Addressing the Physician Shortage in Occupational and Environmental Medicine: Report of a Study

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Subcommittee on Physician Shortage Committee on Enhancing the Practice of Occupational and Environmental Medicine, Division of Health Promotion and Disease Prevention

ADDRESSING THE PHYSICIAN SHORTAGE IN OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

INSTITUTE OF MEDICINE
REPORT OF A STUDY

Subcommittee on Physician Shortage
Committee on Enhancing the Practice of Occupational and Environmental Medicine
DIVISION OF HEALTH PROMOTION AND DISEASE PREVENTION

NATIONAL ACADEMY OF SCIENCES
WASHINGTON, D.C. 1991

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This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee appointed by the members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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The serpent has been a symbol of long life, healing, and knowledge among almost all cultures and religions since the beginning of recorded history. The image adopted as a logotype by the Institute of Medicine is based on a relief carving from ancient Greece, now held by the Staatlichemuseen in Berlin.

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CONTENTS

This report is dedicated to the memory of James V. Warren, M.D., Study Director of the Committee on the Role of the Primary Care Physician in Occupational and Environmental Medicine and Study Director Emeritus of the Committee on Enhancing the Practice of Occupational and Environmental Medicine. Dr. Warren's enthusiasm and intellectual curiosity energized both IOM committees. Initially skeptical, Dr. Warren became a fervent advocate for increasing the role of primary care physicians in occupational and environmental medicine. He was an inspiration to the many individuals who worked with him over the past four years.

INSTITUTE OF MEDICINE

REPORT OF A STUDY

ADDRESSING THE PHYSICIAN SHORTAGE IN OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

1991

EXECUTIVE SUMMARY

Occupational and environmental diseases encompass a broad range of human illness, and give rise to the disciplines of occupational and environmental medicine. Occupational medicine addresses the relation between workplace factors (including physical, chemical, biological, social, and psychological factors) and health. Environmental medicine includes most aspects of occupational medicine, and encompasses conditions related to environmental exposure to chemical, physical, and biological agents. Estimates of physician supply in these fields are derived from several sources, largely self-reporting by physicians, and have deliberately not included the newer and less-defined field of environmental medicine. A 1989 estimate commissioned by the Institute of Medicine indicates an additional need for 3,100 to 5,500 physicians, including primary care physicians with special

competence in occupational and environmental medicine. For full-fledged specialists alone, the deficit is estimated to range between 1,600 and 3,500.

The IOM offers six specific measures to alleviate the shortage of physicians in occupational and environmental medicine: (i) increase interest in the field of occupational and environmental medicine among students and trainees; (ii) establish a cohort of centers of excellence to train future teachers, researchers, and leaders; (iii) integrate environmental medicine with occupational medicine training and research programs; (iv) increase funding for faculty development; (v) support residency and fellowship training; and (vi) explore, refine, and adopt new pathways to certification and accreditation in occupational and environmental medicine.

INTRODUCTION

Public concern over potential hazards to health from exposure to chemical and physical agents in the environment has increased remarkably in recent years. Moreover, concern is widespread that the health care system in the United States is unable to respond adequately to the perceived or actual consequences of toxic occupational and environmental exposures. To address those issues, the Institute of Medicine (IOM) of the National Academy of Sciences convened a committee in 1987 to examine the role of the primary care physician in occupational and environmental medicine and to offer recommendations to foster physician involvement in occupational and environmental health.

In its report, *The Role of the Primary Care Physician in Occupational and Environmental Medicine,* [1] the IOM committee identified three specific problems:

- a shortage of specialty-trained physicians to serve as teachers, researchers, and consultants to practicing physicians;

- a lack of readily accessible information on toxic substances in the workplace and the general environment; and
- barriers in medical education and clinical practice that limit physician involvement in the area, including the perception that occupational and environmental health conditions are infrequent, difficult, and time-consuming to diagnose and treat; the existence of significant economic disincentives such as the fragmented and often adversarial workers' compensation insurance system; and the pervasive presence of complex ethical and legal issues.

The IOM committee recommended that "all primary care physicians be able to identify possible occupationally or environmentally induced conditions and make appropriate referrals for follow-up". [1] To achieve that minimum standard of care, the committee concluded that all physicians must know some basic principles of occupational and environmental medicine, know how to take an appropriate occupational and environmental history, understand the physician's role in the major workers' compensation systems, be aware of the ethical, social, and legal implications of the diagnosis of these conditions, and know when and how to report hazards to public health and regulatory authorities.

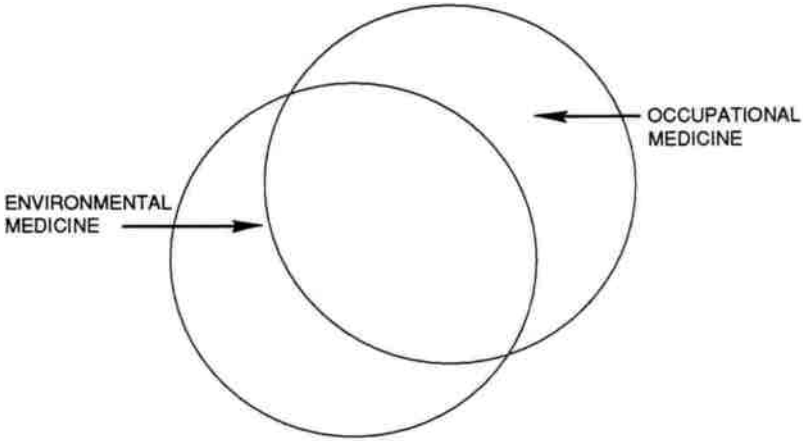
In 1988 the IOM convened a new committee to assign priorities and develop specific strategies for implementing the first committee's recommendations. A subcommittee was formed to address the physician specialist shortage

and the concomitant deficiencies in undergraduate and graduate medical education.* This report is based on the deliberations of that subcommittee. It includes observations of participants at a workshop convened by the subcommittee in 1989 and attended by specialists in internal medicine, family practice, pediatrics, and occupational and environmental medicine, as well as by representatives from government agencies and private foundations. It makes a series of specific strategic recommendations for alleviating the physician shortage in occupational and environmental medicine.

For the purposes of this report, the following definitions of occupational and environmental medicine (OEM) were employed. Occupational medicine is all aspects of the relation between workplace factors (including physical, chemical, biological, social, and psychological) and health, with emphasis on the effects of work on health. Environmental medicine incorporates most but not all aspects of occupational medicine, and encompasses conditions caused or aggravated by exposure to (1) toxic chemical substances, such as formaldehyde and asbestos, that are either man-made or become biologically available as a result of human activities; (2) physical agents, such as radiation or noise, that occur naturally or as result of human activities; and (3) biological substances, such as Legionella spp. in heating and ventilation systems, that become problems as a result of human activities. [2] The domain of environmental medicine also includes the psychological burden of anxiety and concern about environmental

*A second subcommittee on information systems was formed to address the issue of *Meeting Physicians' Needs for Medical Information on Occupations and Environments (Institute of Medicine, 1990).*

hazards--concerns that in some cases outweigh the direct biological threat. Environmental medicine excludes health effects of such behavior as active cigarette smoking, but includes exposure to a wide range of non-occupational physical, chemical, and biological factors (Figure 1).



Occupational Medicine:	All aspects of relation between workplace factors and health.
Environmental Medicine:	Effects on health from exposure to physical agents and toxic chemical and biologic substances which may be natural or result from human activities.

Figure 1. Confluence of Occupational and Environmental Medicine

BACKGROUND

Environmental and occupational diseases encompass a broad range of human illness.[3,4] They include lung cancer and mesothelioma in individuals exposed to asbestos; cancer of the bladder in dye workers; leukemia in persons exposed to benzene; asthma and chronic bronchitis in persons exposed to organic dusts; lung cancer in persons exposed to radon; chronic disorders of the nervous system in workers exposed to certain solvents; kidney failure and hypertension in persons chronically exposed to lead; heart disease in persons exposed to carbon disulfide; impairment of reproductive functions in persons exposed to certain solvents and pesticides; and chronic conditions and disorders of the musculoskeletal system in workers engaged in repetitive motion.

The full nature and extent of the health burden resulting from occupational and environmental exposures remain to be elucidated. The data used to quantify occupational diseases have long been recognized as

inadequate. Moreover, there are simply no estimates available to quantify the total burden of disease caused by exposures in the non-occupational environment--exposures that are generally at much lower levels than those in the workplace but to which a much larger and often more susceptible population is potentially exposed for longer durations and at periods of reduced susceptibility. However, a widespread consensus has emerged that occupational and environmental diseases are a serious but insufficiently recognized problem. [5,6,7,8]

From its annual survey, the Bureau of Labor Statistics (BLS) estimated about 125,000 new cases of occupational diseases in the United States in 1984; [9]in 1988, the BLS reported 240,900 new cases, an increase largely due to a marked rise in disorders attributed to repetitive motion, such as carpal tunnel syndrome and tendonitis, which constituted 48 percent of the cases. [10] For a number of reasons, BLS statistics are felt to be significant underestimates of the extent of occupational diseases. [1] Using a combination of data sources, including the BLS, a study in New York State estimated 35,000 new cases of occupational disease per year in that state alone, which by extrapolation based on relative workforce size would suggest about 350,000 new cases of occupational disease per year in the United States. [8]

Occupational illnesses, injuries, and deaths are costly events, responsible for (1) direct medical costs; (2) indirect costs resulting from lost production, postponed opportunities, and diminished investment; and (3) non-economic costs, resulting from pain and suffering, disrupted careers, and devastated families. Estimates of the direct and indirect costs of occupational disease have

been developed in New York State for five categories of illness (occupational cancer, chronic respiratory disease and the pneumoconioses, cerebrovascular and cardiovascular disease, and end-stage renal failure). [11] These estimates by extrapolation based on relative workforce size suggest that annual costs for occupational disease in the United States exceed $6 billion, with workers' compensation contributing less than 10 percent and tort suit awards less than 5 percent of the total cost.

The morbidity and mortality attributable to non-occupational environmental exposures are simply unknown, as are the associated costs.

THE EXTENT OF THE PHYSICIAN SHORTAGE

In 1972 the National Institute for Occupational Safety and Health (NIOSH) identified a shortage of 3,000 physicians in occupational medicine and a projected national need for 5,400 such specialists.[12] In 1980 the Graduate Medical Education National Advisory Committee (GMENAC) estimated the need by 1990 for 2,300 board-certified occupational medicine specialists,[13] a smaller number from that initially estimated by a technical panel convened by GMENAC. The lowered projection reflected both limitations in availability of medical training and a perception by some that physicians in preventive medicine made little contribution to clinical services.[13,14] A 1988 report by the Bureau of Health Professions (BHPr) of the Health Resources and Services Administration estimated the need in 1992 for 4,830 board-certified specialists, the first estimate to include the need for environmental as well as occupational medicine specialists.[15]

The IOM Subcommittee on the Physician Shortage commissioned a needs estimate that included fully trained *OEM specialists* as well as *OEM clinicians,* the latter defined as primary care physicians with added competence in the field, who would serve as consultants and educators when specialists were not needed or accessible.[16] The resulting estimate of 1989 need by Castorina was 3,100 to 4,700 full-fledged specialists and 1,500 to 2,000 OEM clinicians.[16] The estimate of specialists was based on a need for (1) 127 to 378 academic faculty (1 to 3 faculty per 127 medical schools); (2) 2,400 to 3,600 community specialists (1.0 to 1.5 specialists per 100,000 population); and (3) 550 to 700 physicians in public health agencies (1 physician per 505 local programs serving 100,000 inhabitants and 1-3 per 57 state and territorial health agencies). The need for 1,500 to 2,000 OEM clinicians was taken as 0.75 percent to 1 percent of all primary care physicians (195,538 internists, family practitioners, general practitioners and pediatricians) self-identified in the American Medical Association postal survey in 1987. [17]

Estimates of physician supply in this field have been largely derived from some form of self-report or self-designation on the part of the physician. None has deliberately included the relatively new and less defined field of environmental medicine. GMENAC projections overall for the 1990 supply of preventive medicine specialists, adjusted to the proportion of AMA survey respondents who practice occupational medicine (40 percent), yield an estimate of 2,200 trained specialists. Other estimates of supply include (1) AMA self-report, 2,700; (2) American College of Occupational Medicine membership, 4,800; and (3) Bureau of Health Professions (using board-certification figures for 1987 extrapolated to

1992), 1,550. Based on available data about the number of individuals board-certified to date (1,378) and preliminary data that about 15 percent are no longer active, Castorina estimated for 1989 a supply of between 1,200 and 1,500 active, board-certified or board-eligible occupational medicine specialists.

Table 1 reviews the range of estimates of the physician shortage in occupational medicine. Although the final GMENAC estimates identify only a small deficit (10 percent), the GMENAC preventive medicine specialty (Delphi) panel estimated a deficit of more than 2,000,[15] closer to the BHPr estimate of a shortage of more than 3,000. Because of the limitations of these estimates, including the lack of specific consideration of environmental medicine as part of the field, Castorina estimated a current shortage of 3,100 to 5,500 physicians, numbers that include primary care physicians with special competence in occupational and environmental medicine (OEM clinicians). For OEM specialists only, the deficit would range between 1,600 and 3,500.

Table 1. The Physician Shortage in Occupational and Environmental Medicine

Source	Estimate for Year	Need	Supply (estimated number)	Deficit
GMENAC[1]	1990	2,000[a]	2,200[a]	100[a]
BHPr[2]	1992	4,830[a]	1,550[a]	3,280[a]
Castorina and Rosenstock[3]	1989	4,600-6,700[b]	1,200-1,500[a]	3,100-5,500[b]

[a] Estimate for occupational medicine specialists only.

[b] Estimates for specialists and IOM clinicians (physicians with special competence in occupational and environmental medicine).

[1] Graduate Medical Education National Advisory Committee; see reference 15.

[2] Bureau of Health Professions; see reference 17.

[3] See reference 1.

CURRENT EDUCATION AND TRAINING

The earlier IOM committee concluded that (1) the care of individuals with occupationally and environmentally-related exposures and/or conditions requires mastery of a special body of knowledge, skills, and attitudes by the primary care or other first contact physician, and (2) all levels of medical education -- undergraduate, graduate, and continuing education -- are currently deficient in OEM training. Only 66 percent of U.S. medical schools specifically teach occupational medicine as part of the required curriculum; among schools that require such teaching (about half), the mean required curriculum time over 4 years is 4 hours.[18] A 1987 Association of American Medical Colleges (AAMC) survey of medical school graduates found that occupational medicine was taken as an elective by only 1.4 percent, the least frequently selected elective reported.[19] An AAMC survey in 1988 found that only one of 127 medical schools reported having a required course in environmental health, although 100 schools reported that environmental health concepts

were taught in other courses.[20]A survey of 89 departments of internal medicine with divisions of general internal medicine found that only 20 programs (22 percent) offered clinical occupational medicine experience to medicine residents, elective in almost all cases.[21]

The deficiency in numbers of academic faculty in occupational and environmental medicine is well-documented. In one survey of 102 medical schools, only 59 percent reported having even a single faculty member with special interests in occupational medicine.[22] In another survey of 127 medical schools, only 37 faculty were identified as specializing in occupational medicine.[16]

Specialty training in occupational medicine at the graduate level is largely confined to the 29 occupational medicine residency training programs approved by the Accreditation Council for Graduate Medical Education (ACGME). Most residency programs are based in either schools of public health or medicine, although some are jointly sponsored by schools of public health and medicine. In some instances trainees have dual status as occupational medicine residents and department of medicine fellows. The ACGME does not accredit any occupational and environmental medicine training as a clinical medical subspecialty. It is estimated that about 70 resident physicians are produced each year who are deemed eligible to sit for the certification examination in occupational medicine by the only extant certifying body, the American Board of Preventive Medicine.

The Subcommittee conceives three levels of specially prepared specialists and clinicians to provide needed OEM

training and care (Figure 2). As is described further in the following sections, different levels of certification will recognize their competencies.

	Domain	Certification
OEM Specialist	public health agency full-time faculty research consultation industry	ABPM (OEM) ABIM or ABFP
OEM Clinician	clinical faculty consultation community hospital industry	ABIM or ABFP CAQ in OEM
Primary Care Physician	practitioner	ABIM or ABFP

OEM = occupational and environmental medicine
ABPM = American Board of Preventive Medicine
ABIM = American Board of Internal Medicine
ABFP = American Board of Family Practice
CAQ = Certificate of Added Qualifications

Figure 2. Levels of OEM Physician Expertise

STRATEGIES TO ADDRESS THE PHYSICIAN SHORTAGE

There is a critical shortage of specialty-trained OEM physicians in communities, in academic medical centers, and in public health and related agencies. A severe shortage of front-line primary care physicians who are willing and able to care for patients with occupationally-and environmentally-related illness also exists. To address these shortages, highest priority must be given to interventions that will increase the number of academic OEM specialists who are needed to train sufficient numbers of specialists and primary care physicians to care for a large and currently inadequately served population. The IOM subcommittee recommended the following strategies.

INCREASE INTEREST IN THE FIELD

The physician shortage in OEM cannot be addressed merely with interventions to increase the training and availability of specialists. An important component of the

shortage must be recognized and addressed: insufficient efforts are not undertaken to enhance the attractiveness of OEM as a career option. Although the development of numbers of interested applicants to some training programs, a phenomenon that could worsen if further strong role models in OEM will likely be accomplished by increased training and availability of specialists, it is important that undergraduate and graduate medical trainees be exposed to OEM material. Fundamental OEM concepts should be repeatedly introduced throughout the pre-clinical and clinical years. For example, a validated OEM screening history should be routinely taught in courses about interviewing patients and a clear set of learning objectives in environmental health should be developed for the undergraduate curriculum. Strategies to remove the many economic, legal, and ethical disincentives to the practice of OEM, outlined in the initial IOM report1, should be implemented. At the same time, national education efforts--by both the federal government and medical schools--should be made to increase awareness about OEM and delineate the professional opportunities in this expanding field.

ESTABLISH CENTERS OF EXCELLENCE

The specialty of occupational and environmental medicine is developing during times of limited financial resources and with only a few academic programs currently able to bridge the public health and the clinical aspects of the field. A limited number of centers of excellence--10 to 15--that provide specialized training and

research in occupational and environmental medicine should be established in the near future. They could make the most of scarce resources and seize the opportunity to create a critical mass of qualified faculty, ancillary personnel, and facilities to train future academic faculty. By serving as foci for OEM training, such centers could speed the subsequent diffusion of faculty to other medical schools and residency training programs; a critical factor in achieving the longer term objectives of widespread occupational and environmental medicine training at the undergraduate and graduate level and in meeting overall physician manpower needs in the field.

A major objective of these centers is the training of future teachers and leaders who are well grounded in the clinical, research and teaching components of occupational and environmental medicine. Each specialized center for training and research should be able to (1) develop a program that will attract students with prior or planned attainment of sound clinical training in a primary care specialty (internal medicine, family practice, or pediatrics) who are oriented to academic careers; (2) maintain a productive research base to assure academic visibility of its faculty and research training opportunities for its students; and (3) provide training in the clinical care of a wide range of patients with potential occupationally-or environmentally-related exposures and conditions.

Funding of these centers will require additional federal resources, some of which should be directed to support necessary training and faculty components. There is also potential for funding through partnerships among private sector foundations, organizations, industries, and state governments.

INTEGRATE ENVIRONMENTAL MEDICINE WITH OCCUPATIONAL MEDICINE TRAINING AND RESEARCH PROGRAMS

As defined earlier in this report, environmental medicine incorporates most but not all aspects of occupational medicine and also includes the effects of exposure to a broad range of physical, chemical, and biological agents encountered in the environment outside the workplace. There are at least three important differences between the fields: (1) different populations are at risk, with environmental medicine covering all ages in the population; (2) different levels of exposure and risk exist, with environmental exposures invariably lower, less well-defined, and associated with a less well-developed scientific data base; and (3) different legal and social attributes, e.g., different compensation mechanisms.

There are also important similarities between the two fields. Both disciplines require the physician's skill in being able to characterize exposure and subsequent risks under varying degrees of uncertainty, and both rely on physician knowledge in several broad subject areas that include toxicology, epidemiology, public health, ergonomics, and, to some extent, engineering.

On the basis of these similarities, and the fact that it is the limited number of occupational medicine specialists who are usually called upon to address clinical environmental medicine questions, the committee recommends that the specialty of occupational medicine be formally expanded to include environmental medicine. Accordingly, efforts to deal with the physician shortage should seek strategies to train specialists with clinical,

research, and teaching experience in both environmental and occupational medicine.

In order for the two disciplines to advance together, it will be necessary to modify existing didactic, clinical, and research training of future specialists in OEM. Curriculum in occupational medicine should be altered to draw case material from environmental medicine. For example, teaching industrial hygiene, the mainstay of exposure control in occupational medicine, will need to encompass a broader view of environmental control and technologies. The experiences of practicing occupational medicine physicians and industrial hygienists represent a valuable resource for curriculum design.

Clinical training must also be expanded appreciably, particularly in those occupational medicine training programs that rely solely on workplace practice settings or industrial medicine clinics as clinical training sites. The clinical evaluation of patients with potential environmental conditions is vastly different from the practice of occupational medicine in these settings, which is largely comprised of pre-employment examinations, fitness and disability assessments, and the treatment of work-related injuries. Occupational medicine programs that offer training in diagnostic clinical evaluation of widely divergent clinical problems are most ready to make the transition to training in clinical environmental medicine. Indeed, many of these programs have already begun to respond to the demand from patients and physicians for this service.

Finally, as part of the evolution of expanding the borders of occupational medicine to include environmental medicine, faculty and trainee participation in environmental

medicine research must grow and become an integral part of specialized centers for training and research.

INCREASE FUNDING FOR FACULTY DEVELOPMENT

More funding is needed to strengthen existing academic occupational and environmental medicine programs and to assure adequate start-up resources for newly trained faculty, particularly those engaged in developing new areas of scholarly inquiry in occupational and environmental medicine. Career development awards in other disciplines, such as those in preventive pulmonary medicine and cardiology and the geriatric faculty development academic award programs, can serve as models for providing salary support and resources to persons committed to assuming leadership positions in occupational and environmental medicine in schools of medicine. The appropriate federal agencies, including the National Institute of Environmental Health Sciences (NIEHS), the National Institute for Occupational Safety and Health (NIOSH) and the Agency for Toxic Substances and Disease Registry (ATSDR), should establish comparable awards in occupational and environmental medicine. These awards should be for physicians, both tenured and in tenure tracks, for development of their expertise in occupational and environmental medicine.

In the absence of full-fledged OEM faculty specialists, funding is also needed to address, in the short term, the initiation of training in occupational and environmental medicine in primary care residency training programs. Such funding would allow academic faculty in primary care

specialties to gain special competence in occupational and environmental medicine by participating in intensive training (usually 6 months to 1 year) at an academic center with demonstrated excellence in the field.

In its earlier report, the committee pointed out the need for a strong research base to facilitate faculty development and integration within the traditional medical school context[1]. Time for OEM in the curriculum is not obtainable and residency programs have little likelihood of success without full-time faculty who can compete for valuable course time through their success as faculty members. Such success hinges on the usual criterion of research productivity, and thus an increase in extramural research support in OEM is of central importance to manpower development -- as well as being needed to protect the public against environmental and occupational hazards.

SUPPORT RESIDENCY AND FELLOWSHIP TRAINING

Funding is not presently adequate to support graduate training in occupational and environmental medicine. Only about one-half of available training positions have the necessary funding. Given the need to expand the number of available and funded training positions in OEM, a significant infusion of federal monies is needed in a field that is almost exclusively an outpatient specialty and generates relatively few patient care dollars. In order to maximize the limited additional funds likely to become available, support should be focused on those programs most likely to train academic OEM specialists.

These training funds could be an important component of funding of specialized centers for training and research.

CERTIFICATION AND ACCREDITATION IN OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

Occupational medicine as a specialty in the United States has as its historic academic base an identity with preventive medicine, medical school degree programs, and schools of public health. Certification of individuals is provided only by the American Board of Preventive Medicine, and accreditation of training programs is available through the ACGME's Residency Review Committee for Preventive Medicine. Environmental medicine is a fledgling field with no certifying or accreditation mechanism. Only in the past decade has occupational medicine begun to gain a presence as a clinical discipline within medical schools. It was in this context that the initial IOM committee proposed exploring the possibility of offering certificates of Added Qualifications by the American Board of Internal Medicine (ABIM) and the American Board of Family Practice (ABFP) to diplomates in internal medicine and family practice who had advanced training or experience in OEM. The model for such an approach was the ABIM and ABFP practice of offering a certificate of Added Qualifications in the field of Geriatric Medicine. The subcommittee recognizes that implementing a similar program for OEM is not without controversy. Nonetheless, we recommend this strategy as an effective means to address the shortage of OEM clinicians who are needed as practitioners, consultants, and teachers, particularly in locations not readily served by

academic medical centers. This strategy has the potential to increase interest in OEM among the large pool of primary care specialists by offering a second certificate to those board-certified specialists who participate in one additional year of clinical OEM specialty training. It should be explored by the appropriate boards, including the American Board of Pediatrics (ABP), ABIM, ABFP and ABPM.

The subcommittee also recommends an alternative approach to certification of the full-fledged OEM specialist, a streamlined dual certification program by a primary care specialty Board (ABIM or ABFP) and by the American Board of Preventive Medicine. This process has been adopted by ABIM in three areas, with the American Boards of Pediatrics, Emergency Medicine, and Physical Medicine and Rehabilitation. Figure 3 outlines two pathways by which candidates would qualify for examination by both the ABIM and ABPM; the first is currently available, and the second is an alternative approach that could shorten training with cooperation of the respective Boards.

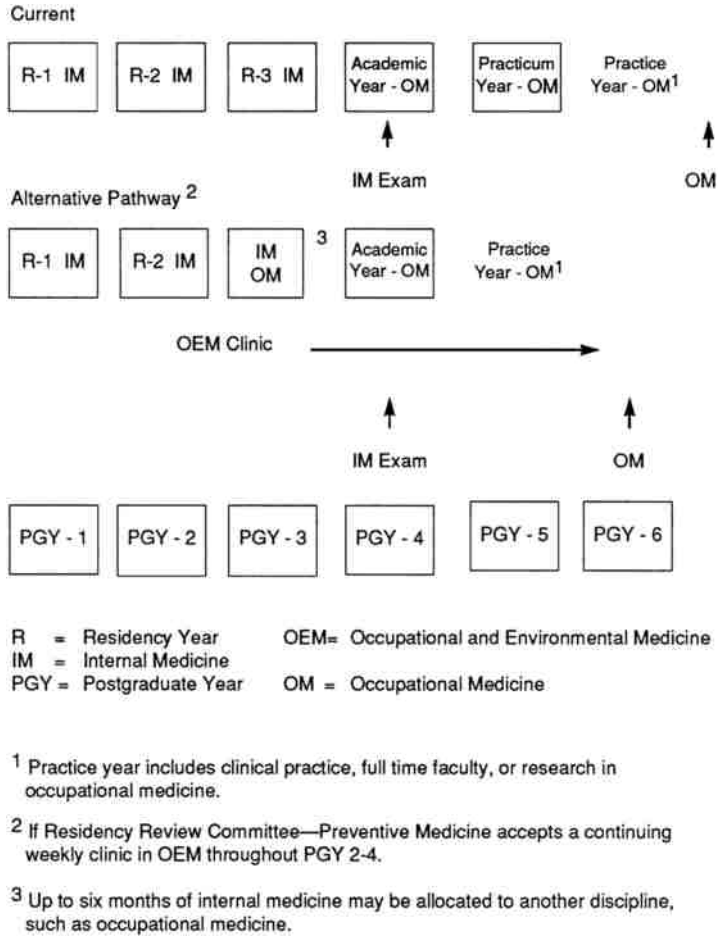


Figure 3. Pathways for Admission to Examinations In Internal Medicine and Occupational Medicine

CONCLUSION

Primary care physicians are inadequately prepared to respond to the growing need for clinical services that address the real and perceived problems of occupational and environmental illness. A recent community-based survey identified physicians as one of the most trusted but least knowledgeable sources of information about chemical risks. [23] This gap between trust and knowledge must be narrowed. Significant changes in medical education are needed at the undergraduate level as well as in the training of clinicians, teachers, and researchers in occupational and environmental medicine.

In specific, the Institute of Medicine recommends (i) increasing interest in the field of occupational and environmental medicine among students and trainees, (ii) establishing a cohort of centers of excellence to train future teachers, researchers, and leaders, (iii) integrating environmental medicine with occupational medicine training and research programs, (iv) increasing funding for faculty development, (v) supporting residency and fellowship

training, and (vi) exploring, refining, and adopting new pathways to certification and accreditation in occupational and environmental medicine. Taken together, these six measures can alleviate the pressing shortage of physicians in occupational and environmental medicine.

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