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ABSTRACT

These guidelines for developing an undergraduate medical education curriculum in pulmonary disease prevention emphasize not only the most current scientific practice but also the active application of cognitive and behavioral skills related to patient education. Chapter 1 introduces the guidelines and the issues and trends in preventative medicine, social change, and public policy that have shaped their development. Chapter 2 contains suggested goals and exit competencies for medical school graduates. The broad behavior and cognitive goals are grouped by the type of clinical encounter or setting for which they are most relevant: well outpatient visit, sick outpatient visit, inpatient setting, and community setting. Chapter 3 contains suggestions for implementing and evaluating a curriculum in preventative pulmonary medicine. It provides general guidelines and a few specific examples. Appendixes contain lists of 61 educational resources by subject area (e.g., apnea, asthma, immunization, occupational lung disease, preoperative care, pulmonary rehabilitation, and tuberculosis) and by type of resource. (Contains 61 references.) (JB)

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GUIDELINES FOR CURRICULUM DEVELOPMENT
FOR UNDERGRADUATE MEDICAL EDUCATION IN
THE PREVENTION OF PULMONARY DISEASES



Developed with the support of the
Preventive Pulmonary Academic Award Program
Division of Lung Diseases
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TABLE OF CONTENTS

	PAGE
Credits	ii
Preface	v
Chapter 1 A Guide to Curriculum Development in Preventive Pulmonary Medicine	1
Chapter 2 A Foundation for Curriculum Development in Preventive Pulmonary Medicine	3
Chapter 3 Developing, Implementing, and Evaluating a Curriculum in Preventive Pulmonary Medicine	7
Appendix A Educational Resources Developed by Preventive Pulmonary Academic Awardees, by Subject Area	A1
Appendix B Educational Resources Developed by Preventive Pulmonary Academic Awardees, by Type of Resource	B1

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PREFACE

Prevention of disease is receiving increased attention today in the United States, Canada, and other developed countries. The growing emphasis on pulmonary disease prevention derives from the recognition that many pulmonary diseases are highly prevalent, costly, and largely preventable. Smoking is the single most avoidable cause of mortality and morbidity in the U.S.; tuberculosis, controlled in the U.S. until recently, is on the rise again; asthma is increasing in prevalence worldwide; and AIDS, with its debilitating pulmonary problems, is spreading among all population groups. To help address these major health problems, medical educators must ensure that medical students have access to the current knowledge and have the skills not only to treat pulmonary diseases but also when possible to prevent and control them.

The development and implementation of preventive health services and health promotion programs has been an important response to the changing health care environment. The changes include advances in science and technology that help prevent disease, the needs of increasingly older populations, the shift from control of communicable diseases to control of chronic conditions, the public's growing interest in health promotion, and patients' desire to exercise more control over their medical care. Considerable national attention has also been directed to health status assessment and health-related quality of life. In addition, there is growing emphasis on health care cost containment and the cost-effectiveness of health care treatment choices. All these factors have implications for preventive health services.

Twenty-one Preventive Pulmonary Academic Awards have been granted to pulmonologists at medical schools throughout the country to improve the teaching of preventive pulmonary medicine at all levels of medical education and to promote research related to the prevention of pulmonary diseases. (Academic award programs initiated in 1993 are specifically designed for the prevention of asthma and tuberculosis.) They have developed a variety of strategies to initiate or augment the teaching of preventive pulmonary medicine as well as to create a variety of teaching resources. This report and the materials discussed are now available to other medical institutions. The availability of the experience, the delineation of sample curricula, the development of attitude surveys, production of materials, and other instructional aids — all will facilitate the extension of preventive pulmonary medicine.

Projections indicate that more people will live longer and have to cope with more chronic medical conditions, that developments in medical science will open new

avenues for disease prevention, and that demands by the public for preventive services will increase. These trends will be accompanied by new and different health care delivery and financing systems, including some form of national health insurance; an increase in ancillary health professionals; and a continued need to contain health care costs. Together, these trends are expected to increase the demand for health promotion and disease prevention services in the future.

To ensure that physicians of the 21st century will be able to provide the quality preventive services that will be required, medical education programs must develop and nurture in students as intense a desire to prevent disease as the desire to cure it. In addition to the acquisition of diagnostic and therapeutic knowledge and skills, disease prevention requires the effective application of cognitive and behavioral skills related to patient education. These include skills in listening, counseling, negotiating, eliciting information, determining learning abilities and needs, assessing behavioral change, relating to patients of diverse cultural backgrounds, involving family members in treatment programs, and using various educational interventions designed to change behavior. Practicing physicians also need to maintain these skills as well as obtain periodic updates on advances in pulmonary medicine.

The purpose of this publication is to share information about what should be known, believed, and practiced by graduating medical students if pulmonary disease prevention is to be more effective. Pulmonologists and medical educators who have developed various interventions to strengthen the preventive aspects of the teaching of pulmonary medicine at their institutions have written these guidelines for use by other medical educators who want to develop or improve programs in their own institutions. Readers are encouraged to adapt and use these guidelines as well as the materials included in the companion document that contains knowledge bases and sample curricula and in the Resource Compendium described in Chapter 1 to enhance the teaching of preventive pulmonary medicine in their educational programs.

A guide to curriculum development in preventive pulmonary medicine

Introduction

Lung diseases, including cancer, chronic obstructive pulmonary disease (COPD), pneumonia, influenza, tuberculosis and asthma, are major causes of morbidity and mortality among all segments of the U.S. population.

- Together these diseases accounted for over 300,000 deaths in 1992 alone.
- In 1991, the age-adjusted mortality rate for lung disease was 72.3 per 100,000 population, an increase of 11% over the prior decade.
- Approximately 25 million U.S. residents suffer from chronic lung disease, 58% of whom suffer from the two most severe forms of COPD — chronic bronchitis (12.6 million) and emphysema (2 million).
- COPD is the fifth ranking cause of death, claiming nearly 89,000 lives in 1991.
- COPD (including asthma) caused 202 million days of restricted activity per year in the 1986-88 period, or nearly 2 months of restricted activity annually for each affected individual.
- Tobacco use, the major cause of lung disease, is responsible for more than one in every five deaths in the U.S., including 84% of all lung cancer deaths, 80% of COPD deaths, and 21% of all coronary heart disease deaths.
- The direct and indirect economic costs attributable to non-malignant lung disease total approximately \$60.4 billion annually.

These sterile statistics provide only a glimpse of the burden of lung disease in the U.S. today. The social and emotional toll they exact on individual patients, their families, and communities is immeasurable and all the more tragic because a significant fraction of most lung diseases is amenable to some form of preventive intervention. Prevention activities at both the individual patient and community levels can help reduce both the magnitude and severity of these respiratory disorders. This curriculum guide focuses on the prevention of these diseases and encourages medical educators to assume leadership roles in fostering the prevention of lung disease.

Prevention in medicine medical education: an activity whose time has come

A focus on prevention is timely, as the emphases and priorities of the health care system begin to shift from diagnosis and treatment to health promotion and disease prevention. Increasingly, society expects physicians to use their medical knowledge to help individuals and groups

reduce their risk of disease and to maintain and promote their health.

Additionally, public and governmental concerns about the escalating costs of medical care have created further demands for a focus on the prevention of disease and injury. Indeed, health care reform initiatives will likely enhance the prominence of both personal and public health preventive services in the health care system.

Medical schools and residency training programs must be responsive to these societal needs and changes by preparing their graduates to fully and competently integrate principles of prevention into their clinical practice. Although curriculum innovation in medical education has never been easy, the forces for change today are formidable. Rapid advances in molecular medicine, exploding information technologies, and growing student and faculty concerns with the structure, format, and process of medical education are powerful incentives for change. A curriculum in preventive pulmonary medicine is an ideal vehicle for seizing the opportunities created by calls for health system and medical education reform.

To be responsive to many of these needs curriculum in pulmonary disease prevention should:

- Address the major causes of morbidity and mortality in the U.S. today — across all age groups;
- Focus on disease prevention and health promotion, providing balance to a health care system and medical education curriculum traditionally weighted towards illness and cure;
- Require students to consider and address the multifactorial determinants of health and disease, including environmental, socioeconomic, behavioral, and genetic factors;
- Be easily and appropriately taught in ambulatory and community settings;
- Provide an opportunity to teach and practice interdisciplinary, coordinated care; and
- Permit the acquisition of problem-solving, communication, and information management skills.

Additionally, a curriculum in pulmonary disease prevention should serve the interests of both basic and clinical science faculty whose roles and places in the four-year curriculum are being examined closely. It should also address the needs (and demands) of students who, as adult learners, are clearly enthusiastic about more active forms of learning and who will likely benefit from a more integrated educational experience.

Content of the guidelines

This volume is a guide for developing and implementing an educational program in preventive pulmonary medi-

cine for undergraduate medical students. It was developed by medical school faculty members who received academic awards in preventive pulmonary medicine from the National Heart, Lung, and Blood Institute, together with the educational consultants with whom they worked. The volume contains:

- Suggested goals and exit competencies for medical school graduates (Chapter 2)
- Suggestions for implementing and evaluating a curriculum in preventive pulmonary medicine (Chapter 3)
- A list of educational resources developed under the Preventive Pulmonary Academic Award Program, by topic (Appendix A) and by type of resource (Appendix B)

A companion volume contains adult and pediatric knowledge bases and sample curricula. A separate diskette contains examples of these resources which can be useful aides for developing and implementing curricula in pulmonary disease prevention. On paper and on diskette, these resources contain:

- An outline of the knowledge base or content areas in preventive pulmonary medicine. Each of eleven categories of lung disorders is described in terms of its risk factors and preventive strategies. Each is also accompanied by an introductory abstract that highlights the key features and epidemiology of the disorder as well as by several suggested references;
- A similar knowledge base for a curriculum in pediatric pulmonary disease prevention;
- Samples of educational materials, such as instructional units on the prevention of specific respiratory disorders, preventive pulmonary correlation abstracts, and a computer-based learning program called PulMeDx; and
- Examples of evaluation materials, such as several Objective Structured Clinical Examinations (OSCEs) or standardized patients, a multiple choice knowledge test in clinical pulmonary disease prevention, and an attitude survey that can help assess student attitudes about preventing lung disease.

To obtain a PC or Macintosh readable floppy disc with the text of the Resource Compendium of sample curriculum materials compiled by Preventive Pulmonary Academic Awardees, send a formatted high-density 3-1/2" floppy diskette (clearly labelled PC or MAC format) and a self-addressed postage paid disc mailer to:

Preventive Pulmonary Academic Award
Attention: Lani Stewart
Occupational/Environmental Medicine Program
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Use of the guidelines

These guidelines can be used by teachers, preceptors, and curriculum planners, including:

- Pulmonary faculty (clinical and basic science)
- Primary care faculty
- Faculty who teach interviewing and clinical skills courses
- Preventive medicine faculty
- Medical education specialists

The guidelines will be used most easily by clinicians and curriculum designers because they emphasize the cognitive and behavioral skills students need in patient care. However, the guidelines will be most effective when clinical and basic science faculty collaborate to design and deliver an integrated and interdisciplinary educational program in preventive pulmonary medicine.

Additionally, the guidelines may be helpful to faculty who want to integrate principles of preventive medicine throughout the medical school curriculum. Although the focus is on pulmonary disease, many of the suggested competencies are generic and can be adapted to cover diseases of other systems. The companion volume and Resource Compendium diskette may also provide a foundation for curriculum and materials development in other areas.

To use the guidelines, review the model for curriculum development in Chapter 3. Then turn to Chapter 2, which presents the educational goals and exit competencies considered most important for medical students in the area of pulmonary disease prevention. These broad behavioral and cognitive goals are grouped by the type of clinical encounter or setting for which they are most relevant — the well outpatient visit, the sick outpatient visit, the inpatient setting, and the community setting. In general, this chapter does not specify the content areas (or diseases) that can or should be used to address these goals.

Consult the companion volume to get a sense of the content areas in both adult and pediatric pulmonary disease prevention. The materials in this curriculum guide and in the accompanying companion volume are not intended to suggest that medical students should master every content area or be competent in every skill. Teaching faculty and curriculum planners should determine the goals, objectives, and exit requirements for students at their respective schools. The companion volume includes sample curricula that illustrate the competencies and content areas identified as important by two medical schools.

Finally, return to Chapter 3 for ideas about how to implement and evaluate your curriculum. Because every

school is different, implementation and evaluation strategies will vary. Chapter 3 provides general guidelines and a few specific examples about how a preventive pulmonary medicine curriculum could be implemented and evaluated. The Resource Compendium diskette contains specific educational and evaluation materials that can be used with little, if any, modification.

CHAPTER 2

A foundation for curriculum development in preventive pulmonary medicine

Introduction

The primary purpose of medical education is to prepare students to practice preventive medicine and health promotion and to detect, treat, and manage disease and other medical conditions. A complete undergraduate medical education curriculum should include student competencies in disease prevention as well as in curative medicine. Traditionally, medical school curricula and, consequently, medical practice have concentrated on diagnosis and treatment. The curriculum foundation in this chapter provides the basis for preparing future physicians to prevent lung diseases.

Prevention efforts can be undertaken at three levels, which can be regarded as a continuum:

- Primary prevention aims to remove or eradicate risk factors. Examples include immunizations, reduced exposure to occupational toxins, and smoking prevention.
- Once a disease or condition has been detected, secondary prevention combats disease in its asymptomatic stage, when treatment or other interventions can alter its progress. Examples include smoking cessation programs for people with COPD and isoniazid prophylaxis for people testing positive on a TB skin test.
- Tertiary prevention refers to clinical activities that prevent further deterioration, reduce complications, or alleviate disability resulting from the disease. Examples include using antibiotics to treat pulmonary infections and anticoagulants in high-risk, post-surgical patients; and, comprehensive rehabilitation services to COPD patients.

This chapter suggests minimum exit goals and competencies in preventive pulmonary medicine for undergraduate medical education, i.e., competencies in lung disease prevention that students should have by the end of medical school. By extension, the goals can be viewed as a statement of the expected performance of practicing physicians. Primary and secondary prevention

are emphasized.

The suggested goals serve as a basis upon which preventive pulmonary medicine curricula can be constructed. The goals also provide a generic model for application to many other areas of medicine. Ideally, the role of the physician in prevention, at both the patient and community levels, can be taught and reinforced across disciplines within the undergraduate curriculum. As faculty search for creative and effective approaches in medical education, this chapter may serve as a model for any curriculum change in which widely accepted principles of disease prevention and early diagnosis are valued.

Professional practice goals

This curriculum foundation is based on professional practice goals inspired by the World Health Organization's Ottawa Charter for Health Promotion (1). The goals encompass both clinical and community-based preventive medicine; all subsequent student goals in the chapter flow directly from the following professional practice goals.

The physician will strive to:

- Modify health services to include primary and secondary prevention as health care priorities;
- Apply patient education and counseling skills to empower patients to adopt risk-reduction behaviors and to participate in appropriate screening programs;
- Initiate and strengthen family, group, and community actions that promote and support the primary and secondary prevention of disease;
- Promote home, work, and community environments that foster the primary and secondary prevention of disease; and
- Establish private and public policies favorable to the primary and secondary prevention of disease.

Student goals in pulmonary disease prevention

Student goals provide the basis for developing a preventive pulmonary medicine curriculum and vary according to the following clinical settings:

- The well outpatient visit
- The sick outpatient visit
- The inpatient setting
- The community setting

The well outpatient visit

The well outpatient visit epitomizes, in spirit and in practice, the opportunity to apply principles of primary and secondary prevention. Working cooperatively with the individual, the physician attempts to reduce his/her risk for disease and injury. The physician also emphasizes early diagnosis and treatment of disease as medical

care priorities. The tasks during the well-visit include risk assessment, physical examination, laboratory testing, and intervention.

Goals

Upon completion of their undergraduate medical education, students will demonstrate the motivation, confidence, and competence to fulfill the preventive pulmonary medicine responsibilities associated with the well outpatient visit.

Risk assessment

The student should be competent to assess each patient's risk for respiratory disease by evaluating the medical and risk factor history. The student should have the skills to determine, evaluate, and record:

- A smoking history, the extent of exposure to secondary tobacco smoke, and the patient's motivation for and obstacles to quitting, where appropriate;
- A patient's tuberculosis exposure history, results of previous tuberculin skin test (PPD) administrations, and risk factors for reactivation;
- A history of alcohol and illicit drug use;
- Occupational, avocational, and environmental histories;
- A travel history;
- An immunization history;
- Patient and family histories of allergy;
- A patient's nutritional status and practices;
- Risks for inherited lung diseases;
- Risk factors for the presence and transmission of human immunodeficiency virus (HIV) infection;
- The presence of, or risk for, breathing disorders associated with sleep; and,
- A patient's history of previous and current lung diseases.

Physical examination

The student should be competent to establish the presence of respiratory disease by physically examining the patient. The student should be able to demonstrate the necessary knowledge and skills to:

- Take vital signs of pulse, respiratory rate, blood pressure, and temperature;
- Compare height, weight, and other developmental measures with previous readings and against population norms;
- Assess nutritional status;
- Examine the chest for visible and palpable deformities, the use of respiratory muscles, and chest excursion;
- Auscultate the chest and interpret abnormal breath sounds;
- Examine the extremities for cyanosis, digital clubbing, pulmonary osteoarthropathy, and edema;
- Perform ear, nose, and throat exams; and,

- Auscultate the heart for signs of pulmonary-related disease.

Laboratory testing

The student should be competent to confirm the presence of, or risk for, respiratory disease through laboratory tests. The student should be able to demonstrate the knowledge and skills to:

- Administer and interpret tuberculin skin tests (PPD) and control tests;
- Order and interpret chest roentgenograms for appropriate patients;
- Perform and interpret spirometry and other pulmonary function tests where indicated by medical history or physical examination.

Intervention

The student should be competent to intervene—both treat and educate—as indicated by findings of the history, physical examination, and laboratory tests. The student should be able to indicate when and to demonstrate the knowledge and skills to:

- Use effective communication skills to inquire about the patient's relevant health beliefs and practices, inform the patient of risk factors and their personal significance, negotiate a mutually acceptable prevention plan, and emphasize the patient's role in effective prevention;
- Use the medical record/information system as an essential part of the process to trigger preventive interventions, such as smoking cessation or immunizations;
- Refer at-risk pregnant women for nutritional counseling and special prenatal care;
- Refer children with a family history of SIDS (sudden infant death syndrome) or a history of sleep-disordered breathing for a cardiopneumogram study, counseling, and consideration of home monitoring;
- Immunize children (and where appropriate, adults) against diphtheria, pertussis, tetanus, measles, mumps, rubella, polio, and Hemophilus influenzae, Type B;
- Immunize high-risk patients against influenza and pneumococcal infection;
- Develop and initiate a smoking cessation treatment plan or refer a patient to an effective smoking cessation program;
- Make an orthopedic referral for patients with significant scoliosis to prevent mechanical respiratory failure later in life;
- Make a dental referral for patients with periodontal disease to prevent bacterial aspiration pneumonia;
- Initiate a workplace risk evaluation, with recommendations for changes in work practices and/or medical work restrictions if indicated;
- Educate patients about sleep-disordered breathing and

- refer them for sleep studies; and,
- Plan a behavioral change strategy or refer the patient to an effective behavioral change program for the prevention of lung disease. Behavioral changes may include:
 - Using child restraints, seatbelts, and air bags;
 - Avoiding certain foods and small play objects with children;
 - Using home smoke detectors;
 - Performing dental hygiene;
 - Breastfeeding of infants
 - Engaging in practices that reduce person-to-person transmission of respiratory diseases;
 - Using sound nutritional practices;
 - Minimizing or eliminating exposure to harmful and toxic substances in the workplace, home, neighborhood, and community environments;
 - Using protected sexual practices;
 - Abstaining from tobacco use and, to the extent possible, avoiding environmental smoke;
 - Following safe work practices.

The sick outpatient visit

The sick outpatient visit involves contact with a patient who either has a complaint or has been diagnosed as having a disease or injury. The tasks of the well outpatient visit are also applicable to the sick outpatient visit. In fact, in many cases, the sick outpatient visit may present the best or only opportunity to provide preventive health services. In addition, particular attention is given to the patient's medical problems to ameliorate or prevent further health problems.

Goals

Upon completion of their undergraduate medical education, students will demonstrate the competence, confidence, and motivation to fulfill the preventive pulmonary medicine responsibilities associated with the sick-outpatient visit in all settings, including emergency centers and acute care clinics. Students should be able to:

- Perform all the tasks of the well outpatient visit;
- Indicate when and how to:
 - For tuberculosis patients: notify public health officials; screen household contacts; treat patients with inactive disease who have never been treated with isoniazid (INH) prophylaxis;
 - For children recently exposed to cases of *Hemophilus influenzae*, type B: prescribe rifampin for post-exposure prophylaxis;
 - For patients with cystic fibrosis: make a nutritional referral; prescribe appropriate physical/respiratory therapy, antibiotics for early signs of infection, oxygen to prevent cor pulmonale, and pancreatic enzyme replacement to maximize bowel absorption of nutri-

- ents; refer to CF center for further specialized care;
- For asthmatics: identify precipitating factors and means of their avoidance; perform measurements of lung function (spirometry or peak expiratory flow determination); emphasize patient-physician collaborative management of asthma; utilize home monitoring of airway obstruction (peak flow determinations); instruct patients in proper use of inhaled medications, including spacer devices when indicated; stress importance of early introduction of anti-inflammatory therapy in treatment programs; emphasize patient/parent/significant other education for minimizing disease severity and complications; and recognize utility of the urgent/emergent care setting as a place to initiate these preventive measures;
- For patients with chronic obstructive pulmonary disease: prescribe and educate patients about the proper use of bronchodilators, antibiotics for early signs of infection, and anti-inflammatory therapy when indicated; refer patients with symptomatic or disabling disease to pulmonary rehabilitation programs for education, exercise training, and counseling; and prescribe low-flow oxygen to prevent cor pulmonale and other complications;
- For sleep apnea patients: recommend appropriate interventions to reduce morbidity and complications according to the underlying nature of the patient's disease;
- For patients with a past history of pulmonary thromboembolism: apply anticoagulant prophylactic therapy or appropriate alternative against recurrence;
- For patients with occupational lung disease: notify the patient, the employer (with patient's consent), and public-health officials of this occupational Sentinel Health Event in order to initiate a workplace evaluation as a preventive measure for others in the workplace; and advise the patient to obtain information about his/her legal rights;
- For HIV-infected patients: prescribe preventive therapy for PPD-positive and other high-risk patients as tuberculosis prevention; prescribe pneumocystis carinii pneumonia prophylaxis for patients in the appropriate risk categories; and educate about prevention of viral transmission; and,
- For alcoholics: treat alcoholism to reduce occurrence of aspiration pneumonia.

The inpatient setting

The inpatient setting provides a unique opportunity to apply the principles of prevention and to have them reinforced by all members of the medical care team. The hospital environment offers unique opportunities to initiate and reinforce preventive measures among patients as well as patient education programs. Also, standard medical care of inpatients includes attention to the pre-

vention of nosocomial pulmonary diseases. Hospitalization increases patients' risk for contracting and exacerbating respiratory disorders. Contacts with hospital staff, other patients, and contaminated equipment present opportunities for iatrogenic respiratory infections. Physician support for risk-reduction policies that promote a safe hospital environment is vital for the prevention of hospital-acquired disease.

Goals

Upon completion of their undergraduate medical education, students will demonstrate the motivation, confidence, and competence to fulfill the preventive pulmonary medicine responsibilities of the inpatient setting. Students should be able to:

- Reduce patient and hospital personnel risk for hospital-acquired disease by:
- Implementing infection control measures, including washing hands before and after contact with each patient;
- Assigning patients with transmissible disease to appropriate isolation, negative pressure ventilation, or ultraviolet-lighted rooms;
- Supporting hospital policies designed to prevent exposure of hospital personnel to biological and chemical hazards;
- Supporting hospital policies that limit smoking by patients, visitors, and staff; and
- Complying with hospital personnel policies on tuberculosis screening and annual influenza immunization.
- Establish a patient's risk for nosocomial respiratory diseases by:
 - Determining in-hospital risk for aspiration of oral or gastric contents;
 - Determining in-hospital risk for venous thromboembolism.
- Establish the presence of, or increased susceptibility to, respiratory diseases by physically examining the patient, including:
 - Monitoring vital signs;
 - Examining the chest routinely for early diagnosis of nosocomial bacterial pneumonia;
 - Assessing regularly the intravascular volume status of patients receiving intravenous fluids to detect intravascular volume overload and to prevent pulmonary edema;
 - Assessing hospital intervention-induced risk factors for aspiration of gastric contents (such as placement of nasogastric tubes, use of sedative medications, use of procedures involving instrumentation of airway, and loss of acid barrier).
- Intervene (treat, educate) as indicated by findings of history, physical examination, and laboratory tests, and as consistent with generally-accepted recommendations for the care of inpatients, by
 - For smokers: providing pre-operative smoking-cessa-

tion counseling and, while in hospital, supporting continued smoking cessation through referral to in-hospital programs, developing a smoking-cessation plan, or making a referral on discharge planning;

- For surgical candidates: performing pre-operative assessment of pulmonary disease risks associated with surgery and initiating a program to minimize risk during the intra- and post-operative periods;
- For surgical patients at high risk for thromboembolism: prescribing early post-operative ambulation and (for appropriate risk categories) pre-operative and post-operative low-dose heparin or coumadin prophylaxis; for other patients at high-risk prescribing heparin prophylaxis while at bed rest; for patients for whom heparin prophylaxis is contra-indicated prescribing external calf compression;
- For asthmatic patients: monitoring lung function while in hospital; evaluating knowledge and skills about asthma, and educating about prevention and self-monitoring of asthma;
- For appropriately selected post-operative patients: administering incentive spirometry and prescribing enforced coughing and change of position in bed at regular intervals for prevention of pulmonary atelectasis;
- For patients scheduled to receive immunosuppressive therapies for malignancy: prescribing appropriate immune system enhancing regimens to reduce risk of infectious pneumonia;
- For patients expected to be on chronic medication after hospitalization: beginning early education regarding the specifics of the medication to enhance adherence; and,
- For high-risk patients: immunizing against influenza and pneumococcal pneumonia while in hospital.

The community setting

The physicians' involvement in community-oriented prevention is an important part of medical practice and may complement and/or support the clinical preventive measures they provide to individual patients. With the status and respect they often enjoy in the community, physicians encounter numerous opportunities to promote broader changes in the home, school, workplace, and community environments—changes that will benefit the health and well-being of many people. Indeed, the development and effective enforcement of policies, regulations, and laws that guarantee healthful environments may well be the best means to prevent a high burden of pulmonary disease. For example, physician advocacy for smoke-free schools and increased excise taxes on tobacco products can be very effective primary prevention strategies (2-4).

Early in medical education, the curriculum should instill

an appreciation for the value of community-oriented prevention. As students progress through their training, they should be able to demonstrate increasing motivation, confidence, and competence in assuming an activist role in promoting community and organizational approaches to pulmonary disease prevention.

Goals

Upon completion of undergraduate medical education, students will demonstrate the motivation, confidence, and competence to fulfill the preventive pulmonary medicine responsibility to serve as a source of accurate scientific and medical information for community groups and to advocate for policies favorable to the primary and secondary prevention of disease at organizational, community, and governmental levels. The student should have knowledge and skills to:

- Utilize and support organizations within the community (such as public health agencies, voluntary health organizations, and school boards) that will assist in creating lung disease prevention programs;
- Support legislation and policies that promote pulmonary disease prevention;
- Serve as a resource to community groups on issues relating to the health of the community, including disease prevention; and,
- Assume leadership roles in legislative and community organization processes.

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CHAPTER 3

Developing, implementing, and evaluating a curriculum in preventive pulmonary medicine

The prior chapter suggested educational goals and student competencies in pulmonary disease prevention organized by type of encounter (well outpatient visit,

sick outpatient visit, inpatient setting, and community setting) and provided some of the essential building blocks in the curriculum development process. This chapter describes a simple curriculum development model, focusing on two important elements — implementation and evaluation.

A process for curriculum development

Many curriculum development models exist, but most have a common and systematic approach that involves setting goals and objectives, selecting educational methods and instructional strategies, determining evaluation methods, implementing the curriculum, and revising it as necessary. While detailed instructions cannot be provided here for following this approach, several practical suggestions are offered.

Developing goals:

Goals are general statements about the knowledge, skills, and attitudes that students should have at the end of the training program. Though stated in general terms, goals should be realistic and attainable. For example, students should be able to:

- Assess a patient's risk for respiratory disease.

Developing objectives:

Objectives are more specific statements, the accomplishment of which will advance students towards the corresponding goals. Objectives should be precise, observable, and measurable and stated in behavioral terms. This is best accomplished by beginning each objective with an action verb that describes what the student should be able to do and avoiding such words as "know" or "understand." For example, in order to achieve the goal stated above (assess a patient's risk for respiratory disease), students should be able to:

- Elicit information about the patient's occupational, environmental, smoking, and family history;
- Differentiate between normal and abnormal breathing patterns;
- Identify common respiratory diseases associated with occupational/environmental exposures;
- List risk factors for acquiring droplet-transmitted infectious diseases; etc.

Selecting instructional strategies:

Educational methods and materials must be identified that will help students achieve the identified goals and objectives. The methods should be realistic, efficient, and effective, and adequate resources should be available to implement the strategies selected. Traditional methods include lecture, discussion, demonstration, reading, and precepting. Emerging methods include computer-based instruction and problem-based learning.

Evaluating outcomes:

Evaluation activities should have two foci — the students and the curriculum itself. Strategies should be identified early in the curriculum development process and are discussed later in this chapter.

Implementing a curriculum in preventive pulmonary medicine

Implementation is often the major stumbling block in the curriculum development process. A curriculum innovation may look impressive on paper, but it will not be successful unless it is effectively implemented. Numerous barriers may impede the implementation of curricular innovations in medical schools. In general, these barriers stem from a resistance to change common to many large organizations, reward structures tied to resistance to change, inertia, and traditional and disciplinary turf battles over curriculum time and emphasis. However, as described in Chapter 1, forces for change are emerging which provide opportunities and stimuli for creative interventions in the medical school curriculum.

Implementation strategies

A curriculum in pulmonary disease prevention can be implemented in a variety of formats; it is especially amenable to small-group, problem-based methods. Such a curriculum can accommodate experiments with student-directed learning in which students define the educational strategies most appropriate for learning the content of the curriculum.

Recognizing that curriculum development and implementation are ongoing processes and that resources are limited, content areas for a curriculum in pulmonary disease prevention should be prioritized in terms of (a) the magnitude of their morbidity and mortality and (b) their amenability to preventive intervention. The priorities should reflect current trends and needs, which likely will change or shift over the years. For this decade, priorities for education in pulmonary disease prevention should focus on:

- Smoking-related disease
- Airways reactivity
- Infectious diseases
- Occupational/environmental respiratory disorders
- Diseases related to inactivity

Implementation of a curriculum in pulmonary disease prevention can be accomplished most effectively by identifying and using appropriate access points in the existing medical curriculum. Development of a separate course in pulmonary disease prevention is neither necessary nor desirable. Rather, key concepts, knowledge, skills, and values can and should be integrated into existing basic and clinical science curricula.

For an example of how to integrate teaching about the prevention of smoking-related disease into an existing, traditional medical school curriculum, consider the following.

Goals for prevention of smoking-related disease

- Help prevent the initiation of smoking in children and adolescents
- Motivate current smokers to quit
- Assist current smokers in their efforts to quit
- Others

Objectives (and possible access points in the curriculum)

By the end of their fourth year in medical school, students should be able to:

- Discuss the major public health consequences of active and passive smoking (epidemiology, biostatistics, preventive medicine courses).
- Discuss the relationship of smoking initiation to childhood and adolescent beliefs and behaviors (child development and human behavior courses, pediatrics rotations).
- Explain the processes of tolerance and addiction to nicotine (pharmacology, human behavior courses).
- Explain the interaction of smoking with other risk factors for cardiovascular and pulmonary disease (pathophysiology, atherosclerosis and cardiovascular disease blocks, clinical rotations).
- Detect the denial mechanisms used by smokers (human behavior and psychiatry courses, rotations in ambulatory care, family practice, pediatrics, and psychiatry).
- Review the mechanisms of carcinogenesis and emphysema (cancer and pulmonary pathophysiology blocks).
- Elicit the appropriate medical history to stratify patients' risk from past smoking and their current degree of addiction (introduction to clinical medicine, medical interviewing courses, clinical rotations).
- Use behavioral and pharmacologic approaches to smoking cessation as part of the general approach to patients with substance abuse problems (pharmacology, human behavior, and behavioral medicine courses, rotations in ambulatory care, family practice, and pediatrics).
- Discuss the role of political action in creating smoke-free environments (preventive medicine, public health, health and society courses, clinical rotations).

Alternatively, other curricular approaches can be used to help students achieve these objectives. The necessary information and learning opportunities can be organized into a unit on smoking prevention and smoking cessation which can be presented shortly before students begin their clinical rotations or during a fourth-year ambulatory rotation when students have had some experience

with physician-patient interactions about smoking and other substance abuse issues. The information can also be presented in a problem-based learning environment in which students and their tutors use clinical cases to define and work through any number of learning issues relating to lung disease, such as respiratory physiology, pathologic mechanisms, pharmacologic properties of addictive substances, human behavior, and preventive strategies.

Students will consider the objectives of a smoking prevention curriculum important to the degree their teachers emphasize their importance. If, early in their first year, students understand the individual and public health significance of smoking, and if knowledge and skills relating to smoking prevention and smoking cessation are introduced and reinforced throughout the pre-clinical and clinical years, students will appropriately prioritize smoking-related issues in their studies and consider such skills necessary for the competent practice of medicine.

Examples of curriculum intervention strategies

A variety of materials and numerous strategies have been developed by the Preventive Pulmonary Academic Awardees to integrate pulmonary disease prevention into the curriculum at their medical schools. Examples of these materials are available in the Resource Compendium. Additional information and materials can be obtained directly from the Awardees (names and addresses provided at the beginning of this publication). Strategies included:

- Written correlation abstracts in pulmonary disease prevention for students and basic science faculty to supplement lectures in the preclinical curriculum.
- Instructional units for basic and clinical science faculty, providing a brief narrative of the topic, examples of visual aids that could be used in presenting the material, selected references, and suggestions for test items. Topics included preventing infectious pulmonary disease, preventing chronic obstructive pulmonary disease, and preventing influenza.
- Pulmonary and cardiovascular risk factor screening for entering students. Students were given individual results and the class mean with handouts explaining the screening tools and their importance for prevention. Group data were also used to teach principles of epidemiology and preventive medicine in the preclinical curriculum.
- Computer-based learning programs to supplement a pulmonary medicine elective.
- Lectures and clinical correlations in basic science courses.
- Multidisciplinary seminars on sleep-related disorders, asthma, and smoking cessation. Smoking cessation seminars were also used to train students to be smoking cessation facilitators in the medical center and in

community-based programs.

- Seminars and small group learning units in smoking cessation and the application of NHLBI guidelines for the diagnosis and management of asthma for students about to begin their community-based clinical experience.
- Cases for use in the introduction to clinical medicine course dealing with smoking cessation, influenza vaccine, preventive therapy for tuberculosis, and preventive therapy for deep vein thrombosis and pulmonary embolism.
- Preclinical elective in pulmonary rehabilitation.
- Seminar series on the prevention of pulmonary disease in primary care.
- Case problems with information on the prevention of respiratory disease for use in a problem-based learning environment.

Faculty development has been considered essential and often accompanied or preceded these interventions. For example, the Awardees developed:

- Materials on taking a smoking history as well as guidelines for smoking cessation counseling which were sent to community-based preceptors in physical diagnosis and family practice courses. Preceptors were informed that the students would be evaluated on their skills in taking a smoking history and providing smoking cessation counseling.
- Seminars and training sessions for primary care faculty who would evaluate students in the Objective Structured Clinical Examinations (OSCEs).
- Seminars in clinical epidemiology for faculty, with an emphasis on preventive intervention.
- Collaborative relationships with faculty members who control relevant parts of the curriculum.

Other strategies

In addition to serving on curriculum committees and task forces concerned with health promotion, disease prevention, and public health, several other strategies have been used to reinforce the importance of pulmonary disease prevention in their medical schools and teaching facilities. These have included:

- Incorporating issues relating to smoking cessation and appropriate management of asthma (applying NHLBI guidelines) into the institution's quality assurance program.
- Serving on committees to make the hospital a smoke-free facility.
- Auditing outpatient clinic records for evidence of flu/pneumococcal vaccine interventions, follow-up with faculty and house staff, and modification of clinic quality assurance plans to include annual monitoring for such intervention.
- Using medical student leaders to help develop new curriculum in pulmonary disease prevention.

- Timing Grand Rounds presentations to coincide with clinical need — e.g., speaking on influenza and influenza vaccine in the fall.
- Using faculty to serve as small group facilitators and student evaluators.

Evaluating a curriculum in preventive pulmonary medicine

Two foci for evaluating the success of a curricular intervention are — the learner and the curriculum itself. Medical school faculty are most familiar with the former; its purpose is to assess the extent to which students are achieving the course objectives. The second type of evaluation, which examines both the content and the process of implementing the curriculum, includes learner outcomes as just one variable in the evaluation effort.

Evaluating the learner

Most medical schools have evolved evaluation methods to assess whether students have acquired the knowledge, attitudes, and skills outlined in course objectives. Knowledge is usually assessed through written examinations and observation of students' clinical interactions with patients; skills are most effectively assessed through direct observation of clinical behavior, which also provides insight into student attitudes. Attitude scales are also used. Most important is the selection of evaluation strategies to best match the behavior stated in the course objectives. Strategies should be appropriate, feasible, objective, fair, and credible.

Strategies for evaluating the student learner include:

- Examinations (written and oral)
- Direct observation/precepting
- Case presentations
- Chart audits
- Simulated patients
- Objective Structured Clinical Exam (OSCE)
- Attitude scales

The Resource Compendium includes examples of evaluation tools. One tool — the OSCE — can assess efficiently and simultaneously student knowledge, skills, and attitudes. The Compendium contains several OSCEs, a knowledge test, and an attitude questionnaire.

Evaluating the curriculum

Curriculum evaluation assesses the effectiveness and efficiency of the educational program itself. Student achievement of course objectives is not the sole measure of success. It is also important to look at curricular content, the process of implementation, and feedback from the teachers and learners in order to determine whether the curriculum remains relevant, up-to-date, complete, and acceptable to teachers and learners, whether it has

been implemented adequately, and whether its use of resources remains appropriate.

Sources of information about these issues include faculty, preceptors, clinic personnel, students, graduates, and employers as well as patients and content experts. Board and examination scores observed over time also help gauge the effectiveness of a curriculum and may signal the need for change. Most medical schools have developed evaluation forms to obtain information from learners about the content, method, usefulness, and acceptability of a particular course or learning experience. Faculty and curriculum committees discuss the appropriateness, efficiency, and effectiveness of the instructional strategies and sequencing of content. Content experts within and outside an institution may be asked to comment on the accuracy, adequacy, and completeness of educational materials or programs.

Although patients and others affected by the educational enterprise are consulted considerably less often, their input may be highly relevant as they are the direct recipients of care or the employers of program graduates. Faculty should be encouraged to tap these valuable sources of information in their curriculum evaluation efforts.

Existing tools and channels of information have been used by Preventive Pulmonary Academic Awardees to help in monitoring the success of efforts to implement new curriculum in pulmonary disease prevention. In addition, maintaining activity logs has aided in monitoring the frequency and success of their interactions with course directors, clinical teaching faculty, students, curriculum committees, local agencies, professional organizations, and other Awardees. Such logs have helped to indicate whether their proposed curriculum interventions actually occurred, what was required in terms of time and resources, who was interested and supportive, and what could be done to enhance the effort.

APPENDIX A

Educational resources developed by PPAW awardees by subject area

Apnea

Objective Structured Clinical Examinations

Medical College of Pennsylvania

- Sleep history/office worker (by Rochelle Goldberg)

Bowman Gray School of Medicine

- Sleep history/injury from fall due to hypersomnolence

Videotape

Bowman Gray School of Medicine

- A simple sleep history for primary care practitioners

35mm Slide Show*

University of Kentucky (by Barbara Phillips)

- Sleep apnea: Prevention of sequela

Computer-based Learning Program

Medical College of Pennsylvania

- PulMeDx/factory worker

Asthma

Objective Structured Clinical Examinations

Baylor College of Medicine

- Monitoring

Bowman Gray School of Medicine

- Childhood asthma/peak flow measurement/anti-inflammatory therapy

Medical College of Pennsylvania

- Occupational asthma

Videotape

University of California, San Diego

- Making the Connection (occupational asthma)

Computer-based Learning Program

Medical College of Pennsylvania

- PulMeDx/chemical exposure

DVT prophylaxis

Objective Structured Clinical Examination

Bowman Gray School of Medicine

- Postoperative pulmonary embolism/failure to use DVT prophylaxis

Videotape

University of California, San Diego

- Venous thromboembolism

Immunization

Objective Structured Clinical Examination

Medical College of Pennsylvania

- Immunization history and counseling/adult

35 mm Slide Show*

University of Pittsburgh

- Influenza prevention and control (by Fred Rubin)

Occupational lung disease

Objective Structured Clinical Examinations

University of Medicine and Dentistry of New Jersey

- Occupational history/refrigeration specialist with dyspnea

Medical College of Pennsylvania

- Occupational history/clerk in manufacturing company with dyspnea

Computer-based Learning Programs

Medical College of Pennsylvania

- PulMeDx/occupational asthma/chemical exposure
- PulMeDx/hypersensitivity pneumonitis/pigeon breeder
- PulMeDx/occupational lung cancer/BCME worker
- PulMeDx/silicosis/ceramics worker
- PulMeDx/industrial bronchitis
- PulMeDx/asbestosis/parachute packer

Videotape

University of California, San Diego

- Making the Connection (occupational asthma)

35mm Slide Show*

University of Pittsburgh

- Occupational history taking (by Michael Hodgson)

Preoperative care

35mm Slide Show*

University of Arizona (by Tony Camilli)

- Preoperative pulmonary evaluation

Pulmonary rehabilitation

Videotape

University of California, San Diego

- A Breath of Life (basic concepts for patients with chronic lung disease)

Objective Structured Clinical Examinations

University of New Mexico

- Smoking history/pre-employment and follow-up
- Smoking cessation/adolescent with sore throat
- Smoking cessation/pregnant woman
- Smoking cessation/wants to quit
- Smoking cessation/wants to quit
- Smoking history/routine visit
- Smoking history/routine exam
- Smoking assessment/results of mammogram
- Smoking assessment/VA patient
- Smoking history/bronchitis follow-up
- Chewing tobacco use/training physical

University of Medicine and Dentistry of New Jersey

- Smoking history/woman with cough
- Smoking history/pre-employment screening

Medical College of Pennsylvania

- Smoking history/influenza follow-up
- Smoking counseling/influenza follow-up

University of Pittsburgh

- Smoking history/productive cough
- Smoking history/employee health

Baylor College of Medicine

- Smoking cessation/mother of young infant
- Smoking prevention/adolescent and mother/annual visit

Case Western Reserve University

- Smoking history/bronchitis

University of North Carolina

- Smoking history/interested in quitting

Bowman Gray School of Medicine

- Smoking history/health promotion visit

University of Washington

- Smoking/occupational & environmental history

Computerized Simulated Patient (with video interaction)

University of Pittsburgh

- Acute onset of productive cough

Videotapes

Baylor College of Medicine

- Smoking cessation counseling skills for pediatricians and family practitioners
- Smoking prevention counseling skills for pediatricians and family practitioners

35mm Slide Shows*

University of Pittsburgh

- Smoking cessation (by Peggy Russell)
- The health effects of passive smoking (by Edward Pattishall)

Attitude Survey

Baylor College of Medicine

- For smoking cessation and smoking prevention in pediatric care

Tuberculosis

Objective Structured Clinical Examinations

University of Medicine and Dentistry of New Jersey

- TB history/patient education/older tuberculosis patient
- TB history/patient education/younger tuberculosis patient
- Smoking/tuberculosis history through spanish interpreter

Videotape

University of California, San Diego

- The Many Faces of TB (hospital transmission)

Computer-based Learning Program

Medical College of Pennsylvania

- PulMedx/nosocomial TB/hospital worker

35mm Slide Show*

University of Pittsburgh

- Prevention of thromboembolic disease (by Irvin Paradis)

* All 35mm slide shows were funded by the University of Pittsburgh

APPENDIX B

Educational resources developed by PPAA awardees by type of resource

Objective structured clinical examinations (OSCEs) or standardized patients

University of New Mexico

- Smoking history/pre-employment and follow-up
- Smoking cessation/adolescent with sore throat
- Smoking cessation/pregnant woman
- Smoking cessation/wants to quit
- Smoking cessation/wants to quit
- Smoking history/routine visit
- Smoking history/routine exam
- Smoking assessment/results of mammogram
- Smoking assessment/VA patient
- Smoking history/bronchitis follow-up
- Chewing tobacco use/training physical

University of Medicine and Dentistry of New Jersey

- Smoking history/woman with cough
- Smoking history/pre-employment screening
- Occupational history/refrigeration specialist with dyspnea
- TB history/patient education/older tuberculosis patient
- TB history/patient education/younger tuberculosis patient
- Smoking/tuberculosis history through spanish interpreter

Medical College of Pennsylvania

- Smoking history/influenza follow-up
- Smoking counseling/influenza follow-up
- Immunization history and counseling/adult
- Occupational history/clerk in manufacturing company with dyspnea
- Sleep history/office worker

Bowman Gray School of Medicine

- Smoking history/health promotion visit
- Sleep history/injury from fall due to hypersomnolence
- Childhood asthma/peak flow measurement/anti-inflammatory therapy
- Postoperative pulmonary embolism/failure to use DVT prophylaxis

University of Pittsburgh

- Smoking history/productive cough
- Smoking history/employee health

Baylor College of Medicine

- Smoking cessation/mother of young infant
- Smoking prevention/adolescent and mother/annual visit
- Asthma monitoring

Case Western Reserve University

- Smoking history/bronchitis

University of North Carolina

- Smoking history/interested in quitting

University of Washington

- Smoking/occupational & environmental history

Videotapes

Baylor College of Medicine

- Smoking cessation counseling skills for pediatricians and family practitioners
- Smoking prevention counseling skills for pediatricians and family practitioners

Bowman Gray School of Medicine

- A simple sleep history for primary care practitioners

University of California, San Diego

- Making the Connection (occupational asthma)
- The Many Faces of TB (hospital transmission)
- A Breath of Life (basic concepts for patients with chronic lung disease)
- Venous thromboembolism

35mm Slide Programs*

University of Kentucky (by Barbara Phillips)

- Sleep apnea: Prevention of sequela

University of Pittsburgh

- Influenza prevention and control (by Fred Rubin)
- Smoking cessation (by Peggy Russell)
- The health effects of passive smoking (by Edward Pattishall)
- Occupational history taking (by Michael Hodgson)
- Prevention of thromboembolic disease (by Irvin Paradis)

University of Arizona (by Tony Camilli)

- Preoperative pulmonary evaluation

Computer-based Learning Programs

Medical College of Pennsylvania/PulMeDx Series

- Occupational asthma

- Hypersensitivity pneumonitis
- Occupational lung cancer
- Silicosis
- Nosocomial TB
- Industrial bronchitis
- Asbestosis
- Sleep apnea

Computerized Simulated Patient (with video interaction)

- University of Pittsburgh
- Acute onset of productive cough

Curricula and Syllabi

- Medical College of Pennsylvania
- Pulmonary Medicine Curriculum/Competency-based

- New York Medical College
- Preventive Pulmonary Medicine Curriculum
 - Syllabus for Pulmonary Medicine Elective
 - Preventive Pulmonary Curriculum for Respiratory Therapists

Correlation Abstracts

- Yale University School of Medicine
- 1-2 page discussions of key areas in lung disease prevention written as supplements to first and second year medical student course syllabus. A few pertinent references are included.

Cardiopulmonary Risk Factor Assessment for Medical Students

University of California, San Diego

- Screening program administered to entering first year medical students covering selected pulmonary and cardiovascular risk factors. Individual and summary class results are presented to students highlighting the importance of prevention. Effective in engaging students in prevention issues by personalizing health risks. Pulmonary components include tuberculin skin testing, spirometry, pulmonary health history, knowledge, and attitudes about lung disease prevention.

* All 35mm slide shows were funded by the University of Pittsburgh