

The Medical Consequences of Radiation Accidents and Nuclear War

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THE EXISTENCE OF fissionable materials raises the specter of radiation accidents. Partial nuclear reactor core meltdowns have occurred already; the accident at Three Mile Island in 1979 was the fourth such episode to have occurred in America since 1952. Further, "significant release" episodes have taken place in five states, and the potential exists for radiation accidents during storage, transportation, and reprocessing as well as for radioactivity release in weapons accidents and during all stages of the nuclear fuel cycle.

As awareness of the threats posed by nuclear materials has grown in the general population, there has been a corresponding awareness in the medical community of the medical problems that would exist as a result of radiation accidents. And the profession is beginning to realize—and to seek to correct—its inability to respond effectively to the medical consequences of radiation accidents.

This growing sensitivity to radiation accidents and their medical consequences has prompted a corresponding sensitivity to the nuclear arms race, the threat of nuclear war, and the medical consequences of a war involving nuclear weapons. Many physicians, after studying the probable effects of a nuclear war, agree with Howard Hiatt, M.D., F.A.C.P., dean of the Harvard School of Public Health, that nuclear war is "the greatest public health hazard of all time." As such, its prevention is imperative.

Summary of Positions

- I. The American College of Physicians recognizes that medical education must be improved to increase and update the information physicians receive about the medical consequences of radiation accidents and urges that medical care professionals be trained to triage and to treat blast, radiation, and burn injuries. Furthermore, the College accepts its share of the profession's responsibility to promote educational materials about the medical consequences of radiation accidents.
- II. The American College of Physicians endorses increased public education about the medical consequences of radiation accidents.
- III. The American College of Physicians believes that there can be no adequate medical preparedness for

the devastating medical consequences of nuclear war; prevention is the only reasonable medical response to the hazards posed by nuclear weapons. To foster prevention of nuclear war, the American College Physicians endorses increased professional and public education about the medical consequences of nuclear war. Also as a means of preventing nuclear war, the American College of Physicians urges the federal government to continue and to emphasize international dialogues on mutual nuclear disarmament.

Rationale

- I. The American College of Physicians recognizes that medical education must be improved to increase and update the information physicians receive about the medical consequences of radiation accidents and urges that medical care professionals be trained to triage and to treat blast, radiation, and burn injuries. Furthermore, the College accepts its share of the profession's responsibility to promote educational materials about the medical consequences of radiation accidents.

The medical profession gradually is becoming aware that it is not prepared for a large-scale radiation accident. An expression of this inadequacy was dramatically revealed following the accident at Three Mile Island (TMI). Gordon K. MacLeod, M.D., F.A.C.P., former Secretary of Health for Pennsylvania, wrote about the medical consequences of TMI in the March 1980 *Forum on Medicine*:

We knew that a large release of radioactive iodine into the atmosphere from a nuclear power reactor would result in the public's inhaling, ingesting, or otherwise absorbing amounts which could produce acute, continuing, or late thyroid effects ranging from mild thyroiditis to hypothyroidism to benign thyroid neoplasms, nodules, and cancer. Fetal hypothyroidism associated with cretinism is of particular concern due to the inverse relationship between iodine uptake and age.

One of the major problems practitioners faced in attempting to handle such a medical emergency was the inadequacy of factual information, much of which was initially fragmentary or nonexistent. Because of conflicting reports in the press, patients trusted neither industry nor government. They turned naturally to physicians, who are in a position of high public trust and are expected by the lay public to be knowledgeable about all health matters. Practicing physicians, who were inundated with telephone calls from their patients requesting interpretation of the accident's significance in terms of their per-

* Members of the Health Policy Committee for the 1981-1982 term were Lawrence Scherr, M.D., Chairman; Samuel P. Asper, M.D.; Steven C. Beering, M.D.; Daniel D. Federman, M.D.; Thomas F. Frawley, M.D.; Paul F. Griner, M.D.; Ceylon S. Lewis, Jr., M.D.; Robert H. Moser, M.D.; and John T. Sessions, Jr., M.D. Suzanne Stone served as the staff liaison to the committee for this paper. The position paper was adopted by the College Board of Regents on 16 April 1982.

sonal health, did not, however, have the knowledge or expertise to offer advice on nuclear matters.

Physicians and other medical care professionals have inadequate knowledge that would enable them to treat the short- and long-term consequences of radiation accidents. Dr. MacLeod has stated that his department and the entire medical emergency network faced the possibility of a "whole systems failure" during TMI. In an editorial in the March 1982 *American Journal of Public Health*, Dr. MacLeod wrote:

Public health preparedness has been tested in a nuclear reactor accident and has been found wanting. . . . If we fail to learn the lessons of TMI, we shall be unprepared to protect the public's health during the next nuclear reactor accident, wherever it occurs. We cannot ignore the unpredictable catastrophes that may accompany our embrace of nuclear power regardless of our opinion about the wisdom of that embrace; if and when catastrophes occur, we must be prepared to deal with them as expeditiously as possible and, at the same time, to document their impact upon the health of the public.

Dr. MacLeod urges that state health departments prepare for radiation accidents. Such preparation includes establishment and training of radiation health units, collection of baseline data (measurements of thyroid hormone deficiency in newborns, fetal death rates, neonatal and infant morbidity and mortality rates, known exposure to carcinogens, cancer incidence and prevalence within circumscribed areas around nuclear facilities, occupational history, demographic characteristics, and symptoms of psychological distress of the population at risk), from the area around a nuclear facility before it becomes operational, development of a "radiological emergency response plan to handle the health aspects of a nuclear accident," and establishment of "preventive, protective, and treatment programs against radiation effects." It would be prudent if health departments, after establishment of such units, tested their operations with periodic "dry runs," as is done commonly for all emergency medical units.

The medical profession's preparation for radiation accidents also includes increased education about radiation injuries and their treatment. The medical consequences of radiation accidents, including the biology and pathology of radiation injury and the treatment of acute radiation syndrome, are described in an article in the November 1981 *New Physician*. In summary the authors cautioned that this presentation should not be taken as a claim "that the present health care delivery system can deal with a nuclear emergency." Their conclusion was a call to medical schools to follow the lead set by Stanford University's School of Medicine to teach "the medicine of acute radiation exposure."

The American College of Physicians recognizes that physicians need to receive more information about the medical consequences of radiation accidents and about the most effective medical treatment for those consequences, and in this light, urges medical schools and organizations to accept that responsibility. The College urges that such educational efforts be broad in scope and be extended to all medical care professionals. The College

urges that medical care professionals be trained to triage and to treat blast, radiation, and burn injuries. Furthermore, the American College of Physicians, as an organization devoted to continuing medical education for physicians, accepts its share of this responsibility for promoting improved education about the medical consequences of radiation accidents.

As an initial response to that responsibility, the College offered a symposium on "The Medical Consequences of Nuclear Accidents and Nuclear War" at its 1982 Annual Session. Materials from this symposium will be made available as educational resources. Additionally, the bibliography attached to this position paper can serve as an excellent beginning point for physicians' self-education about the medical consequences of radiation accidents.

II. The American College of Physicians endorses increased public education about the medical consequences of radiation accidents.

The event at TMI also pointed out the lack of public preparedness to handle the medical consequences of radiation accidents. Studies demonstrate a 113% increase in the number of persons near TMI using sleeping pills, 88% in those using tranquilizers, 14% greater alcohol consumption, and 32% increase in cigarette smoking. It is clear that radiation accidents and their largely unknown threats produce stress, which in turn produces its own medical consequences. Increasing the public's education about radiation accidents and their medical consequences, resulting in increased knowledge about prevention and treatment, might reduce these consequences, resultant stress, and the medical problems caused by tension and stress.

The American College of Physicians recognizes that physicians are ideally suited to contribute to public education in this area. As Drs. Lown, Chivian, Muller, and Abrams have stated in the 19 March 1981 *New England Journal of Medicine*,

[Physicians] are widely respected as teachers and are accustomed to interpreting complex scientific findings for their patients and for the public at large. They are trained to devise practical solutions to seemingly insoluble problems. Their educational role in society on all issues pertinent to health and life is widely recognized.

Thus, the American College of Physicians, accepting the profession's role in public education, endorses increased public education about the medical consequences of radiation accidents. The College encourages individual physicians to become active in public education programs and to seek to fulfill their patients' images of them as sources of information about the medical consequences of radiation accidents.

III. The American College of Physicians believes that there can be no adequate medical preparedness for the devastating medical consequences of a nuclear war; prevention is the only reasonable medical response to the hazards posed by nuclear weapons.

To foster prevention of nuclear war, the American College of Physicians endorses increased professional and public education about the medical consequences of nuclear war. Also as a means of preventing nuclear war, the American College of Physicians urges the federal government to continue and to emphasize international dialogues on mutual nuclear disarmament.

The medical consequences of nuclear war have long been topics of concern for physicians. In 1962 *The New England Journal of Medicine* printed a series of articles outlining the probable medical effects of a nuclear war. Physicians and many medical organizations then became active in civil defense programs. Recently, as nuclear arms production has increased, SALT II talks have failed, and the technology has been modified to devise weapons more likely to provoke than to deter nuclear war, many physicians have begun re-examining the likelihood of a nuclear war and its probable medical effects.

The Congressional Office of Technology Assessment has conducted a study (with the assistance of the Congressional Research Service, the Department of Defense, the Arms Control and Disarmament Agency, and the Central Intelligence Agency) that found that the devastation from a one-megaton atomic weapon exploded in central Detroit would include 70 square miles of property destruction, 250 000 fatalities, and 500 000 injuries. After such an explosion, care of the injured would present a medical task of unprecedented magnitude and would likely be ineffective.

Hospitals, physicians, and nurses tend to be concentrated close to the center of cities. In its hypothetical example of a nuclear explosion in Detroit, the Office of Technology Assessment projected that of the 18 000 hospital beds in and around Detroit, no more than 5000 would remain relatively undamaged. Only 1% of the injured would be able to be accommodated. Not only would medical facilities be destroyed, but medical personnel would be among the dead and wounded. After the nuclear blast at Hiroshima, 65 of the city's 150 physicians were killed outright, and most of the remainder were wounded. Of the 1780 nurses, 1654 were dead or too badly injured to work.

It is clear that the vast numbers of severely burned and otherwise injured victims would be looking in vain to the surviving medical care professionals for treatment. The demand for treatment would rapidly surpass the sorely depleted supplies. An example of the personnel and materials required to care for one patient suffering from third-degree burns over 85% of his body emphasizes the impossibility of caring for a city full of burn victims. Dr. Hiatt has described such a case; admitted to a special burn unit, the 22-year-old man received 281 units of plasma, 147 units of packed red blood cells, 37 units of platelets, and 36 units of serum albumin. He underwent six separate surgical procedures. And, despite these ministrations from scores of highly trained specialists, the patient died on the thirty-third day. A single nuclear blast would result in tens of thousands of similar severe burn injuries.

The health care system would be assaulted also by the need to provide short-term treatment for untold numbers of fractures, organs ruptured from excess pressure, hemorrhage, and other trauma from flying glass and debris and long-term treatment for the injuries from radioactive fallout. The great majority of those exposed to radiation would die, either from central nervous system syndrome or from vomiting, diarrhea, hemorrhage, and septicemia. Some people would, however, survive to seek treatment for their stress, trauma, fatigue, and burns. They would suffer from contaminated wounds, increased skin cancer, degenerative disease, accelerated aging, and increased incidences of infertility, congenital malformations, still births, neonatal deaths, and genetic disease.

Additionally, radiation-resistant strains of bacteria, fungi, and viruses might multiply and mutate, spreading uncontrollable infestations leading to epidemics of such diseases as plague, hepatitis, polio, encephalitis, typhoid, and dysentery.

These facts argue that medical disaster planning for nuclear war, unlike that for radiation accidents, is futile. There is no possible adequate medical response to a situation where hundreds of thousands of people would be injured and ill, most hospitals destroyed, most medical personnel killed, and most medical supplies unavailable. The American College of Physicians has drawn the following conclusion from these facts: prevention is the only reasonable medical response to the hazards posed by nuclear weapons.

The College believes that education is a key to prevention of nuclear war and endorses increased professional and public education on the medical consequences of nuclear war. The College notes that medical schools at the University of Chicago, Harvard University, the University of Oregon, and the University of Washington offer courses on the health aspects of nuclear weapons and thermonuclear war. The College encourages other institutions to include similar electives in their curricula and urges that such education be extended to all medical care professionals and to the public.

Medical organizations must accept their share of responsibility for promoting educational materials about the medical consequences of nuclear war. The attached bibliography makes reference to a statement adopted in December 1981 by the American Medical Association that it help educate the federal government and "prepare informational materials to educate physicians and the public on the medical consequences of nuclear war." And the College, in preparing this bibliography and in sponsoring the symposium on "The Medical Consequences of Nuclear Accidents and Nuclear War," has taken the first steps toward meeting its responsibility to the profession and the public.

The American College of Physicians hopes that public education of the medical consequences of nuclear war will raise the level of consciousness of the American people. The College also hopes that similar steps will be taken to elevate the awareness of the citizens of the Soviet Union and of all other nations bearing nuclear arms so that political leaders throughout the world will come to

the bargaining table with identical mandates and incentives for success.

Finally, the College, in keeping with its stance on the value of prevention in health promotion, urges the federal government to continue and emphasize international dialogues on mutual nuclear disarmament. The American College of Physicians makes this recommendation in recognition of the truth in German pathologist Rudolf Virchow's (1821-1902) call for medicine's involvement in public policy:

Should medicine ever fulfill its great ends, it must enter into the larger political and social life of our time, it must indicate the barriers which obstruct the normal completion of the life-cycle and remove them. Should this ever come to pass, medicine, whatever it may then be, will become the good of all.

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