Dealing With Radiological Disasters

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ABSTRACT: **Dealing with the victims of a radiological disaster can be daunting for nurses who have little experience in this area. Knowing how to set up a response area that protects the hospital and staff from radiation exposure coupled with treatment of victims is the goal. Accomplishment of these goals requires a knowledge base of the different types of exposure and the treatment of each. (J Radiol Nurs 2014;33:100-104.)**

KEYWORDS: **Radiological disaster; Contamination; Decontamination; Radiation exposure; Acute radiation syndrome.**

INTRODUCTION

There has been much in the media about radiological disasters for at least 20 years. From Three Mile Island (World Nuclear Association, 2012) to the tsunami that destroyed the Fukushima power plant in Japan (International Atomic Energy Agency, 1998-2013), radiological disasters and terrorist attacks are infrequent but an area of nursing that must be explored and understood. The reality becomes greater for nurses working in hospitals with victims arriving that may possibly result in hospital contamination. Nurses in the emergency department (ED) caring for patients who are exposed to radiation must be skilled, experienced, and fully understand their role (Yin et al., 2012). This article will discuss the role of the hospital-based nurse in responding to such situations.

Radiological disasters are complex and usually fall into one of six categories (Adelstein, 2005, as cited in Arizona Department of Health Services, 2012, p. 3; DeLuca & Adelman, 2009):

1. Detonation of explosives with dirty bombs containing radiological materials,
2. Placement of radiation materials in public places,
3. Attacks on nuclear sites or release of radiation from a power plant,
4. Accidents involving vehicles transporting radioactive isotopes,
5. Contamination of water or food supplies, and
6. Detonation of a nuclear explosive device.

Staff at the institution receiving radiological disaster victims may have to deal with two types of victims: those decontaminated at the scene and untreated victims arriving without prior care who maybe contaminated, so it is important for staff to understand the possible types of contamination that they may encounter. The first is radiation in the form of dust, solid particles, or liquid that attaches to the victim's skin or clothing. This can be detected by monitoring and may consist of alpha, beta, or gamma emitters. The second is inhalation, contamination of wounds, or digestion of dust, solid particles, or liquids. This is a true emergency because the contact with internal organs can result in tissue destruction. Finally, the patient may experience acute radiation syndrome, which is high exposure to gamma rays, such as an X-ray. The patient will not be radioactive and offers no danger to the staff (Downstate Medical Center, 2008).

ED RESPONSE

The Radiation Emergency Assistance Center [REAC/TS] (n.d.) has steps that must be followed when the ED receives a call about a radiation accident. The first step is to check the credibility of the call. If the call is not received through the usual emergency notification channels, then verification of the accident must be made through those proper channels. If the call is

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credible, then information must be gathered for proper preparation and determination of the number of victims.

Unknown Exposure Versus Known Exposure

When there is doubt about a person's contamination status, the person is assumed contaminated on arrival for treatment in the decontamination room. The United States Nuclear Regulatory Commission (United States Nuclear Regulatory Commission [USNRC], 2013) recommends that, if possible, clothing from the patient be removed and placed in a bag before entering the ED. Because this may not always be the case, patients with known exposure are taken directly to the decontamination room, undressed, and their clothing bagged. Because contamination can be present on the skin or in an orifice or wound from ingestion or inhalation, emergent care is provided first. This may take the form of washing the patient, lavage of the stomach, or oral chelating agents (DeLuca & Adelman, 2009). The main goal of decontamination of the victim is to prevent radioactive materials from being further inhaled by the victim or ingested. Once the patient is stabilized, the radiation status of the patient is determined. Patients who enter the ED and deemed no longer contaminated receive standard basic care with no special precautions need to be taken.

Setting Up Triage and Decontamination

Preparing to receive victims of radiological disasters and protecting the hospital staff and building from further contamination are also important. The Radiological Emergency Response team is notified and dresses appropriately. A team may consist of the following personnel: a radiological physicist, physician, nurse, and radiology technologist. A decontamination room, preferably with a separate ventilation system, should be set up close to the entrance. Without such a separate system, the ventilation should be turned off from the ED to the rest of the hospital. Security should be available for control of family members, media, and onlookers. Equipment is brought into the decontamination area and plastic placed on the floor to prevent transfer of radiation into clean areas of the ED via shoes, stretchers, and wheelchairs, as well as other equipment being moved from one area to the next (USNRC, 2013). During transport, the patient, stretcher, and pillow should be covered with a blanket (Downstate Medical Center, 2008). The ED nurse who is trained as part of the response team will assist with procedures, collect specimens, perform physical assessments, provide direct patient care, and monitor radiation contamination levels. Care of patients who are not contaminated continues throughout the rest of the ED by nurses who are not trained to be on the response team.

INPATIENT CARE FOR THE RADIATION VICTIM

The number of incoming casualties, severity of injuries, and causes of injuries may influence how much patient management is needed and the focus of medical treatment (DeLuca & Adelman, 2009). In general, healthcare personnel in the hospital are not familiar with the standards of care for the treatment of patients who were exposed to different types of radiation (Veenema & Toke, 2007; Williams & Williams, 2010). Understanding what is involved and the potential risks associated with caring for such patients must be made clear to the receiving units. It is also important for nurses to understand that caring for mass casualties without increasing harm often entails changing accepted nursing standards of practice (Veenema & Toke, 2007). With an influx of patients admitted with radiation exposure and lack of qualified personnel, duties may expand beyond the normal scope of practice for nurses in a radiological disaster. However, there is nothing in the extant literature on exactly how the role of the nurse changes in the hospital setting (Yin et al., 2012). These changes may also occur in the role a hospital unit may normally have, such as when an intensive care unit is used as an operating room (Veenema & Toke, 2007).

Caring for a patient with a radiation exposure and determining the prognosis requires specific nursing interventions. One must look at the patient's laboratory values, diagnostics, clinical manifestations, and type of radiological exposure. A Geiger counter, which detects particles from a radioactive substance (Shampo, Kyle, & Steensma, 2011), may be used to detect if the patient has been adequately decontaminated. The Geiger counter is moved directly over the patient and throughout the room to detect whether any radioactive materials were inadvertently transported into the unit. The complete blood count results can be used as an indicator of patient prognosis because radiation lowers lymphocyte production that indicates a high exposure and poor prognosis (Pae, 2006). The first CBC should be obtained as soon as possible while in the ED so comparisons can be made after transfer to the receiving unit. Physical assessment findings may reveal alterations such as changes in mental status, cardiac dysrhythmias, respiratory distress, and/or impaired tissue and skin integrity (Iroquois Memorial Hospital, 2003). Potassium iodide is the treatment of choice when a patient has been exposed to radioactive iodine as it inhibits the uptake into the thyroid gland (Centers for Disease Control and Prevention, n.d.;