

Transportation Emergency Preparedness Program

Hospital Care Provider Job Aid for Radiological Exposure and Contamination

The hospital staff's incident operations is key to the success of the setup, management, recovery, and public information for the incident. Assigning staff positions to perform the specific tasks needed to care for and treat the patient is the primary goal. Listed below are three assignment functions that can be used as guidance for the preparation, setup, and management of a radiologically contaminated patient. The hospital support staff from any or all of the following departments can be assigned the preparation, setup, and patient management tasks (Maintenance, Engineering, Nuclear Medicine, Security, Housekeeping, Administration, Physicians, Nurses, Radiation Safety Officer, and Public Information Officer).

Preparing the Radiation Emergency Area (REA)

The steps listed below are suggested to minimize the spread of contamination:

Outside REA

- Setup portable structure and establish a water supply
- As needed patient management systems
- Ensure the following equipment is available to receive the patient(s)
 1. Gurney(s) with multiple sheets
 2. Emesis basins/collection containers
 3. Survey meter(s) and, as available, dosimetry
 4. Waste container(s) lined with plastic bags

Inside REA

- Identify the treatment room(s) location
- Protect the floor surfaces with paper covering along the patient receiving area and pathway to treatment
- Remove unnecessary equipment/carts from the treatment room(s)
- Cover wall/ceiling mounted equipment with plastic sheeting or butcher type wrapping paper
- Cover light switch(es) with plastic sheeting/tape
- Cover floor and wall for splash protection
- Establish a water supply and a drainage system. A morgue/embalming type table for containment and easy draining is a good option
- If room is not designed for negative air pressure, consider HVAC operations as a possible spread of contamination; close or seal off conditioned air supplies
- Provide additional lighting in the treatment room as needed
- Provide public address systems
- Ensure the following equipment is available at the emergency entrance to receive the patient(s)
 1. Cart(s) of supplies
 2. Survey meter(s) and, as available, dosimetry
 3. Waste container(s) lined with plastic bags

Preparing the primary care provider to treat the patient

The steps listed below should be used to select, stage, and dressup/dressdown in the necessary personal protective clothing.

Establish a clean area for the personal protective equipment (PPE) staging area and care provider dressup area. The clean area should be marked and easily identifiable.

Select/inspect and dressup in the appropriate PPE:

- Disposable coveralls with headcover/hood
- Eye protection/face shield
- Respiratory protection
- Various colors and sizes of medical exam gloves
- Foot protection (boots or shoe covers)
- Masking type tape

Establish a decontamination dressdown area where care providers leaving the treat room can stand and conduct a stand-in-place self-decontamination.

Dressdown from head to toe carefully placing removed protective clothing in appropriate waste container(s).

Once all PPE has been removed, use a contamination meter conduct a whole-body survey.



Preparing the needed supplies to treat the patient

Select and stage necessary supplies for decontaminating/treating contaminated patient(s).

Supplies needed include:

- Cotton tipped applicators
- Sterile saline/water
- Bleach
- Iodine solution or other surgical soap
- Hydrogen peroxide
- Soft scrub brushes
- Medical equipment (suction, oxygen, IV solutions, airway intubation)
- Sharpie type pens
- Various sized plastic bags
- Sheets, blankets, towels, patient gowns
- Gauze of various sizes
- Masking/medical tape
- Five gallon bucket



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Contamination Survey Techniques

Select and protect the appropriate instrument/probe/detector.

- Hold the probe ½ inch from the surface being surveyed and move the probe slowly, approximately 1 - 2 inches per second.
- If the count rate increases while surveying, pause for 5 - 10 seconds over the area to provide adequate time for instrument response.
- If contamination is found, note the location and continue surveying.
- Become familiar with the jurisdiction's or state's guidelines for when an individual or object is considered contaminated. Often, an individual or material is considered contaminated if it reads 100 CPM or more above background.

Radiation Survey Techniques – Exposure rate survey instruments usually measure radiation in terms of milliroentgen per hour (mR/hr) or roentgen per hour (R/hr).

Cutaneous Radiation Injury (CRI) - Injury to the skin from acute exposure to a large external dose of radiation. Presentation of CRI can include itching, tingling, or a transient erythema or edema without history of exposure to heat or caustic chemicals. Damage to the basal cell layer of the skin will result in inflammation, erythema, and dry or moist desquamation. In addition, radiation damage to hair follicles can cause epilation. Transient and inconsistent erythema (associated with itching) can occur within a few hours of exposure and be followed by a latent, symptom free phase lasting from a few days to several weeks.

Dose	Sign
300 Rem	Epilation (loss of hair)
600 Rem	Erythema (redness of skin)
1,200 Rem	Dry desquamation
1,500 Rem	Blistering or wet desquamation
2,500 Rem	Chronic Radionecrosis (long term)

Generalized Acute Dose-Response Effects - The doses and effects listed are generalizations and a great deal of variability exists among people.

Dose	Effect
50 Rem	Blood count changes
100 Rem	Vomiting Threshold
150 Rem	Mortality Threshold
320 - 360 Rem	LD 50/60 (with minimal supportive care)
480 - 540 Rem	LD 50/60 (with supportive care)
800 Rem	100% mortality (with treatment)

Patient Decontamination Considerations

Removing radioactive material (contamination) from locations on the patient. Survey the patient to determine the locations and levels of contamination, the isotope(s) involved, and provide documentation regarding the contaminant.

Patient contamination can be presented to the medical staff in different ways. Save all solutions, foreign bodies, and swabs for analysis.

- **External Contamination** – This is contamination that is deposited on the surface of the patient, such as on their skin, hair or clothing.
- **Internal Contamination** – when ingested, inhaled, injected (impaled), or absorbed.
- **Incorporation** – Taken into the cells, tissues and organs. Specific organs such as liver, bone and thyroid are involved depending on the material absorbed.

To prevent internalization/incorporation, the portals of entry (wounds, mouth, eyes, nose, and ears) should be addressed before intact skin.

Wound - survey the wound with an appropriate instrument, and to examine dressings, exudate, and/or debride tissue for radioactivity.

Lacerations - Gentle irrigation will remove most of the contamination. Sometimes hydrogen peroxide or betadine surgical scrubs will be necessary. Often residual contamination will be found on the jagged edges of a wound and debridement may remove it.

Foreign Bodies - Treat as usual, locate and remove appropriately.

Puncture Wounds - scrub the opening surrounding the wound. If that is not effective, a tourniquet or incision may be used to induce bleeding. Then scrub and cleanse.

Thermal and Chemical Burns - In most cases, normal burn care in the Emergency Department will remove most of the radioactive material.

Orifices - Remove foreign bodies, swab, and irrigate.

Intact Skin - Wipe or irrigate the skin and gently scrub the skin with warm soapy water using a soft brush such as a surgical scrub.

Medical Countermeasures for Internally Contaminated Patients

The most effective method of treatment is to prevent the internalization of the radioactive material. The method of treatment depends, in part, on the isotope and its chemical nature.

- **Decrease absorption from gut**—By decreasing the solubility of the radioisotope, the absorption of ingested radioactive material can be reduced and the material passed with the stool.
- **Isotopic dilution**—Administering large amounts of the stable isotope of the same element as the radioisotope will increase excretion of the radioactive isotope.
- **Block incorporation**—Saturate the target tissue/organ with the stable isotope to reduce uptake of the radioisotope.
- **Mobilizing agents**—Chemicals that enhance elimination of the radioisotope from the body.

More specific information about patient assessment and treatment can be found at the following websites:

- Radiation Emergency Medical Management (REMM) website at www.remm.hhs.gov
- CDC Radiation Emergency Information for Clinicians www.cdc.gov/nceh/radiation/emergencies/clinicians.htm
- Oak Ridge Institute for Science and Education Resources for Radiation Medical Professionals (865) 576-1005 ask for REAC/TS <https://orise.ornl.gov/reacts>
- Radiation Injury Treatment Network Treatment Resources www.ritn.net