuperscript{36} conducted a randomized controlled trial to determine the effectiveness of chart reminders and making nicotine gum available for improving smoking cessation counseling. Based on 1,500 exit interviews with medical and dental patients, they found that both intervention strategies significantly increased the number of times physicians asked about smoking and advised patients to quit smoking.

Cummings et al\textsuperscript{36} found that two factors were consistently associated with family practice residents' success in counseling patients to quit smoking: (1) advising patients to set a target date for quitting, and (2) monitoring patients' progress in quitting. They also found that physicians who were optimistic and confident about their ability to help patients stop smoking were more successful than those who expected patients to be unresponsive.\textsuperscript{36}

Minimal-contact techniques that do not rely on frequent professional appointments are most likely to be practical for physician use. Brief physician counseling has been found to be effective with a variety of patients in diverse health-care settings. A 3- to 5-min behavioral counseling intervention from a physician was significantly more effective than a minimal warning to promote abstinence from smoking for both workers exposed to asbestos\textsuperscript{30} and young women in public family-planning clinics.\textsuperscript{41} The experience in these two studies further indicated that a single training session was inadequate to achieve physicians' adherence to the counseling protocol. Thus, feedback and reinforcement for physicians seem necessary to promote adherence.

Other findings from studies of physician efforts to promote smoking cessation indicate that patients with disease (either heart disease or disease evidenced by abnormal pulmonary function test results) are more likely to quit smoking after physician advice than those who are symptom-free.\textsuperscript{42} The use of nicotine gum and longer follow-up periods by the physician also improved rates of success with smoking cessation.\textsuperscript{43}

Although the availability of nicotine gum has increased physician willingness to treat patients' smoking behavior,\textsuperscript{44} the primary role for doctors remains that of providing motivation, skills, and support to the patient.\textsuperscript{34} A 3-h smoking cessation and counseling training program for 50 internal medicine and family practice residents resulted in an increase in physician knowledge and in their perceptions of their ability to influence their smoking patients.\textsuperscript{45}

**Lung Cancer**

The incidence of lung cancer continues to rise dramatically.\textsuperscript{1} The challenge for pulmonary medicine is to find a practical method of detecting lung cancer at a curable stage. Several cooperating studies on screening for early lung cancer are in progress to assess the feasibility of screening.\textsuperscript{46} The Johns Hopkins
Lung Project, the Mayo Lung Project, and the Memorial Sloan-Kettering National Lung Program began subject recruitment in 1978. The data accumulated from the initial screening phase (prevalence) involving approximately 30,000 men and more than five years of follow-up do not yet indicate whether screening leads to decreased mortality from lung cancer. One recommendation that has emerged is the suggestion that screening be carried out within the framework of general health care (ie, in private practitioners' offices, health maintenance organizations, and general medical clinics). At present, however, mass screening of asymptomatic individuals for lung cancer is not recommended in the United States.

**Occupational Exposures**

Recent environmental studies provide evidence of the relationship between pulmonary disease and particulate pollution. Further, evidence is available for occupationally induced airway obstruction, which is not limited to smoking-related disease. Recommendations for preventive practice include collecting information on occupational exposures as part of the health screening of all workers. Smoking history should be an integral part of the individual's exposure record.

Investigation and control of occupational exposure to asbestos are considered primary target areas for pulmonary prevention. For asbestos workers, the risk of developing lung cancer increases with cumulative asbestos exposure and the number of cigarettes smoked per day. Smoking cessation programs are important adjuncts to efforts to improve the environment for susceptible workers. Promotion of smoking control through both cessation programs and smoking policies should also be included among the standard preventive actions to control asbestos-related death and disability.

**Chronic Lung Diseases**

Within the past ten years, several CME efforts in prevention and management of chronic lung diseases (COPD, asthma, and cystic fibrosis) have been reported. In one community COPD program, which included detection by screening, professional CME, and community involvement, senior medical students played an active role in screening activities. After professional education, patients with abnormal test results understood their condition better, were more likely to consult a physician for follow up, and were more likely to quit smoking within the next two to three years. Another community COPD campaign found that an ongoing physician-patient relationship improved disease management and rehabilitation.

A significant contributor to persistent pulmonary morbidity for asthmatic patients is noncompliance with drug regimens. One study of adult asthmatic patients explored a variety of possible psychosocial predictors of compliance and found that only the "usual habit of compliance" discriminated between patients who did adhere and those who did not. Educational and behavioral theories provide a basis for effective strategies and their application to the practice of clinical prevention of disease complications.

Effective preventive pulmonary counseling may focus on both adults and children. Because managing asthma at home and in the community is a complex problem for families, physicians, psychologists, and health educators must collaborate in providing patient education to increase medication compliance.

Patient education also has an important role in other chronic conditions, such as AIDS-related lung disease and cystic fibrosis. Physicians who are familiar with behavioral strategies and skilled at their implementation can successfully influence their patients' disease management skills.

**MEDICAL EDUCATION TO IMPROVE PULMONARY DISEASE PREVENTION**

As evidenced in the work summarized to this point, there are efforts to include preventive techniques, such as risk assessment, screening, and counseling, in primary medical care and pulmonary medicine and to study their effectiveness. Corresponding efforts are under way in medical school curricula, medical-student health-promotion programs, and prevention-oriented CME.

Jonas proposed that preventive medicine become an integral part of preclinical training and of all clinical training, rather than being treated as a separate subject. Medical education in prevention of lung diseases is a basic element of primary care curricula. Important aspects of preventive pulmonary medicine, particularly smoking control, are compatible with prevention training in other specialties, such as cardiology and oncology.

**Problem-based Learning**

The use of problem-based learning strategies is one approach that has been proposed to make prevention an integral component of standard primary care in the future. At Harvard Medical School, a pilot program in 1985 integrated health promotion and disease prevention in a first-year problem-based curriculum. The emphasis for first-year students was on primary and secondary prevention. Second-year students focused on understanding potential risks of preventive medical actions. To implement the goals of increased preventive medicine knowledge and skills, course directors used four case-study exercises, including a problem about screening for lung cancer.
Resident Education

An intensive prevention-oriented curriculum was used with family-medicine residents in a community hospital. Evaluation demonstrated that the program raised the residents' use of preventive strategies with patients. Easy-to-follow protocols for management of common problems like smoking cessation were the type of preventive strategy most successfully integrated into practice.

Medical-Student Health-Promotion Programs

Investigators have noted that younger physicians are more likely to follow guidelines for preventive services that have been promulgated by national medical organizations. Fewer medical students smoke than in the past, and they seem more willing to present tobacco-free life-style recommendations to patients. It has been suggested that medical students who take responsibility for their own health will be more likely to promote preventive health actions for patients in their own practices.

Based on these ideas, an approach that has been gaining popularity is an experiential strategy in which medical students are offered preventive medicine/health promotion programs during medical training. These are based on the assumption that a personal appreciation of prevention will later be carried over into professional practice. A recent survey of 120 accredited medical schools in the United States, Canada, and Puerto Rico found that 29 offered student health promotion programs and another 19 had programs scheduled to begin in the near future.

Continuing Medical Education

Continuing medical education offers a means to reach practicing physicians with new guidelines and techniques for incorporating preventive pulmonary techniques and protocols into health care. A variety of methods are available, such as workshop formats, traditional group sessions, and self-study CME. Wang and colleagues conducted a quasi-experimental evaluation of a CME program for COPD using audiovisual packages, educational needs assessment, and feedback on test performance. Using an expert physician panel, they defined the highest priority as improved patient education, and smoking cessation as the most important type of patient education. The intervention groups showed significant improvements in knowledge, clinical judgment, and self-rated behavior related to diagnosis and treatment of COPD. After nine months, the experimental groups retained more information and used more program material in patient visits than did controls. The changes were attributed to the audiovisual packages, with no additional difference accounted for by use of educational needs assessment or feedback on test performance.

Two community CME programs suggest ways to improve physicians' prevention practices. Stross et al used "educational influencers" to extend CME to small community hospitals for COPD management, and successfully improved appropriate management for COPD in the intervention hospitals, as measured by chart audits. A community childhood asthma campaign provided information to primary-care physicians and encouraged school physicians to work closely with family physicians. The results indicated that the program improved diagnosis and management in children.

Physicians are expressing a high level of interest in learning how to practice prevention. Rimer et al found that over 60 percent of physicians responding to a statewide survey reported an interest in attending a CME program on smoking cessation skill development. This finding, combined with social trends, suggests that preventive pulmonary CME will find an interested and enthusiastic audience.

Integrating Prevention into Pulmonary Medical Education

On the basis of a comprehensive review of the literature, there appear to be gaps in the integration of preventive pulmonary medical education and practice throughout the curriculum. Most of the studies involving physicians in prevention and patient management and education are for residents or are CME courses. Additional efforts are needed to integrate preventive concepts into the earlier years of medical education, as well as to successfully disseminate postgraduate and CME programs with proven effectiveness. To date, there is no precedent for preventive pulmonary medical education at all levels of training.

There is a need for clear and integrated emphasis on the importance of prevention and on the potential efficacy and cost-effectiveness of preventive care throughout medical education. This should be supplemented by programs to teach skills and increase the confidence of physicians in their ability to prevent respiratory diseases and their sequelae. Medical students and practicing physicians need to be aware of and have access to the current scientific research plus the best available behavioral medicine technologies. A coordinated educational plan throughout medical training can best prepare them to meet the challenges of prevention.

The National Heart, Lung and Blood Institute (NHLBI) has provided grants known as Preventive Pulmonary Academic Awards (PPAs) to academic physicians and their institutions to accelerate the development of methods to integrate preventive goals and practices into medical education. As one example, the introduction of preventive pulmonary medicine into the curriculum is now a focus for educational
innovation at Temple University School of Medicine. The aims of the preventive pulmonary curriculum at Temple are (1) to introduce the concept of preventive pulmonary medicine at the earliest possible time and at every reasonable opportunity during required undergraduate medical courses; (2) to enhance the preventive pulmonary content of the second-year systems disease course; and (3) to increase research and teaching opportunities in preventive pulmonary medicine for residents and fellows.

Strategies for integrating these goals into the existing curriculum include implementation of an 8-h module in preventive pulmonary medicine for first-year students, expansion of the present second-year pulmonary pathophysiology course with occupational medicine topics and a smoking cessation workshop, and the addition of a fourth-year pulmonary elective with field trips to cooperating industries to enhance direct knowledge of pulmonary health hazards in the workplace. In addition, a preventive pulmonary CME course for occupational medical professionals will be developed and evaluated as part of the Temple University PPAA effort.

The multi-institutional PPAA program provides for a synergistic effect across awards and institutions. Grantees are collaborating on evaluation measures and sharing educational resources to facilitate adoption of the best available technologies and materials. A total of 16 five-year grants have been awarded through the program. The Preventive Cardiology Academic Awards (PCAA) program, under way with NHLBI support for more than a decade, provides a model for multi-institutional collaboration, curriculum innovation, and dissemination activities.84

CONCLUSION

Respiratory illnesses are leading causes of illness, disability, and death today, and they are major contributors to the escalating costs of acute medical care, hospital services, and rehabilitation. Pulmonary physicians face a challenge to become practitioners of preventive pulmonary medicine and to take on a leadership role in advancing the practice of preventive medicine in primary-care settings.

Recent studies show that the majority of physicians do not consistently incorporate preventive practices into their routine practice. An important barrier to the integration of preventive pulmonary strategies into primary care is the belief of most physicians that they are ineffective in counseling patients, due in part to a lack of training in prevention strategies. Most medical school curricula do not yet provide an integrated approach to preventive medicine throughout all levels of training.15-19

The NHLBI has awarded grants to academic physicians to develop pulmonary disease prevention curricula in their institutions, to initiate clinical and education research in pulmonary preventive medicine, and to work collaboratively to advance the art and science of preventive pulmonary medical education. This review has synthesized the needs, foundations, and precedents for enhancing physicians' effectiveness in lung disease prevention; thus, it can help all physicians and medical educators to chart the course for improved health care and prevention of disease.

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