

Radiation Safety Training

prepared for non-radiology hospital personnel, hospital security,
and hospital volunteers

providing radiology continuing education to imaging techs *and*
radiation safety training to non-radiology personnel



What is radiation?

Radiation is found almost everywhere. It travels in the form of electromagnetic energy, which can be very powerful. In hospitals and medical imaging centers, it is found in higher energy levels - known as ionizing radiation. *Ionization* refers to a process whereby an electron is provided enough energy to break away from an atom - resulting in a net positive-charge molecule and a negative-charge free electron.¹ This process can have damaging effects in the human body.

Most non-radiology personnel working in the hospital should be concerned with the *stochastic* effects of ionizing radiation. This refers to the probability (as opposed to the severity) of the physical effects of radiation as it relates to radiation exposure.²

What are the physical effects of radiation?

Radiation does carry some health risk with even small amounts of exposure over a period of time. These risks include cancer (though this occurrence is rare), hereditary effects (malformations - as an example - also rare), and *fetal effects* (this includes both cancer and hereditary effects to the unborn child - but also mental retardation and even fetal loss).³

Radiation does pose some health risk to any person working day to day in its vicinity (though its probability is extremely low with adequate protection). However, *pregnant women* should avoid any radiation exposure (except for their own diagnostic study under the direction of a physician).

Where is radiation found in the hospital?

Radiation is emitted from: fixed and portable x-ray machines, fluoroscopy machines, CT (computed tomography) scanners, linear accelerators and brachytherapy sources (in radiation therapy), and radiopharmaceuticals (in nuclear medicine). Signs like these help you make note of *sources of radiation* in the hospital.



Everyone who works or volunteers in a hospital should be aware of sources of radiation found *throughout the hospital*. In general, look for these radiation warning signs in radiology, radiation therapy, nuclear medicine, and portable x-ray machines - which can be found anywhere.



How do I protect myself from radiation?

Hospital workers are provided with *many things to shield them from radiation-emitting sources*. They include lead aprons, thyroid shields, and lead gloves for shielding specific body parts. In nuclear medicine and radiation therapy, lead bricks, lead vials, lead syringe shields (among other tools) are employed. Lead glass is also used for radiation protection.⁴



Most importantly, remember that the most effective method of radiation protection is to do 3 things: *minimize time* (around radiation sources), *maximize distance* (from radiation sources), and *maximize shielding* (as described above).

In the nuclear medicine department . . .

Hospital workers, such as the security personnel, are often assigned the task of transporting radiopharmaceuticals. This radioactive medicine emits *gamma radiation* - and poses the same health hazards as x-radiation. It is considered a primary hazard during most radiological emergencies, so take the necessary precautions when handling it.⁵ It is important to note that x-ray machines turn on and off - while radiopharmaceuticals are always *on* - emitting radiation all the time.



Be advised by the *radiation safety officer* as to the specific protocols, protective gear, and safety vial shields, syringe carriers, and bricks used in transporting the radiopharmaceuticals.

Radiation awareness as you work . . .

Housekeepers should be given *permission and protocols with protective equipment* by the radiation safety officer before removing bedsheets or any sort of cleaning in radiation restricted areas (such as nuclear medicine) that contain radioactive substances. Maintenance and clerical personnel should do likewise before working in these areas.

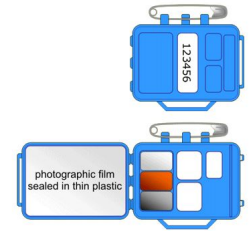


To avoid accidental ingestion or inhalation of radioactive materials - never eat, drink, or apply cosmetics in *radiation restricted areas*.⁶

providing radiology continuing education to imaging techs *and* radiation safety training to non-radiology personnel

The importance of radiation monitoring:

OSHA (Occupational Safety and Health Administration) of the US Department of Labor has set forth several guidelines for hospitals to follow to help ensure the safety of those working around the sources of radiation discussed in this presentation on a day-to-day basis. OSHA states that *“Film badges or their equivalent should be used for long-term monitoring.”*⁷



Examples of long-term radiation monitoring devices include **film badges, double-badging, and ring badges**. The radiation safety officer can help you determine which is right for you.

providing radiology continuing education to imaging techs **and** radiation safety training to non-radiology personnel

Make every reasonable effort . . .

The US Nuclear Regulatory Commission, in the Code of Federal Regulations (10 CFR 20.1003), has created the acronym **ALARA** to remind us to make every reasonable effort to keep exposures to ionizing radiation as far below the dose limits as practical.⁸



ALARA stands for **As Low As Reasonably Achievable**. Simply put - keep your exposure to ionizing radiation as low as possible using the techniques, equipment, and warnings discussed in this presentation. Further, consult the radiation safety officer for all protocols and equipment needed before working around any radiation emitting sources.

providing radiology continuing education to imaging techs **and** radiation safety training to non-radiology personnel



Works Cited

1. "Health Effects." *EPA*. Environmental Protection Agency, 7 Aug. 2012. Web. 19 Dec. 2014. <http://www.epa.gov/radiation/understand/health_effects.html>.
2. "Questions and Answers for Physicians About Medical X-Rays." *Questions and Answers for Physicians About Medical X-Rays*. U.S. Food and Drug Administration, 10 Mar. 2009. Web. 19 Dec. 2014. <<http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/MedicalX-Rays/ucm115359.htm>>.
3. "Radiation: Non-Ionizing and Ionizing." *EPA*. Environmental Protection Agency, 3 Dec. 2014. Web. 19 Dec. 2014. <<http://www.epa.gov/radiation/understand/#ionizing>>.
4. "Nuclear Medicine Shielding and Dosimetry." *Washington.edu*. University of Washington, 2014. Web. 19 Dec. 2014. <http://depts.washington.edu/uwmip/Week_6/alessioNMdoseSlides06.pdf>.
5. "Gamma Rays." *EPA*. Environmental Protection Agency, 15 May 2013. Web. 17 Dec. 2014. <<http://www.epa.gov/radiation/understand/gamma.html>>.
6. Bank, Morris I. "RADIATION INFORMATION FOR HOSPITAL PERSONNEL." *AAPM Report 53 (1995): n. pag.* AAPM. American Association of Physicists in Medicine, 2014. Web. 20 Dec. 2014. <https://www.aapm.org/pubs/reports/rpt_53.pdf>.
7. "Radiation Exposure." U.S. Department of Labor. OSHA, 2014. Web. 20 Dec. 2014. <<https://www.osha.gov/SLTC/etools/hospital/clinical/radiology/radiology.html>>.
8. "ALARA." US NRC. U.S. Nuclear Regulatory Commission, 20 Nov. 2014. Web. 20 Dec. 2014. <<http://www.nrc.gov/reading-rm/basic-ref/glossary/alara.html>>.

A short test follows this presentation, which is necessary for completion of the training and to receive the certificate. Go to radunits.com/radiationtraining - then click on your place of employment to access the test. *thank you*