RADIATION SAFETY
Key Takeaways

RADIATION SAFETY OFFICER DUTIES

- Help establish a radiation safety program as part of an interdisciplinary team.
- Oversee the facility’s radiation safety program.
- Monitor compliance with regulatory requirements.
- Assist in creating and enforcing organizational policies and procedures.
- Determine methods for monitoring and recording occupational exposure.
- Identify radiation safety problems and initiate, recommend, and verify corrective actions.
- Be present or designate an authorized user before and during radionuclide therapy.
- Control and maintain the surveillance program for radionuclides.
- In an ASC, ensure that all radiologic services are provided in accordance with the cross-referenced hospital requirements.
- In an ASC, periodically evaluate and calibrate equipment (e.g., test protective devices) in compliance with federal, state, and local laws.

PATIENT EXPOSURE

- Establish the pregnancy status of all premenopausal patients.
- Notify the surgeon and anesthesia professional when a patient has declared she could be pregnant.
- If the patient is pregnant, place lead shielding between the fetus and the source of radiation when possible.
- Move the patient’s extraneous body parts out of the path of the radiation beam.
- Place lead or lead-equivalent shielding over the patient’s thyroid, gonads, and breasts when these body parts are near the radiation source.
- Place shielding between the patient and the radiation source but not within the path of the x-ray tube beam.
- Place the patient as close as possible to the image intensifier side of the fluoroscopic unit and away from the tube side of the unit.
- Monitor the radiation dose received by the patient and inform the operator when the peak value for notification is reached.

DOCUMENTATION

Document the following in the patient’s health record:

- Radiation dose (diagnostic and therapeutic)
- Type and location of radiation protection
- Pre-radiation and post-radiation skin assessment

* Documentation of the radiation dose provides the information needed to calculate the lifetime patient dose. A high lifetime dose has been associated with cancer and other adverse effects that may occur after a prolonged time.

Patients should be protected from unsafe levels of ionizing radiation. The most radiosensitive cells include those of the hematopoietic system, the gonads, and the developing embryo.

A radiation safety officer or administratively designated alternative should work with an interprofessional team to establish a radiation safety program. A radiation safety officer must be appointed in all facilities in which radiation by-products (e.g., brachytherapy, stereotactic radiosurgery) are administered.
SHIELDING DEVICES

- Use shielding devices with all sources of radiation.
- Use equipment-mounted and mobile shields in addition to personal shields when required to remain near the patient or the sterile field.
- Wear a protective cap if required by the radiation safety program.
- Wear a protective apron that covers the body from the area below the thyroid collar to the knee.
- Wear a wraparound apron if your back will be exposed to the radiation beam.
- Wear a thyroid shield during fluoroscopic procedures.
- Wear lead eye protection if you are near the source of the radiation beam.
- Use sterile radiation shield drapes as an alternative to or in addition to equipment-mounted and mobile shields when permitted by the requirements of the invasive procedure.
- Wear protective gloves when your hands are near but not in the primary x-ray beam.

OCCUPATIONAL EXPOSURE

- Maintain the greatest distance possible from the radiation sources.
- Limit the amount of time spent close to the source.
- If you are the equipment operator, alert personnel in the treatment room before activating the equipment.
- Stand on the image intensifier side of the fluoroscopy unit whenever possible.
- Use slings, traction devices, and sandbags to maintain the patient’s position during radiation exposure.
- Use cassette holders to secure films.

PATIENT EDUCATION

- Consult with the physician regarding the need for post-procedure patient education and the timing of follow-up care for a patient who has had an image-guided procedure.
- Educate the patient about the signs and symptoms of overexposure to radiation (e.g., gastrointestinal symptoms, radiation burns, potential hair loss).
- Inform the patient of the potential time frame for the appearance of signs and symptoms.
- Explain the importance of receiving follow-up care from the physician who performed the procedure.

The radiation dose to personnel decreases proportionally as the distance between the radiation source and the person increases. Alerting personnel before equipment activation allows them to maintain as great a distance as possible from the source. Holding the patient manually increases the risk of exposure by the direct beam.
THERAPEUTIC RADIONUCLIDES

- Handle therapeutic radiation sources in accordance with local, state, and federal regulations.
- Handle capsules, seeds, and needles that contain radioactive sources with forceps, tongs, or tube racks.
- Use radioactive materials under direct supervision of the radiation safety officer or an authorized user.
- Account for all radioactive seeds in the counting procedure.
- Follow manufacturers' written instructions for storing radioactive materials.
- Maintain as great a distance as possible from irradiated tissue and use long forceps when handling irradiated tissue.
- During patient transfer, notify personnel who will be receiving the patient about the radiation source and anatomical location.
- Instruct the patient and caregivers on precautions to follow after the patient is discharged. Include the length of time the precautions should be continued.
- Advise the patient to stay away from crowded places, double flush urine, and wear protective clothing (eg, breast shields).
- Advise female patients not to breast feed for one week after treatment.
- Advise family members, caregivers, and visitors to stay a distance of 3 feet from the patient, if possible, for a period of time equal to the half-life of the radionuclide.

PREGNANT PERSONNEL

Document the following:

- Declare your known or suspected pregnancy to the radiation officer or through other appropriate facility channels.
- Do not exceed 0.5 rem exposure to radiation during the entire gestational period; this should be uniform over time and not received all at once.
- Wear an additional radiation monitor at the waist under shielding during radiation exposure.
- Follow standard radiation protection techniques.
- Wear a maternity or double-thickness apron or a wraparound apron that is large enough to cover the entire abdominal area.

Local, state, and federal regulations determine the radiation precautions to be followed by personnel who are pregnant. Declaration of pregnancy is supported in professional guidelines but is not legally required.

DOSIMETERS

- Wear radiation monitors or dosimeters as required by regulatory agencies.
- Wear dosimeters in a consistent location.
- Wear one dosimeter inside the lead apron.
- Wear one dosimeter outside the apron at the collar or left shoulder to measure exposure to the head, neck, and lens of the eye.
- Wear a finger dosimeter if you are within 1 m of the primary x-ray beam.
- Store dosimeters at the facility at the end of every work day.

Personal radiation monitoring devices are the principal mechanism for monitoring day-to-day radiation exposure and determining cumulative radiation levels. Radiation monitoring devices should not be taken home because the device may collect ionizing radiation from other sources (eg, sun, soil, airport scanners).

DISPOSAL OF RADIOACTIVE WASTE

- Dispose of radioactive waste according to local, state, and federal regulations.
- In preparation for disposal, place radioactive waste in a radioactive waste container if it cannot be disposed of using a dilute or disperse technique.
- Label radioactive waste with the radioisotope name, amount of radioactivity, date of disposal, and radiation personnel or authorized user’s name.

Disposal techniques are subject to regulatory requirements.

OTHER RESPONSIBILITIES

- Participate in the radiation safety interprofessional team.
- Participate in the monitoring required for the quality assurance program (eg, frequency of when the patient dose triggers patient follow-up).
- Participate in radiation safety education.

Personnel should follow the principles of time, distance, and shielding when handling therapeutic radionuclides or caring for patients who have received therapeutic radionuclides. Advance communication and education protects personnel, caregivers, and visitors from unnecessary exposure to radiation.