

## OCCUPATIONAL HEALTH EDUCATION NEW PERSPECTIVES AND CHALLENGE

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### ABSTRACT

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The recent increase in interest by highly industrialized as well as developing countries in occupational health education is a reflection of the new level of consciousness, concern and responsibility for maintaining a safe and healthful work environment. Occupational health education should be oriented largely to understanding biological mechanisms and problem solving, both in relation to current hazards and for future generations. These problems are interdisciplinary and transdisciplinary. Educational units which offer learning experiences must provide the critical mass of multidisciplinary faculty resources, research and clinical facilities, and availability of problems of study. Programs must provide not only proper curricula but flexibility to meet needs of students with different career objectives and variable access to academic programs. The occupational health professions now have new and exciting opportunities for developing creative educational experiences. The role of teacher, curriculum design, basic science components, laboratory, clinical and field experiences, as well as trainee research is discussed.

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The interest of western medicine in injuries and diseases of occupational origin dates back 300 years. Occupational medicine, however, was only formally recognized as a special discipline of medicine, in most industrialized countries of Western Europe and the Americas, after World War II. In the United States, university programs for training occupational physicians were initiated in the late 1940's and early 1950's. Several years later, university programs were started for training industrial hygienists, safety professionals and nurses. During this time certifying bodies were created to set standards for professional educational qualifications for these disciplines.

It should be clearly understood that the quality and effectiveness of occupational health practice is dependent on the availability and quality of occupational health education. This includes occupational medicine, nursing, industrial hygiene, safety, toxicology - all of the disciplines of occupational health. Like research in occupational and environmental health, occupational health education is an interdisciplinary enterprise - a transdisciplinary effort.

In the United States, society's concern about environmental hazards, their effects on human health and the quality of life, have been translated into several

important statutes and regulatory measures. They include: the Clean Air Act of 1963; the Air Quality Act of 1967; the Federal Coal Mine Health and Safety Act of 1969 and its amendments; the Occupational Safety and Health Act of 1970; the Safe Drinking Water Act of 1974; the Federal Water Pollution Control Act of 1970; the Federal Food, Drug and Cosmetic Act with numerous amendments; and most recently, the Toxic Substances Control Act of 1976. During the past decade or more, expanded federal agencies were given the responsibility for carrying out the mandates of these Acts. These laws and regulations increased the need for professional and scientific personnel in federal and state agencies, in industries required to meet standards, in private institutions and university units which undertook to carry out the problem solving and scientific research demanded by the laws and regulations.

#### PROFESSIONAL MANPOWER DEFICITS

Two studies of manpower needs in occupational health in the United States were made under the sponsorship of NIOSH; one in 1973 following a survey of industries for current and future requirements based upon the objective of providing a basic minimum of occupational safety and health services<sup>1</sup>. Projections were made on the basis of the needs of eight types of industry including government. These were manufacturing, retail trade, finance, construction, transportation and utilities, service, agriculture and government. These estimates are shown in Table 1. Another study was done more recently which indicates that between 1977 and 1980 an additional 100 physicians will be

TABLE 1  
Estimates of manpower needs in occupational health.

Manpower	Need
Physicians, specialists board certified or qualified	1 200
Physicians with some industrial health training	4 200
Industrial hygienists	4 000
Safety specialists	4 700
Nurses - trained and certified	8 500
Nurses with some occupational health training	20 000
Occupational health technicians	9 000

required and 600 nurses<sup>3</sup>. Both surveys have biases related to design and response. It should be noted that except for the well organized occupational health programs, industries have been obliged to fill their physician and nurses needs with professionals with very limited training or no training at all in occupational medicine and nursing. Hence, the real need for qualified professionals is much greater than the apparent demand. The requests for qualified personnel continue to be substantial. While the specialities cited comprise the required core group, there are other professional disciplines needed in effective occupational health programs. They include toxicologists,

environmental quality specialists for air, water, solid waste, radiation control, epidemiologists, biostatisticians, informational resource specialists, health program administrators, etc.

### PROGRAM DEVELOPMENT

The initial graduate education programs for occupational medicine were spinoffs of research programs and intimately dependent upon research faculties and their resources. This was the case at the University of Cincinnati, the University of Pittsburgh, the University of Michigan and more recently at Harvard University and the program in New York City involving New York University Institute of Environmental Health and the Mt. Sinai School of Medicine. Some curricula stressed the academic aspects of instruction with classroom and laboratory courses, conferences and seminars. Current programs offer curricula containing the clinical components of a medical residency, including occupational medical practice, which are carefully combined with the didactic classroom and laboratory work. The objective of an occupational health program is to train health professionals with a high level of clinical, scientific, professional and administrative competence for service and research.

#### Essential resources for a training program

What are some of the essential resources necessary for a productive occupational health training program? They should include<sup>4,5</sup>:

- a productive research program;
- a critical mass of faculty capabilities in the occupational and environmental health disciplines;
- adequate facilities for academic, field and clinical work;
- access to problems for study;
- industrial and community resources with occupational health programs and occupational health needs;
- participation of other academic disciplines such as the behavioral sciences, humanities, law, business and management disciplines, economics, and of course, engineering and other physical science disciplines.

#### Program at the University of Cincinnati, Educational Resource Center

One of the first occupational health training programs was initiated at the University of Cincinnati in 1947. It now includes a multi-level program in occupational medicine, occupational health nursing, industrial hygiene, occupational safety, occupational toxicology, occupational epidemiology and biostatistics, occupational dermatology and an educational materials and methods unit.

The occupational medical program involves: (1) the training of medical students, (2) a full-time, two-year residency and graduate student program, (3) a mini-residency program, (4) short courses and (5) an outreach program.

Professional training in occupational medicine starts at the medical student level. At the University of Cincinnati, in the second year of the medical school curriculum, there is a 55-hour course entitled "Preventive Medicine in Clinical Practice". About one half of the contact hours are devoted to the environmental and occupational factors in the pathogenesis of illness. Included in this is ten hours of an introduction to biostatistics and epidemiology. The course provides an introduction into diagnosis, treatment and prevention of occupational and environmental disease (14 hours). The students develop skills in taking an occupational history and eliciting critical environmental exposure information. Eight hours are devoted to the problem of heart diseases and stroke, four to alcoholism and drugs, seven to infectious diseases, five to nutrition, malnutrition and obesity, and two hours to sports injuries. One review and four examinations take five hours. Elective program for the third and fourth year offers 21 elective subjects: aerospace physiology, applied psychiatry, behavior in organizations, clinical toxicology, environmental medicine clinic, environmental sanitation, epidemiology - advanced studies course, epidemiology of infectious disease, ergonomics, experimental design, health service administration, in-plant occupational medical practice, labor problems, management, medical clinics (varied), occupational dermatology, pathology of cellular injury, radiation health, regression analysis, and role of trade unions in occupational health.

One hundred and ninety-two students each year are now involved in this required course. The medical students are also offered numerous elective opportunities. These include occupational medicine clerkships in industries, in hazard evaluation studies, in occupational medicine practice, in diagnostic consultation clinics, in pulmonary medicine, in the research laboratories of the Department.

The aim of the residency program is to develop proficiency in diagnosis and management of illnesses common both to primary care and occupational medicine, as well as the practice of preventive medicine in an industrial setting. It provides training in the planning and implementation of health care and surveillance programs and the use of epidemiologic methods to study the factors which influence frequency and distribution of occupational illness and accidents. It provides training in industrial hygiene and toxicology for the physician who must be prepared for making policy decisions about occupational hazards and for designing control programs which use the knowledge of these disciplines.

The two-year residency and graduate fellowship program combines clinical components of a medical residency program with didactic classroom and laboratory work. The current required courses and electives are listed in Table 2. The two-year program and the preparation of a thesis will lead to a M.Sc. degree. It offers a flexible curriculum and fulfills the needs of those who aspire to either a clinical career, a research and academic career, or an administrative career - or a combination of these. The number of residents has been growing significantly in the past three years and in 1978 there were 11 full-time residents in this program and two part-time residents.

TABLE 2  
Required courses for residency program in occupational medicine.

Course	Academic quarters	Required credits
Environmental health seminar	3	3
Environmental hygiene technology	3	9
Special topics in occupational medicine	3	6
Critical problems in occupational medicine	3	6
Clinical toxicology	1	1
Biostatistics	1	4
Epidemiology	1	3
Toxicology	1	3
Clinical assignments	8	24

One of the new innovations is the Mini-Residency Program. This is addressed to needs of physicians who aspire to a limited scope of training and who are unable to devote one to two years in full-time training. The program consists of an initial intensive period of academic work over a period of three weeks. The curriculum is outlined in Table 3. The three-week program includes course work in industrial hygiene, toxicology, epidemiology, biostatistics,

TABLE 3  
Mini-residency curriculum.

Course	Hours
Introduction and orientation	2
Clinical occupational medicine - lectures	34
Dermatology	7
Psychiatry	5
Orthopedics	4
Pulmonary	6
Cardiology	2
Ophthalmology	2
Radiology	2
Physical medicine	3
Audiology	3
Occupational health clinics	10
Pulmonary function laboratory	8
Practice of occupational medicine	19
Governmental activities	4
Environmental hygiene technology	14
Clinical toxicology	8
Animal toxicology	6
Environmental toxicology	3
Environmental quality management	2
Biostatistics and epidemiology	6
Open discussion and reviews	4
Total	120

occupational hazards, ergonomics, administration, environmental quality management, etc. There are two scheduled revisits for three to five days during each of the following two years for additional course work and for problem solving conferences. The resident has an assigned advisor with whom he maintains correspondence during the two-year period. The resident is required to conduct a study of his or her own choosing on an occupational health problem. Guidance for this effort is provided by the advisor.

In 1977 and 1978 two classes totalling 48 students were underway. Each class represented a wide range of professional interests. They were young men and women with major responsibilities for occupational health programs in industry and government agencies but with no academic training. There were several doctors in mid-career who spent a number of years as occupational physicians in small and large industries; there were personnel physicians for universities and for large cities; physicians in private general practice and family practice; and residents in pulmonary disease.

At the continuing education level, there are short courses which are given on specific subjects in occupational medicine. These may run two days to one week in length and may cover a wide range of subjects. For those aspiring to academic and research careers, there is a Ph.D. program in environmental medicine.

In order to satisfy the manpower needs for qualified professionals with different levels of knowledge and competence, we believe that it is necessary to offer a range of curriculum opportunities. Programs must provide not only properly focused learning experiences, but flexibility to meet the needs of students with different career objectives and with variable access to academic programs. In occupational medicine, a multi-track effort can include a medical student program, a full-time two-year residency program, a part-time residency program, a mini-residency program, a short course program and an outreach program, and for those who aspire to research careers, a Ph.D. in environmental and occupational medicine.

#### EDUCATIONAL RESOURCE TRAINING CENTERS

One of the most important steps which has been taken by the federal government in the United States is the creation of the Educational Resource Center program which NIOSH has initiated.

The objective of the ERC program is to "provide a mechanism for combining and expanding existing activities and arranging for coordinated multidiscipline and multilevel training and continuing education in occupational safety and health under a single grant, servicing a geographic region. The program is intended to afford an opportunity for full and part-time academic career training, for cross training of occupational safety and health practitioners, for mid-career training in the field of occupational health and safety and for access to many different and relevant courses for students pursuing various degrees"<sup>2</sup>. It is a rather well conceived program which intends to support

undergraduate and graduate training at all levels, continuing education in the form of short courses and to develop and expand outreach programs. The major thrust of the centers is to train practitioner specialists in occupational medicine, nursing and industrial hygiene and safety, as well as to train specialists in related essential disciplines for occupational health work such as radiologic health, epidemiology, biostatistics, and toxicology. Ten centers are now being supported. They are in various stages of development and they include those listed here:

1. University of Arizona
2. University of Cincinnati
3. Harvard University School of Public Health
4. University of Illinois School of Public Health
5. Johns Hopkins University School of Public Health
6. University of Minnesota, Mayo Clinic and University of Iowa
7. New York University and Mt. Sinai School of Medicine
8. University of North Carolina School of Public Health
9. University of Texas School of Public Health
10. University of Washington

There are now 53 physicians in full-time residency programs at the centers and at one unit not included in the center program: University of Arizona - 1, University of Cincinnati - 11 (Mini-Residency - 48), Harvard University School of Public Health - 15, University of Illinois School of Public Health - 7, Johns Hopkins University School of Public Health - 5, University of Minnesota - 1, Mt. Sinai School of Medicine - 4, University of North Carolina School of Public Health - 1, University of Texas School of Public Health - 6, University of Washington - 1, and University of California, Irvine - 1.

The ERC center in Cincinnati includes training curricula in occupational medicine, occupational health nursing, industrial hygiene, safety, occupational toxicology, occupational epidemiology and biostatistics, occupational dermatology (Figure 1). In addition, an educational method and material development unit provides a learning resources facility for developing syllabi, for the design and

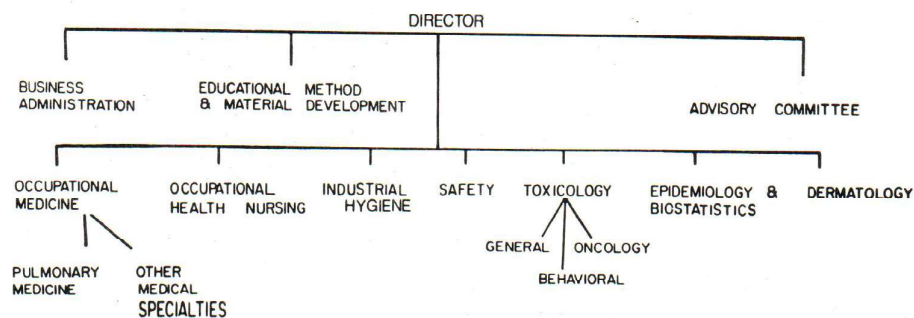


FIG. 1 - The organization of the University of Cincinnati Occupational Safety and Health Training Resource Center.

production of audiovisual and self-teaching materials for all of the seven component programs as well as programs elsewhere in the country.

With the initiation of the ERC program, the occupational health professions now have an excellent opportunity for developing creative educational experiences; for developing new forms of research and problem solving education. This, in combination with opportunities for attracting well qualified students will go a long way to meet the long standing professional manpower deficits. These events reflect the changing attitude concerning the responsibility and accountability of federal and regional government, industries and trade unions, as well as the professional and scientific community, for maintaining a safe work environment. They are complimented by a growing strong interest of young people at universities and of professionals in mid-career for the occupational health profession.

It is essential to say a few words about general education in environmental and occupational health. We have discussed problems relating to professional and scientific manpower needs, and some of the solutions offered by graduate education. That represents only part of the educational challenge. In order to really attain our goals for a safe workplace and a healthful environment, we do need a well informed and appreciative citizenry, a people which understand the important environmental issues of this nation, a citizenry which can help make and implement decisions about control of hazards. To do this, teaching about environmental and occupational health issues must start in the early primary grades and extend into secondary school. Discussion of environmental issues including occupational health, must become an essential part of college and university curricula, in science oriented as well as non-science oriented programs.

Finally, what is the role of the educator in this flux; in this changing system of values and priorities? The responsibility of the educator is to be sensitive and responsive to the needs of society and the professions in determining more precisely the goals of the profession and the goals of the program. The needs of society and the profession change. The educational objectives must reflect and accommodate to those changes.

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