



Procedures for Medical Emergencies Involving Radiation

*Modified from Miller, K. and Erdman, M. Health physics considerations in medical radiation emergencies, Operational Radiation Safety, Health Phys 87(Suppl.1):S19-S24; 2004.

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RADIATION EMERGENCY RESPONSE

Patients may include those who have received a significant whole body exposure, patients who have inhaled radioactive materials or patients who are contaminated. **The treatment of patients with significant injuries or medical conditions should always take precedence over radiation exposure or decontamination procedures.**

If you are informed that radiation accident victims will be sent to the hospital, immediately notify the nuclear medicine department, health physicist, radiation safety officer and others who have expertise in radiation emergencies.

Decontamination of contaminated individuals not requiring resuscitation or stabilization should occur prior to receiving them into the healthcare facility. All patients should be considered contaminated until proven otherwise. Segregate contaminated and non-contaminated patients. Arrange a location where contaminated patients can be observed with limited staff contact.

Attempt to remove outer clothing. This eliminates 70 to 90% of the contamination.

Place any floor covering in patient treatment areas to control contamination.

Persons doing the monitoring, as well as the triage officer, should wear appropriate PPE. At a minimum, this should include surgical scrub suits, gloves and shoe covers. If available, personal dosimeters should be used.

Whether injuries are life threatening or not, attempt to question the patient. Ensure to ask whether any recent nuclear medicine tests or therapy involving radiopharmaceuticals has been conducted.

EMERGENCY SUPPLIES

In the event of a radiation emergency involving contamination, the following supplies will be needed:

1. Surgical caps
2. Surgical gowns
3. Surgical masks
4. Disposable shoe covers
5. Plastic gloves
6. Film badges and/or pocket dosimeters
7. N95 respirators (if necessary)
8. Adhesive tape
9. Plastic sheets and bags (bags for contaminated clothing)
10. Geiger-Mueller (G-M) radiation survey meters
11. Disposable non-sterile gloves or Saran Wrap to cover and protect instruments
12. Absorbent paper to cover floor
13. Filter paper for smears
14. Signs and labels stating "Caution Radioactive Material" and/or "Radiation Area"
15. Cotton-tipped applicators and collection tubes
16. Large barrels, marked with radiation signs, in which all contaminated liquids and clothing may be placed.
17. KI tablets (for radioiodine exposure only)

HANDLING OF CONTAMINATED INDIVIDUALS

Priority for treatment or decontamination generally will be determined by the severity of non-radiation injury, the levels of skin or clothing contamination, and the possibility of radionuclides entering the body through contaminated wounds. **In general, trauma is more serious than contamination and must be treated first if it is life-threatening.** All bleeding must be stopped and other life-support procedures instituted prior to decontamination. Collect *all* urine for bioassays for at least 24 hours in appropriately marked containers. If large radiation doses are expected, differential complete blood counts (CBCs) should be taken over several days. If acute radiation syndrome is possible, CBC's should be repeated every 6 hours for about 48 hours. Note the time of onset of vomiting.

DECONTAMINATION PROCEDURES

Gross Whole Body Contamination

1. Explain the decontamination process, equipment used, patient specimens taken and contamination precautions to the patient *prior* to the start of any decontamination procedure
2. Scan patient with survey meter prior to decontamination. If contaminated, remove patient's clothing.
3. Bag, label and hold contaminated clothing and other contaminated items for Radiation Safety Officer. The bag should be clearly marked 'Do Not Discard'.
4. Scan slowly (about several inches per second). Monitor carefully the hands, forehead, nose, mouth, neckline, torso, knees and ankles. Repeat this technique with the back of the body. Monitor soles of the feet.
5. If areas of high levels of radioactivity are found, localize and mark.
6. Seal open wounds with plastic and/or waterproof adhesive tape to prevent contamination being washed into the wounds and limit spread of contamination.
7. Shower or wash with tepid water and soap, taking care that the contamination from high level areas is washed off rather than spread over the rest of the body. Do not abrade the skin
8. As soon as body contamination is lowered, begin wound treatment or, if no wounds are present, shift to localized skin decontamination.

Contaminated Wounds

1. Encourage bleeding when possible.
2. Irrigate with copious amounts of saline. Save contaminated saline in specially marked containers.
3. **Do not wash skin contamination into the wound.**
4. Re-survey wound at periodic intervals using a G-M survey meter or wipe with sterile cotton-tipped applicator and survey the applicator. Record findings.
5. Decontaminate skin around the wound.
6. When wound and surrounding skin are decontaminated, seal area with plastic or waterproof adhesive tape.

Contamination of Body Entrance Orifices

1. Use moistened swabs collect a sample of each orifice separately, i.e., mouth, nose, eyes and ears. Bag (e.g. in a labeled "zip-lock baggie") separately and save for assay for internal contamination.
2. Make sure the cavity is actually contaminated and not the surrounding area.
3. Evaluate and decontaminate surrounding area.
4. Irrigate with copious amounts of water or normal saline.
5. If mouth is contaminated encourage brushing the teeth and rinsing. Instruct patient NOT to swallow
6. If pharyngeal region is contaminated, gargling with 3% H₂O₂ may be useful.
7. If tympanic membrane is not damaged due to explosion or trauma, use ear syringe for contaminated ears.
8. Gently swab with moistened cotton-tipped applicator.
9. Re-survey.
10. If necessary, and not irritating, use cotton-tipped applicator moistened with soap.

Eye Contamination

1. The only treatment for cornea contamination is copious irrigation.
2. If possible, avoid contamination of nasolacrimal duct
3. Sample irrigation fluid at frequent intervals, label samples and save for counting.
4. After decontamination, treat irrigation-induced conjunctivitis.

Localized Skin Contamination

1. Mark the area of skin contamination.
2. Begin treatment of area of highest contamination.
3. **Do not injure or abrade skin.**
4. Do not spread contamination to other areas of the skin.
5. Wash with water and soap using a gauze pad.
6. Put gauze pads used for decontamination in a plastic bag and label.
7. Re-survey, using a G-M survey meter and record results.
8. Some radioactive material may remain fixed to the skin.

Contaminated Hairy Areas

1. Survey and record results.
2. Wrap or position patient to avoid spread of contamination.
3. Wash with soap and save all contaminated fluids in appropriately marked barrels.
4. Dry with clean uncontaminated towel. Do not shave hair. If necessary hair may be cut, but do not injure skin.
5. Re-survey and record.
6. If contamination persists, repeat above steps.

Disposition of Patient

Once the patient has been treated for both trauma and contamination, transfer can be made to an appropriate area within the hospital. Repeat monitoring of all contaminated areas. For suspected internal uptakes, urine and feces should be collected for 24 hours for four consecutive days. If large radiation doses are expected, differential complete blood counts (CBCs) should be taken over several days. If acute radiation syndrome is possible, CBC's should be repeated every 6 hours for about 48 hours.

NOTIFICATION OF EXTERNAL AGENCIES

1. Local/County health department
2. State Bureau of Radiological Control and/or NRC.
3. Do not provide comments to the news media or make any public statements regarding the situation until they have been cleared by the Radiation Safety Officer, facility Administration and Public Relations officials.

WASTE DISPOSAL

1. Collect contaminated water and put in plastic containers for sampling and appropriate disposal.
2. Put contaminated disposable supplies in plastic bags for disposal.
3. Keep contaminated equipment in the controlled area until decontaminated.

PERSONNEL DISPOSITION

1. All persons entering the control area must wear appropriate PPE.
2. Survey all persons when they leave the control area.
3. Personnel contamination will be handled in the same manner as described above.
4. All personnel involved with contaminated patients must be surveyed before leaving their assigned area.
5. If internal uptake is possible, some staff may be required to submit successive urine samples for analysis.

LIMITS OF PERSONNEL EXTERNAL RADIATION EXPOSURE

1. All practical efforts will be made to keep personnel exposure as low as reasonable achievable.
2. The allowance of greater personnel exposures will be at the discretion of the health physicist and regulatory authorities.

EMERGENCY TELEPHONE NUMBERS

Health Physicist _____

Radiation Safety Officer _____

Hospital Administrator _____

Nursing Supervisor _____

Nuclear Medicine Physician _____

Nuclear Medicine Technologist _____

Media/Public Relations _____

Others _____

County Health Department _____

State Bureau of Rad. Control _____

NRC Regional Contact (if applicable) _____



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