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Improving Education and Resources for Health Care Providers

by Maureen Paul[1] and Laura Welch[2]

Workers and citizens are turning increasingly to the health care system for information about occupational and environmental reproductive hazards, yet most primary care providers and specialists know little about the effects of occupational/environmental toxicants on the reproductive system or how to evaluate and manage patients at potential risk. Although it is unrealistic to expect all clinicians to become experts in this area, practitioners should know how to take a basic screening history, identify patients at potential risk, and make appropriate referrals. At present, occupational and environmental health issues are not well integrated into health professional education in the United States, and clinical information and referral resources pertaining to reproductive hazards are inadequate. In addressing these problems, the conference "Working Group on Health Provider Education and Resources" made several recommendations that are detailed in this report. Short-term goals include enhancement of existing expertise and resources at a regional level and better integration of information on occupational/environmental reproductive hazards into curricula, meetings, and publications of medical and nursing organizations. Longer term goals include development of a comprehensive, single-access information and referral system for clinicians and integration of occupational and environmental medicine into formal health professional education curricula at all levels.

Introduction

Scientists and the public are concerned about the effects of occupational and environmental exposures on reproduction, ranging from reduced fertility to adverse pregnancy or postnatal outcomes. According to conservative Federal estimates, 20 million workers in a variety of industries in the United States are potentially exposed each year to reproductive hazards on the job. The National Institute for Occupational Safety and Health (NIOSH) ranks reproductive disorders among the 10 leading occupational illnesses and injuries in the nation (*1*).

Exposures that can adversely affect reproduction or development include physical agents such as heat and ionizing radiation, teratogenic viral infections such as cytomegalovirus and rubella, metals such as lead, and a number of organic solvents and pesticides (*2,3*). Strenuous work may increase the risk for preterm delivery (*4–7*). Each year several hundred new compounds are added to the 30,000 compounds and 4 million mixtures already in commercial use (*8*). Of 79,000 chemicals listed in NIOSH's *Registry of Toxic Effects of Chemical Substances*, 5063 (16%) demonstrate some evidence of reproductive or developmental toxicity (*9*).

Employers, workers, and citizens look to primary health care providers for advice regarding occupational and environmental hazards. The Institute of Medicine (IOM) recently published a document emphasizing the vital role of the primary care provider in occupational and environmental medicine (*10*). The IOM reported that new scientific methodologies are emerging to better evaluate exposures and toxicant-induced health effects and that public awareness of adverse effects has increased due to workplace and community right-to-know laws and heightened media attention to issues of environmental contamination. The environmental movement has assumed a local character, demanding responsiveness from community-based practitioners to citizen concerns, and labor unions are significantly involved in increasing worker awareness about occupational safety and health issues. The IOM concluded that the demand for clinical services outstrips the current resources of specialists in the field of occupational and environmental medicine (*10–12*). With only about 1500 board-certified occupational health physicians in the nation, the majority of whom are employed by industry, the need to educate academicians and primary care providers

[1]Departments of Obstetrics and Gynecology and Family and Community Medicine (Occupational Health Program), University of Massachusetts Medical Center, Worcester, MA 01655.

[2]Division of Occupational and Environmental Medicine, George Washington University, Washington, DC 20037.

Address reprint requests to M. Paul, Department of Obstetrics and Gynecology, University of Massachusetts Medical Center, 55 Lake Avenue North, Worcester, MA 01655.

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about this issue is obvious. Obstetrician-gynecologists, family practitioners, nurse practitioners, perinatal nurses, and midwives interact with patients at critical times when concerns about potentially deleterious occupational or environmental exposures are paramount. By identifying potential problems and implementing effective counseling and intervention strategies, informed health professionals can help to prevent adverse reproductive and developmental outcomes.

Yet, to date, occupational and environmental health issues in general, and reproductive and developmental toxicology in particular, are not well integrated into medical- or nursing-school curricula, residency training, or continuing medical education programs. National organizations involved in the education of health professionals do emphasize some factors that can broadly be described as environmental, such as alcohol consumption and smoking, but give little attention to evaluation of workplace or community exposures. In addition, as emphasized by the IOM, hard-pressed primary care providers need easily accessible, comprehensive information resources to evaluate and manage patients with occupational or environmental health concerns (*13*).

Problems in Clinical Risk Evaluation and Management

Clinical evaluation and management of patients with occupational or environmental reproductive concerns involves the following basic components, many of which are foreign to the traditional medical work-up.

a) Detection of potential hazards, i.e., to what agents are the patient and partner potentially exposed, and is there evidence to suggest that these agents are reproductive or developmental toxicants? This step may involve an occupational/environmental history, interpretation of material safety data sheets (MSDSs), use of computer databases or other resources that provide information about potential reproductive or developmental health effects, and assessment of effect biomarkers (e.g., physical findings, semen analysis).

b) Exposure assessment, i.e., what is the actual timing and doses of exposure? In addition to information derived from the history, this step may involve collection and interpretation of environmental and biological monitoring data.

c) Risk estimation, i.e, what is the estimated risk to the patient given the characteristics of the toxicant(s), exposure conditions, and other potentially interactive risk factors (e.g., medical conditions; prior reproductive history; demographic, nutritional, genetic factors; couple-dependent factors)? While quantitative risk estimates may be available for exposures such as ionizing radiation and teratogenic viral infections, risk estimates for most chemical exposures will be qualitative and uncertain or often infeasible.

d) Risk management, i.e., patient counseling, provision of medical recommendations, and suggestions for hazard control measures when necessary. This step may require communication with employers, unions, industrial hygienists, public health officials, regulatory agencies, workers compensation boards, insurance companies, and others.

For each of these steps, special training is needed and expert judgment required. Even so, a number of factors makes clinical evaluation and management of these patients difficult. First, there is considerable scientific uncertainty about occupational/environmental reproductive or developmental health risks. Very few of the chemicals in widespread commercial use have been adequately tested for reproductive or developmental effects. Most available information derives from experimental animal studies, and toxicological expertise is necessary to determine the relevance of these data for humans.

Second, the Occupational Safety and Health Administration (OSHA) has developed comprehensive standards for only four substances based in part on consideration of reproductive effects: lead, ethylene oxide, dibromochloropropane (DBCP), and ionizing radiation. While the Environmental Protection Agency (EPA) examines available information on reproductive and developmental effects when setting maximum contaminant levels for public drinking water, these data are commonly limited. In the absence of specific standards, clinicians have little idea what constitutes a "safe" level of exposure for patients.

Third, there is a lack of well-coordinated and practice-oriented information resources for clinicians. Most clinicians are not aware of existing information resources, and, even if they are, several calls to different agencies or referral services are often required to obtain comprehensive information. Most currently available toxicological databases are neither clinically oriented nor easily accessible to health care providers. In addition, most databases concentrate on developmental effects, with less attention paid to reproductive or male-mediated effects.

Fourth, counseling patients about potential reproductive or development risks is exceedingly difficult, particularly in the face of scientific uncertainty. Patients may be exposed to multiple toxicants in the home, community, and workplace, and numerous other factors may interact to affect risk. In addition, complex social, ethical, political, economic, and cultural determinants may profoundly influence patients' perceptions of risk. Counseling during pregnancy is especially difficult, since issues of fetal health may conflict with a woman's need for full employment and right to informed, autonomous decision making.

Fifth, while the traditional model of treatment of disease typically relies on medications and/or lifestyle changes, management of occupational and environmental reproductive risks often requires interventions that are not under the control of the clinician or patient. These measures include worker training, substitution of toxic chemicals with safer ones, engineering controls, and provision of effective personal protective equipment. Clinicians are often asked by employers to make recommendations regarding job modifications or transfer/removal of workers. Yet, most clinicians do not know about hazard control measures or about effective ways to interface with employers, unions, or public health officials. Moreover, clinicians are often unaware of the legal and social consequences of their medical recommendations.

Proposed Solutions: An Agenda for the 1990s

A primary goal for the 1990s should be to reduce occupationally and environmentally induced adverse reproductive and developmental outcomes through the active involvement of knowledgeable primary health care professionals. In discussions at the Woods Hole conference, our working group developed a set of short-term and longer-term goals for meeting the needs outlined in the introduction to this paper. These recommendations, also in keeping with recommendations by the IOM (*10,13*), include development of regional centers of expertise in clinical management of occupational and environmental risk; provision of a readily available, comprehensive, single-access information resource for practitioners; and enhancement of educational opportunities in the area of reproductive toxicology for health professionals at all levels of development including medical and nursing students, residents, faculty, and practitioners.

Clinicians need information to manage the reproductive hazards faced by their patients. The committee concluded that, at the present time, there are few fully trained experts in the area of reproductive hazards who can provide clinical management information or run training courses for primary care clinicians. Several specialties have some expertise. For example, genetic counselors and Teratogen Information Services (TIS) counselors know how to help men and women make decisions in areas with scientific uncertainty, but most do not know the toxicological literature in occupational or environmental medicine nor how to assess and control hazards. Occupational medicine clinicians know a great deal about toxicology in general and about control of hazards, but they have not been specifically trained in the basic biology and pathophysiology of reproductive hazards. Obstetricians and gynecologists know how to manage high-risk pregnancies but cannot identify the pregnancies at risk from occupational and environmental exposure.

At the same time, we cannot expect primary care clinicians, as a group, to become expert in this area. Reasonable expectations are that these clinicians take a brief occupational/environmental history, recognize an individual or couple at potential risk for adverse reproductive or developmental outcomes, and identify patient concerns. They would then consult with or refer to a regional expert for further evaluation and management of patients or counseling about concerns. Of course, some primary care clinicians will choose to learn more and become regional experts, but the panel agreed that it is unrealistic to expect all primary care providers to learn comprehensive assessment and management of these complex problems.

Currently, some resources exist to help clinicians manage reproductive risk, and many practitioners are close to being regional experts in this field. A concerted effort of directed training courses on occupational and environmental reproductive hazards and coordination of resources can produce a network of experts and resources in a reasonably short period of time.

Improving Information Resources for Clinicians

Comprehensive care of the patient with occupational or environmental reproductive health concerns requires an efficient, multidisciplinary approach. Primary care providers and specialists must have access to comprehensive and accurate information resources and to local referral sources such as toxicologists, occupational/environmental medicine specialists, industrial hygienists, regulators, legal advocates, and others. Optimally, a single telephone call should put the whole wheel in motion.

Development of a comprehensive information system is a longer-term goal and is discussed in detail below. For the interim, the working group developed a plan for enhancement of existing expertise and resources at a regional level, to be implemented over a shorter time frame.

Enhancing Regional Resources. The first step in the development of regional resources will be a survey to determine existing resources and needs, which the working group agreed to develop and disseminate. The survey will be sent to NIOSH-sponsored Educational Resource Centers (ERCs), occupational medicine residencies, faculty scholars funded under the new faculty development program of the National Institute of Environmental Health Sciences (NIEHS), TIS, Poison Control Centers, clinics of the Association of Occupational and Environmental Clinics (AOEC), and the few existing reproductive toxicology centers. This survey will determine if these organizations currently provide consultation on occupational/environmental reproductive hazards, who or what the center uses as a resource, what additional resources the center would need to answer reproductive hazard questions, and if the center would send staff to a training course on evaluation and management of occupational/environmental reproductive risks. A summary of needs and recommendations from the committee will accompany the surveys, and the responses will be used to develop priorities for training.

Following this needs assessment, the committee recommended the development of "train the trainers" courses. Courses would be developed for various sectors such as occupational health specialists, family practitioners, genetic counselors, nurse midwives, and obstetrician-gynecologists, with the goal of improving regional resources. The committee proposed that the initial course be developed for occupational medicine specialists, to be followed by ones for the TIS and various other health specialties. The committee felt that occupational medicine specialists, and in particular those affiliated with the AOEC and NIOSH-sponsored ERCs, would be able to provide broad consultation without extensive additional training or resources, and so would serve as regional resources in the shortest period of time. Their work would then be quickly enhanced by training of other designated sectors. Particular emphasis must be placed on reaching practitioners from or working in communities of color. The working group specifically recommended the development of a course for the National Medical Association (NMA); the NMA has a high percentage of obstetrician/gynecolo-

gists, and such training would enhance resources to African American communities. Involving providers from Latino, Asian, and other communities of color will require specific outreach efforts.

"Train the trainers" courses could be taught over 2–3 days, in conjunction with national meetings of the American College of Occupational and Environmental Medicine (ACOEM), the American Public Health Association (APHA), and other organizations. The Agency for Toxic Substances and Disease Registry (ATSDR), NIEHS, and NIOSH have been funding a program that can serve as a model for a "train the trainers" course, known as the EPOCH-Envi program. The first priority would be to identify a group of educators to run the course and to be actively involved in development, implementation, and evaluation. This course could also be used as a forum to pilot test and refine case studies, develop curricula for medical and nursing schools, and develop core questions on occupational and environmental reproductive hazards that could be incorporated into a standard history form for obstetrician-gynecologists, nurse midwives, nurse practitioners, and others.

Course participants would serve as experts at regional centers, and these experts could then train other specialists in their areas. They could implement different but complementary curricula for primary practitioners, genetic counselors, and others. The materials for these courses might be developed or reviewed by the core group of educators discussed above. Every effort must be made to involve educators from communities of color in the design and implementation of curricula and to develop approaches and materials that are language-specific and culturally sensitive.

Finally, regional resources would be quickly enchanced by institution of an apprenticeship program, with an exchange between TIS, Poison Centers, AOEC clinics, the ERCs, and others. Each group could learn special skills from the others. The educational goals and objectives and the curricula for such apprenticeships would need development before such an exchange took place.

Developing a National Network. The Institute of Medicine (*10,13*) has recently proposed the development of a network of multidisciplinary occupational/environmental regional information centers accessible to clinicians via a toll-free telephone line and a national Occupational and Environmental Resource Center to coordinate, provide quality assurance, and administer the regional centers. The working group endorsed this concept as a long-term goal to improve information resources. Some specific functions of the national center would include administering grants or contracts to regional centers, developing standardized information resources, establishing communication systems with regional centers for data dissemination and collection, and developing mechanisms for advertising the system with national medical organizations. Some functions of the regional centers would include providing a 24-hr toxics information line, disseminating printed materials, providing referrals, ensuring access to appropriate consultants, and collecting local case surveillance data. One idea proposed by the Institute was to integrate the regional center functions into existing Poison Control Centers.

While we generally support the national/regional centers model proposed by IOM, certain considerations are necessary to assure that the centers appropriately respond to the unique issues raised by reproductive and developmental hazards. First, obstetricians do not necessarily turn to Poison Control Centers for information about toxicant-induced reproductive risks, but rather to TIS. There are currently 34 such services in the United States. This network has a long history of counseling patients and clinicians about reproductive risks and is making concerted efforts to better integrate information on occupational and environmental exposures into their services. In fact, their 1990 international meeting was devoted to this topic. Second, existing toxicology databases need to be expanded to include more information on occupational and environmental toxicants pertinent not only to teratogenesis but also to other reproductive end points and male-mediated effects. Third, even occupational medicine specialists are not necessarily well-educated in issues related to reproductive risk. Appropriately trained reproductive hazard specialists should be integral personnel in regional centers. Fourth, a rapid clinical response network is of paramount importance, particularly for pregnant patients.

In keeping with these considerations, we make the following proposals to augment the model put forth by the Institute of Medicine:

a) Calls to the regional center that present a reproductive or developmental risk problem should be handled by a reproductive hazard specialist at the center or, alternatively, by personnel at regional TIS working in conjunction with the center. These personnel would need to be trained under the model outlined above.

b) Calls requiring multidisciplinary clinical and consultative services should be referred to local clinics that are members of AOEC. These clinics have the distinct advantage of offering or having access to a multitude of resources necessary to clinically evaluate and manage patients (e.g., industrial hygienists, toxicologists, occupational/environmental medicine specialists). In most instances, one call to an AOEC clinic will set the wheel of clinical management in motion, an advantage not associated with the use of TIS lines that can inform about hazards but cannot do exposure assessments, suggest control measures, or perform other steps necessary to address the problem comprehensively and expeditiously. The Association of Occupational and Environmental Clinics already has quality assurance mechanisms in place and should ensure that criteria for membership and continued quality assurance include comprehensive and timely response to reproductive concerns. As discussed above, providers in these clinics would be targeted for the initial "train the trainers" courses to ensure appropriate clinical management of occupational and environmental reproductive health problems.

c) The national center should have a discrete unit within it that specializes in reproductive hazards. Some functions of this unit might include the development of comprehen-

sive information databases on occupational and environmental reproductive and developmental hazards (in conjunction with the National Library of Medicine and others), dissemination of clinically relevant multilingual written educational materials for callers to regional centers, development and implementation of training programs to train reproductive hazard specialists to work both in and outside of regional centers, and establishment of communication networks with regional centers to provide assistance with complex problems and facilitate information transfer.

The IOM plan is obviously a long-range, ambitious one, and funding for the proposal is not yet forthcoming. In the meantime, there are many projects that can be undertaken to improve clinical information resources and to lay some groundwork for the IOM plan. In addition to the ideas already presented for improving regional resources, other feasible projects might include the following: *a*) development of a national computerized directory of reproductive hazard information resources (the University of Massachusetts Reproductive Hazards Center has begun this project) and *b*) improvement of reproductive and developmental toxicology databases.

Improving Education for Health Care Providers

It is unrealistic to expect that the primary care provider will develop expertise in all of the disciplines necessary to address occupational and environmental reproductive health problems (e.g., toxicology, epidemiology, industrial hygiene, genetics, ergonomics). The Institute of Medicine proposes that "at a minimum, all primary care physicians should be able to identify possible occupationally or environmentally induced conditions and make the appropriate referrals for follow-up" (*10*). We propose in addition that primary providers (including nurses) have the basic awareness and expertise to facilitate primary prevention of reproductive and developmental health problems.

Educational objectives to accomplish these goals might include the following: *a*) promote integration of the occupational and environmental history into the initial evaluation of each patient, *b*) teach health care professionals the basic principles of reproductive toxicology and the steps involved in clinical risk evaluation and management, *c*) familiarize health professionals with available information and referral resources regarding reproductive hazards (e.g., computer databases, TIS, occupational/environmental clinics, government agencies), *d*) enhance effective interaction between health professionals and employers, appropriate consultants, and third parties involved in compensation and disability plans, *e*) encourage preconception counseling and teach counseling methods that promote informed patient decision making and health protective behaviors, *f*) sensitize health professionals to the legal, social, ethical, and cultural dimensions of the problem and their involvement in it.

As short-term goals, the committee recommended several specific steps to better integrate information about occupational and environmental reproductive hazards into curricula, meetings, and publications of specialty societies in obstetrics and gynecology, genetics, occupational/environmental medicine, and nursing. Each member of the committee representing a specialty society agreed to present the recommendations in this report and to make the following specific suggestions:

- M. Greene will submit a report to the American College of Obstetricians and Gynecologists (ACOG) and introduce the idea of adding information or questions on occupational and environmental reproductive hazards to PROLOGUE, to the regular President's column in women's magazines, and to the ACOG-recommended medical history form. In addition, he will propose that ACOG provide more educational sessions on the topic at its annual meeting. The committee agreed that any questions to be added to a standard history form need to be pilot tested.
- G. Gillen will submit a similar report to the American Academy of Family Physicians.
- M. Smith-Deichmann from the Illinois TIS will recommend that a short course be developed and offered at the annual meeting of the National Society of Genetic Counselors. In addition, recommendations from this conference will be taken to the Organization of Teratogen Information Services annual conference with suggestions for acting on the recommendations.
- L. Paine will lead a discussion on the topic at a meeting of nurse midwife educational program directors in May 1992. Occupational and environmental reproductive hazards are already part of the core competency exam for nurse midwives; Paine will suggest that the directors review how the subject is taught, with the recommendations of this meeting in hand. Paine will also report on this meeting to the Association of Teachers of Maternal and Child Health, in her role as a board member.
- The American Association of Occupational Health Nurses also has a core curriculum on reproductive health issues. The committee recommended review of this curriculum and its integration into broader nursing school curricula.
- L. Welch will report to the AOEC Board and make recommendations on the development of a curriculum for AOEC clinics.
- J. Lewis will report on this meeting to the Association for Obstetric, Gynecologic, and Neonatal Nurses (NAACOG). Lewis will suggest that the Board incorporate content on occupational/environmental reproductive hazards into the association's professional and consumer education efforts.

Integrating this topic area into existing medical and nursing school curricula is more difficult and represents a longer-term goal. Recognizing the difficulty of introducing new curricula into already-overloaded medical and nursing education programs, some of this material can be integrated into existing required courses. For example, on the basic science level, pharmacology course material might include information on the toxicokinetics of important occupational and environmental reproductive toxicants such as lead. Pathophysiology courses could address

the effects of toxicants on the male and female reproductive systems and the conceptus. Occupational and environmental issues could be better integrated into existing public health courses in epidemiology and preventive medicine. In addition, the course on physical diagnosis is an optimal means for introducing the skills necessary to obtain an adequate occupational and environmental history. Eventually, one might envision a required course in occupational/environmental medicine in the undergraduate years and clerkships that combine didactic with practical experience in occupational/environmental health clinics and workplaces/communities.

Current trends in medical and nursing school curricula development afford the opportunity to introduce concepts of occupational and environmental health, with a new emphasis on problem-based learning. The Harvard University School of Medicine has developed a program called the New Pathway, and the Kellogg Foundation is funding several other medical schools to implement similar programs. Because reproductive hazards cross traditional disciplines of developmental toxicology, preventive medicine, and obstetrics/gynecology or urology, the subject is best taught in the context of a problem-based system. To enhance its inclusion in medical and nursing school curricula, the working group recommended the development of five standard reproductive hazard cases for use in problem-based learning situations.

At the graduate level, occupational and environmental reproductive risk issues could be integrated into core curriculum guidelines and programs for family practice, obstetrics/gynecology, pediatric, and internal medicine residents. At the University of Massachusetts Medical Center, for example, we are proposing to expand the core curriculum for obstetrics/gynecology residents to include a segment on occupational and environmental reproductive hazards. Proposed course content includes mechanisms of reproductive and developmental toxicity; research methods; exposure assessment methods; information about specific toxicants; approaches to clinical evaluation and patient management; information resources; and legal, ethical, and policy issues. Residents will be encouraged to integrate their own patient cases into the course sessions.

At the postgraduate level, 1-year fellowship opportunities could be offered to develop consultants with specialized expertise in occupational/environmental reproductive and developmental toxicology. While the fellowship would not result in Occupational Medicine board eligibility, certification of added competence might be offered by the American Board of Obstetrics and Gynecology or other specialty boards.

Finally, continuing medical education programs for practitioners can take a variety of forms including grand rounds, postgraduate courses sponsored by national medical organizations, and accredited self-learning programs. The working group also briefly discussed how these activities could be supported and identified several agencies that could be approached for funding. Many other sources are possible, but the following ideas are provided for those who want to pursue the concepts outlined in this report.

The NIEHS has a new program for faculty development in occupational and environmental medicine, and the working group recommended that one such fellowship be devoted to reproductive hazards. In addition to the fellowship, this program could support the development of training courses at the recipient institution, with the goal that these courses be made available to other schools as well. The Agency for Toxic Substances and Disease Registry (ATSDR) has responsibility for developing educational programs in the environmental health area for health professionals and might provide support for these recommendations. Development of problem-based learning cases could be supported by existing programs under the

Table 1. Curriculum needs for occupational/environmental hazards.

Curriculum type	Target audience	Comments
Expert-level "train the trainers" courses (2–3 days)	Occupational/environmental nurses and physicians, nurse midwives, obstetrician-gynecologists, Teratogen Information Services (TIS) staff, genetic counselors	Done initially on basis of needs assessment survey. Special outreach to National Medical Association and other providers from or working in communities of color.
Postgraduate continuing medical education programs	Primary care practitioners and specialists, TIS and genetic counselors	Integrate into programs and meetings of health professions organizations. Special outreach to primary providers serving communities of color.
Postgraduate fellowship (1 year)	Occupational/environmental health and reproductive health specialists	Seek certification of added competence from specialty boards.
Core curriculum guidelines and programs for residents	Residents in family practice, obstetrics/gynecology, pediatrics, and internal medicine	Encourage organizations responsible for residency education to integrate occupational/environmental issues into core curricula and implement model programs.
Undergraduate nursing and medical education	Students in schools of nursing, midwifery, and medicine	Emphasize problem-based learning. Develop at least five problem-oriented cases and other faculty support materials so that "nonexpert" faculty can present cases. Materials should sensitize students to health, socioeconomic, legal, cultural, and ethical issues.

National Fund for Medical Education, NIEHS, ATSDR, or NIOSH. The office of Maternal and Child Health at the National Institutes of Health might be a source for development of core curricula for maternal and child health programs.

Conclusion

Scientific and public concern about occupational/environmental reproductive hazards has increased dramatically in recent years, yet, at present, most clinicians are unprepared to effectively evaluate and manage patient concerns about these issues. Although primary care clinicians cannot be expected to become experts in occupational and environmental medicine, they should know how to take an initial screening history, identify patients at potential risk for adverse reproductive outcomes, and make appropriate referrals for further evaluation and management.

Accomplishment of these objectives will require integration of occupational and environmental issues into medical and nursing education curricula and the development of improved information and clinical resources for health care providers. This report of our working group emphasizes expansion of regionally based resources and integration of these issues into health professional education at all levels (Table 1). Many of the initiatives proposed in this report are attainable in the short term and deserve serious attention and support.

This paper reflects the ideas and insights of the members of the Working Group on Health Provider Education and Resources at the Occupational and Environmental Reproductive Hazards Conference in Woods Hole, MA. We thank all working group members for their participation including Maxine Garbo, Gary Gillen, Michael Greene, Claude Hughes, Judith Lewis, Robert McCunney, Linda Rae Murray, Donna Orti, Lisa Paine, Kathleen Rest, and Maureen Smith-Deichmann.

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