RESPONSE OF HEALTH PROFESSIONALS IN A RADIATION EMERGENCY

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My background is in the surgery of trauma and burns. I will discuss the role of emergency medical services in the care of patients with radiation exposure or injury.

Every state has an emergency medical service system with regional and local structures under a state director. Nationally, the AMA Commission on Emergency Medical Services, of which I am Chairman, has been established by the AMA Board of Trustees and is made up of representatives from 23 organizations, all having commitments to emergency medicine. More than a dozen physicians' organizations are represented, as are organizations involving nurses, emergency medical technicians, hospitals, and public health programs. The federal government is represented by the Federal Emergency Management Agency (FEMA), the Department of Health and Human Services, and the Department of Transportation. Another organization intimately involved in emergency medical care is the American Burn Association, which has identified more than 125 burn facilities throughout the United States.

A program under development, the Advanced Burn Life Support Course, will provide physicians, nurses and allied health personnel in community hospitals with guidelines for managing patients during the first hours after they are injured by fire, chemicals, electricity or radiation. The program also will provide community hospitals with guidelines for management of radiation emergencies.

Each of you has a strong commitment to the prevention and management of radiation emergencies. I am not an expert in radiation emergencies, but I ask you now to take on the role of a physician or nurse in a small community hospital and assume that you have just enrolled in the Advanced Burn Life Support Course. I will confine my comments to the section on initial management of radiation emergencies. By assuming this role, you may learn what is essential for the initial care of radiation emergencies.

RADIATION EMERGENCY PLANNING

We learned from the Three Mile Island episode some eight years ago that there may be zones of both intense and peripheral radiation and that hospitals within the intense area must have a response

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mechanism. Further study of the problem indicates that exposure may be by inhalation, contact, and/or ingestion and the direction of the plume or cloud is variable. Hospital personnel must be aware of these factors.

The basic need is not simply to develop a response to nuclear energy emergencies, but to develop an awareness that today we use isotopes in industry and in medicine and that the use or transport of these isotopes also may result in emergencies. These facts multiply the possibility that we may be faced with a patient who has been exposed to radiation. We are obligated to respond.

The survey manual of the Joint Commission on Accreditation of Hospitals (JCAH) states that every hospital must have written policies and procedures specifying the scope and conduct of patient care provided in the emergency department. The manual states further that such care may include radiation monitoring and designation and preparation of space for evaluation of the patient. These include control of the air circulation system to prevent the spread of contamination; decontamination of the patient through appropriate cleansing; and containment, labeling, and disposing of wastes and containment materials.

Thus, hospitals need a radiation emergency plan, which begins with identification of appropriate personnel, identification and location of equipment, identification of a decontamination area, and organization of a treatment protocol.

The key individual in such a plan is a radiation safety officer, who may be a radiologist or radiotherapist, surgeon, nuclear medicine specialist, clinical pathologist, or other staff member. The plan also requires a team of physicians, nurses, and technicians who can initiate assessment, stabilization, and decontamination of a patient exposed to radiation.

It has been estimated that the total cost of equipping a radiation emergency facility is less than $300. Much of the equipment is available from a hospital supply source: gowns, gloves, shoe covers, plastic bags for recovery of irrigating solutions.

The decontamination facility should be a room with a separate entrance to allow isolation of the patient. Most emergency departments can designate a room that can be isolated without disrupting the traffic flow to the remainder of the department. Isolation can be achieved by roping off areas of access to the decontamination area and utilizing heavy contractor's paper to line the floors. Showering and bathing facilities and means to control ventilation to prevent airborne contamination also are necessary. The presentation of Dr. Newlon Tauxe considers this subject in greater detail.

Planning requires that the hospital be able to determine the nature of the emergency, have an established decontamination team, have a designated facility, develop notification procedures, and, probably most important, conduct periodic tests and exercises. Like major fires and explosions, a radiation disaster may necessitate the treatment of any number of irradiated patients--one or two or many--that could cause an overload to a system and result in poor medical care.

RADIATION INJURIES

In general, ionizing radiation may be divided into forms involving mass (alpha and beta particles and protons) or forms involving only energy (gamma or x-rays). Pathophysiology of the injuries produced relates to the maturity or immaturity of the cell. Although blood cells are vulnerable to ionizing radiation, muscle and nerve cells are relatively resistant.

It is unlikely that radiation burns to the skin will appear during the first hours after exposure. Such burns are usually localized and appear as thermal injuries days or even weeks after exposure. The skin response to radiation of 200 to 300 rads is epilation. After exposure to a maximum of 2,000 rads, radionecrosis may appear within days.

Whole body radiation affects the bone marrow and the gastrointestinal tract. Massive doses cause gastrointestinal symptoms in the first 24 hours. Nausea, vomiting, enteritis, and leukopenia indicate the patient received whole body radiation. Leukopenia progresses to bone marrow destruction in days or weeks. The absence of these findings is significant in identifying severity of exposure.

MANAGEMENT OF THE RADIATION VICTIM

Management of the victim utilizes the same principles employed for every emergency patient. Initially, the ABCs (airway, breathing, cardiovascular system) are evaluated. Once the ABCs are stabilized, plans for decontamination and monitoring can proceed. A secondary evaluation for evidence of associated injuries, such as fractures or injuries of the internal organs, also is necessary. Finally, measures that will prevent further injury to the patient and minimize exposure to hospital personnel are addressed.

All of the patient's clothing must be removed and placed in a plastic bag. Samples should be obtained from every orifice to identify the route of exposure and contamination. Sampling from the patient is a relatively simple process requiring cotton swabs and saline to sample the nasal orifices, ears, mouth, and skin. Samples of excreta are collected in plastic bags and appropriately labeled.

Emergency treatment common to all seriously injured patients is followed by radiologic diagnosis and decontamination. A survey of the levels of contamination should be carried out with appropriate

instruments by trained hospital staff. Dirt is removed by gentle bathing, and this also removes sources of contamination. The washings are saved and evaluated. Repeated monitoring is necessary to determine if the source of contamination has been removed.

Open wounds should be carefully and thoroughly cleaned. Embedded fragments should be removed by forceps or a pulsating water jet, and all recovered materials should be salvaged, packaged, and appropriately labeled for assessment by the monitoring team.

The eyes are irrigated with saline solution, beginning at the medial aspect of the eye and extending to the lateral surface to avoid the lacrimal ducts and possible incorporation of radioactive material. If the eardurm is intact, ears are also irrigated.

The early management of radiation injuries caused by ingestion or inhalation, for the most part, should be done only after consultation with a radiation injury center such as the Radiation Emergency Assistance Center-Training Site at Oak Ridge, Tennessee (615-481-1502 or 576-3131). A burn center within a region may be the radiation injury resource center.

SUMMARY

The management of radiation injuries in community hospitals can be achieved by planning, and periodic practice with this plan will ensure appropriate response if an emergency arises. A radiation plan identifies key personnel, equipment, and a designated facility. An understanding of the different types of radiation exposure that are possible should lessen the anxiety of emergency room staff and ensure efficient response. Decontamination of the patient is carried out <u>after</u> assessing the ABGs and sources of radiation. Re-evaluation following decontamination will identify residual foci of radiation. Radiation resulting from inhalation or ingestion requires consultation with radiation experts and, possibly, transfer to a radiation emergency center. The Advanced Burn Life Support Course will provide a resource for the training and education of hospital staffs in the United States and Canada. The course will include a section on radiation emergencies.